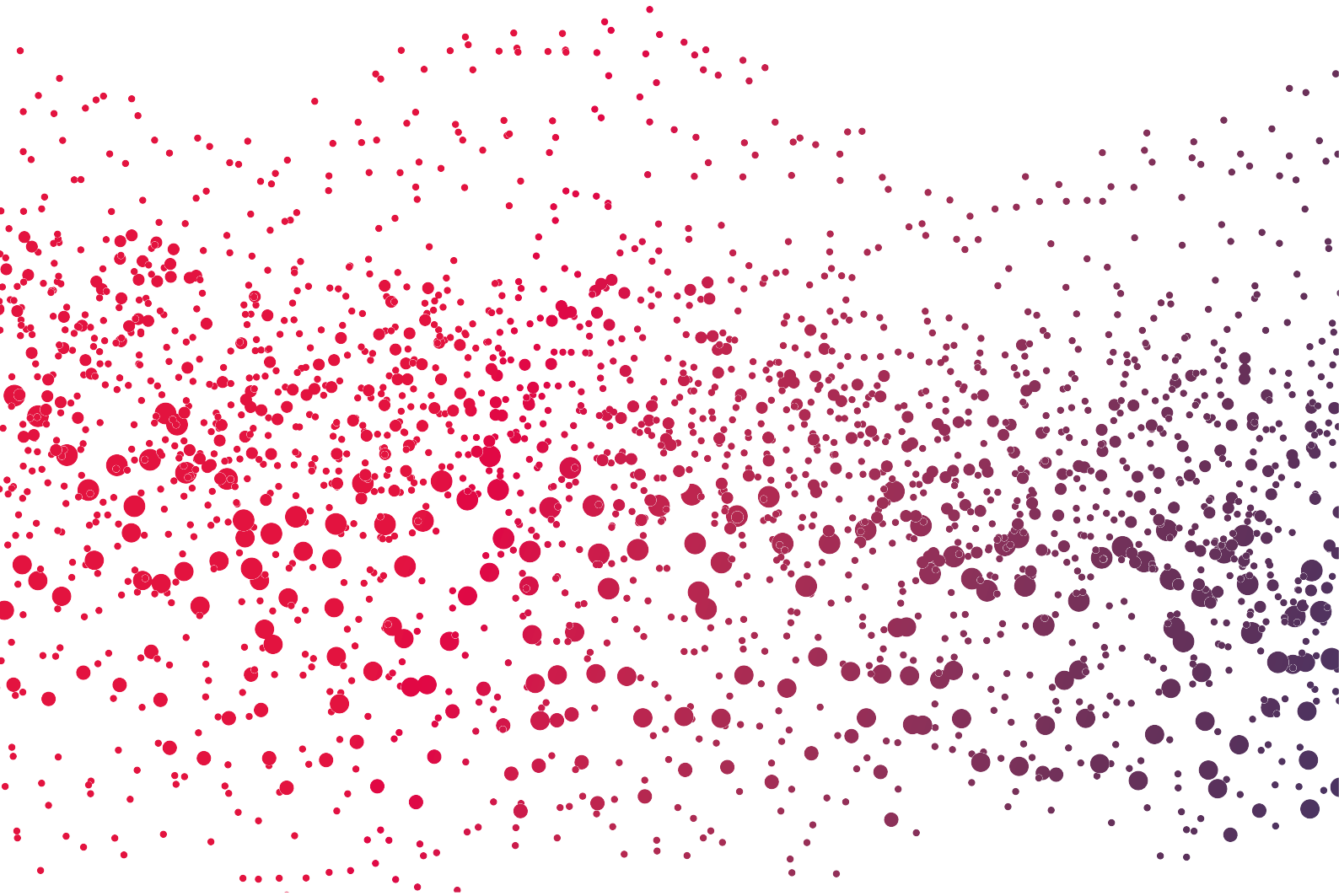
AMPLIFON CENTRE FOR RESEARCH AND STUDIES

amplifon

CRS SCIENTIFIC JOURNAL

Otology & Audiology Article Review

Volume 9
June 2026



Perceived barriers and enablers to help-seeking and informed decision-making in hearing care

From Hearing Patterns to Functional Outcomes: Quantifying Audiometric Profiles for Precision Hearing Care

Hearing Loss Among Older Adults: Epidemiology, Disparities, and Gaps in Research

CONTENT

Published by Parresia - 35-39 Boulevard Romain Rolland - 75014 Paris - France

EDITORIAL

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 11 interesting articles published in the first quarter of 2026.

This edition highlights several emerging themes shaping the future of hearing healthcare, including precision audiology, digital health accessibility, patient-centred rehabilitation, and the growing integration of hearing care within broader public health and healthy ageing frameworks. The selected articles explore a wide-range of topics, from cognitive processing and noise acceptance in older adults, to audiometric profiling for personalised hearing aid fitting, vestibular implications of recreational listening habits, and barriers influencing help-seeking behaviour in hearing care.

Several contributions in this issue also address the increasing role of technology in modern audiology. Reviews on digital literacy among older adults with hearing loss, as well as the use of consumer devices such as Apple AirPods Pro2 as assistive listening technologies, reflect the rapidly evolving relationship between consumer electronics and hearing healthcare delivery. Other articles emphasise the importance of self-efficacy, patient engagement, and long-term behavioural support in achieving successful auditory rehabilitation outcomes.

Lastly, this issue includes an important public health review examining hearing loss among older adults, focusing on epidemiology, disparities in access to care, and critical research gaps that continue to shape global hearing healthcare policy and service delivery. Together, these contributions underscore the need for more integrated, accessible, and personalised models of hearing care across both clinical and community settings.

I would also like to take this opportunity to introduce Nicholas Reed, my successor at the Amplifon Centre for Research and Studies following my retirement this year, who will coordinate the future development of this journal. Building on the strong foundation at the *CRS Scientific Journal* to provide timely and practice-relevant reviews of the current literature, Nicholas will explore new avenues for disseminating information and hopes to strengthen connections with external experts and thought leaders through editorials on the future of hearing care and research, complementing the journal's reviews. I look forward to working with Nicholas as we shape the exciting future of the CRS Scientific Journal.

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

Nicholas Reed
&
Mark Laureyns

COGNITIVE TESTS AND ACCEPTANCE OF NOISE IN OLDER ADULTS WITH NORMAL HEARING

Hedrick M., Bugg L., Mazeall L., et al.

Am J Audiol. (2026): 35(1), 258–66

doi: 10.1044/2025_AJA-25-00102. Epub 2025 Dec 19. PMID: 41417674.

Thomas J. Tedeschi, US

A focused and insightful contribution to the literature on noise acceptance in ageing.

INTRODUCTION

In this study, Hedrick and colleagues examine an important and clinically relevant question: whether cognitive abilities account for interindividual differences in older adults' tolerance of background noise, despite clinically normal hearing thresholds. Their study focuses on the acceptable noise level (ANL)-a measure widely used in audiology to estimate how much competing background noise a listener can tolerate while following speech-and asks the extent to which ANL is related to cognitive test performance in older adults. The article makes a valuable contribution by extending a line of research which has predominantly focused on younger or mixed-age samples and draws attention to a population in which age-related cognitive decline may affect everyday listening abilities even in the absence of measurable hearing loss (HL).

STUDY PURPOSE

The authors set out with two objectives: first, to identify cognitive variables that may influence older adults' acceptance of noise; and second, to corroborate previous findings suggesting that age itself may contribute to variations in ANL. This is an important research agenda because ANL has practical implications for hearing aid (HA) counselling, communication strategies, and audiological rehabilitation planning, yet its underlying cognitive mechanisms remain insufficiently understood. The study also builds on the authors' earlier work as well as related research, demonstrating associations between key cognitive processes-inhibitory control, attentional processes, and working memory-and listeners' experiences in noisy listening environments.

METHODS AND DESIGN

The sample comprised native English-speaking older adults aged 50 to 72 years with normal hearing thresholds. However, eight participants were excluded because their pure-tone

CRITICAL NOTE

Clinical relevance

Despite its limitations, the paper offers clear clinical relevance. The authors' results suggest that noise tolerance in older adults may reflect processes extending beyond peripheral hearing sensitivity, even when hearing technically falls within clinically normal ranges. This has important implications for clinical practice because patients often report difficulty 'tolerating' environments before they show obvious hearing loss (HL). Accordingly, the article supports counselling approaches that address listening setup, room acoustics, and sound source placement, as well as a broader appreciation of cognitive factors in auditory rehabilitation.

The work also reinforces a well-established principle in audiology: test scores alone do not capture the lived experience of listening. Acceptable Noise Level (ANL) may be clinically informative not because it directly predicts speech recognition, but because it identifies a listener's willingness to sustain communication in noisy environments. In that sense, ANL may be best understood as a bridge between audiometric function and everyday communication behaviour.

Overall assessment

Hedrick et al. provide a focused and rigorous contribution to the literature on noise acceptance in ageing. Their main achievement is showing that, in older adults with normal hearing, ANL appears to be more closely associated with cognitive processes related to attention and working memory rather than with speech-in-noise recognition per se. While the study is not definitive – owing primarily to its small sample size and correlational design – it is nevertheless conceptually strong and clinically relevant. It is best interpreted as a hypothesis-generating paper which clarifies which cognitive mechanisms warrant further attention in future ANL research.

averages (PTA) exceeded the study's audiometric inclusion criterion, leaving a final analytical sample of 15 participants. All participants also obtained scores of at least 26 on the Montreal Cognitive Assessment (MoCA), a screening threshold determined by the authors to minimise heterogeneity associated with possible mild cognitive dysfunction and ensure the study remained focused on normative ageing. This screening procedure strengthens the study's internal validity; however it simultaneously limits the generalisability of the findings to the broader older-adult population.

The authors used a robust battery of measures. In addition to ANL, participants completed the Hearing in Noise Test (HINT), the Operation Span (OSPAN), the WAIS-IV Digit Span and Letter-Number Sequencing subtests and the Woodcock-Johnson Auditory Attention subtest. This multidimensional approach constitutes a notable strength of the study because it enabled the authors to examine multiple facets of cognition rather than relying on a single proxy for 'cognitive ability.' Their inclusion of both simple span and more complex working-memory measures is especially well justified in light of the ongoing debate over whether speech-in-noise (SIN) performance is better explained by storage, manipulation, attention capacity, or broader executive processes.

MAIN FINDINGS

The study's central finding was that ANL-related performance in older adults was more strongly associated with cognitive variables—particularly measures of attention and memory—than with speech recognition as measured by the HINT. The authors report that HINT scores did not correlate significantly with either ANL or the working-memory tests in the combined data set, suggesting that speech recognition in noise and noise acceptance are two distinct constructs. They further interpret the observed significant relationships among age, PTA, letter-number sequencing, background noise level (BNL), and attention as evidence that older listeners may exhibit altered top-down and bottom-up interaction when navigating noisy environments.

A particularly valuable element of the discussion is the authors' distinction between ANL components. They propose that the Most Comfortable Level (MCL) may be tied to cognitive registration or attention, whereas the BNL may reflect inhibitory control or selective suppression of irrelevant input. This interpretation is consistent with the broader conceptual framing of ANL as a measure of noise tolerance rather than merely a speech-recognition score. Moreover, this interpretation also aligns with the article's discussion of recent neurophysiological research suggesting that neural indices of registration and inhibition may map onto MCL and BNL differently.

INTERPRETATION

The article's strongest contribution is theoretical. Hedrick et al. do not merely report correlations; they attempt to explain them using contemporary models of listening effort and language processing. Their discussion of the Framework for Understanding Effortful Listening (FUEL) and Ease of Language Understanding (ELU) frameworks is particularly compelling because these models help distinguish between hearing, understanding, effort, and the cognitive resources required to sustain communication in adverse acoustic conditions. The authors exercise appropriate caution not to overgeneralise the relationship between working memory and ANL. Instead, they argue that the relevant mechanism may involve information manipulation and inhibitory control, rather than relying solely on storage capacity or memory span. This nuance is important: a recurring pitfall in audiology and cognitive-hearing research is the temptation to treat all memory measures as interchangeable indicators of 'cognitive capacity.' The authors resist this oversimplification by emphasising that digit span measures and sequencing tasks may not capture the same processes as complex span measures such as OSPAN or auditory reading-span paradigms used in prior studies. Their interpretation—that the influence of working memory on listening outcomes may depend on processing demands and interactions with long-term memory—is one of the article's most persuasive points.

STRENGTHS

Several strengths stand out. First, the article addresses a clinically meaningful question: why certain older adults demonstrate greater tolerance to noise, a consideration which has direct implications for counselling and HA use. Second, the study uses a fairly rigorous cognitive and audiologic test battery rather than relying on a single screening task. Third, the authors are transparent about the limitations of their research, including the small sample size and a potential order effect, as the OSPAN task had to be administered last. Such methodological transparency increases confidence in the interpretation of their findings.

An additional strength lies in the authors' willingness to connect their results to prior and emerging work. Their discussion draws on earlier ANL studies, the inhibitory control literature, and recent neurophysiological evidence, thereby positioning the paper within a coherent research programme rather than as an isolated correlational study. Lastly, the authors provide clinically relevant recommendations: preferential seating; reducing interfering noise; and more counselling for HA users who struggle with noisy environments.

LIMITATIONS

The most salient limitation is the study's small sample size. With only 15 participants included in the final analysis, statistical power is limited, and the stability of the observed correlation estimates remains uncertain. The authors argue that their moderate-to-strong correlations and effect sizes partially mitigate this concern; however, replication in a

larger cohort is still essential. A second limitation concerns the restricted sample: all participants demonstrated NH and no evidence of cognitive impairment on screening, which substantially narrows the generalisability of the findings to older adults with HL, mild cognitive decline, or both.

A further methodological concern is the potential for an order effect. Because OSPAN had to be administered last, participant fatigue may have influenced performance, even if the authors suggest that any such effect was likely minimal. In addition, the study relies on cross-sectional correlations, which precludes any causal inference regarding whether attentional control or working memory contributes to noise acceptance. Finally, because ANL is a highly specific clinical protocol, its relationship to broader constructs such as annoyance, motivation, and real-world HA success may be more complex than can be fully resolved in the study design. •

SWEET-SPOT COMPRESSION: AN AMPLIFICATION STRATEGY FOR IMPROVING LISTENING OUTCOMES

AT MODERATE TO HIGH LEVELS

Jürgensen L., Fereczkowski M. & Neher T.

Trends Hear. (2026): 30, 1–14

doi: 10.1177/23312165261431931. Epub 2026 Mar 17. PMID: 41841336; PMCID: PMC13009919.

Gian Carlo Gozzelino, Italy

Despite the potential of sweet-spot compression to enhance both speech understanding and user preference, the study exposes a significant limitation in current 'threshold-only' fitting philosophies.

INTRODUCTION

Modern hearing aid (HA) technology has made significant strides in improving audibility for soft sounds, yet the industry continues to contend with a phenomenon known as 'rollover.' This term describes the paradoxical decrease in speech understanding which can occur when sound becomes too loud—a common issue for individuals with sensorineural hearing loss (SNHL). Despite this, standard clinical protocols often prioritise linear gain or standard wide-dynamic range compression (WDRC) based solely on pure-tone thresholds, frequently failing to account for how an individual's performance degrades at moderate to high intensities.

The research presented by Jürgensen, Fereczkowski, and Neher explores an innovative amplification strategy called Sweet-Spot Compression (SSC). Unlike traditional methods, SSC focuses on the so-called "sweet spot" of the listener's performance, i.e. the specific intensity range in which both clarity and comfort are maximised. By shifting the focus from simple threshold compensation to the optimisation of supra-threshold hearing, this study seeks to provide a more personalised and effective solution for aided listening in complex, high-volume environments.

SUMMARY OF KEY FINDINGS

The study was structured into two phases: first, to establish a baseline of individual differences; and second to test the efficacy of the new SSC strategy.

- **Individual Variability in Speech Performance:** The researchers found that listeners with similar audiograms exhibited vastly different speech intelligibility (SI) profiles at high volumes. Whereas some maintained relatively stable performance, others showed significant 'rollover.' Interestingly, participants' Most Comfortable Level (MCL) did not directly correlate with the level of their maximum speech understanding; however, it generally served as a reliable lower boundary for the 'sweet spot' range.
- **Superiority of SSC in Intelligibility:** When compared to the standard clinical reference (NAL-NL1) and a linear baseline (NAL-RP), SSC consistently produced higher speech intelligibility scores. This benefit was observed at both moderate (65 dB SPL) and high (80 dB SPL) input levels.

CRITICAL NOTE

Despite the positive results, several limitations limit the scope of the study and highlight potential practical hurdles for implementation.

- ***Sample Characteristics:*** *The participant sample was relatively small (17–18 people) and consisted primarily of individuals with mild-to-moderate hearing loss (HL). Consequently, the rollover effect was less pronounced than that reported in previous studies involving more severe losses. It therefore remains to be seen whether the benefits of Sweet-Spot-Compression (SSC) would scale linearly in listeners with much narrower dynamic ranges or more profound neurological damage.*
- ***Hardware Limitations:*** *The researchers noted that SSC often prescribes 'negative gain' (attenuation) at high frequencies to maintain the sweet spot. However, because they used standard 'domes' rather than custom earmolds, they could not always achieve these targets due to sound leakage. This suggests that the full potential of SSC may only be reached with highly occlusive, custom-fitted earmolds, which may not be well tolerated for all patients.*
- ***Protection Against Transients:*** *The reliance on long attack times (800 ms) is particularly good for supporting speech clarity, however, it can also be potentially dangerous for sudden, loud noises (such as a door slamming). The authors acknowledge this limitation, noting that a commercial version of SSC would require an additional 'fast-acting' layer to protect users' ears from acoustic shocks without distorting the primary speech signal.*
- ***Comparison Standards:*** *The study used NAL-NL1 as the reference, which is now considered a legacy standard. While valid for comparison with previous literature, modern (HAs) have commonly moved towards updated frameworks such as NAL-NL2 or NAL-NL3. Comparing SSC against these more modern, high-compression formulas would provide a more rigorous test of its competitive advantage.*

On average, SSC improved speech scores by approximately 7–8% over clinical reference.

- **User Preference and Comfort:** Beyond objective clarity, the study focused on subjective quality. Participants overwhelmingly preferred the sound quality of SSC over the reference condition across nearly all tested environments, including quiet settings and various levels of background noise.
- **Rollover Mitigation:** While the sample as a whole did not show massive rollover at the tested presentation levels (likely due to the mild-to-moderate nature of their HL), SSC was more effective at the individual level in preventing the decline of speech scores as volume increased compared to traditional strategies.

STRENGTH POINTS

The study stands out for its progression from theoretical simulation to real-world application. By utilising a wearable research HA rather than relying solely on headphone simulations, the authors provide evidence that is highly relevant to actual clinical practice.

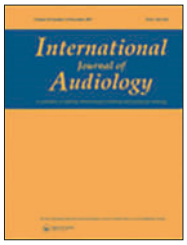
- **Personalisation Focus:** The core strength of SSC lies in its departure from 'one-size-fits-all' gain prescriptions. By anchoring amplification around each individual's MCL, the strategy acknowledges that the internal 'gain control' of the human ear varies significantly between people, even with ostensibly identical HL on a standard chart.
- **Acoustic Integrity:** A major technical achievement of this research is the use of long-time constants (800 ms for both attack and release). This approach provides 'quasi-linear' amplification, which preserves the natural fluctuations and temporal cues of speech. This avoids the 'pumping' artifacts commonly associated with faster compression systems, thereby enabling better clarity in noise.
- **Ecological Validity:** The inclusion of diverse test conditions—ranging from soft speech in quiet to loud speech in 'babble' noise—ensures that the results reflect the daily challenges faced by HA users.

CONCLUSIONS

The research by Jürgensen et al. provides a compelling argument for rethinking how we fit HAs for moderate and high-level sounds. By demonstrating that SSC can simultaneously improve speech understanding and user preference, the study highlights a significant flaw in current 'threshold-only' fitting philosophies.

The primary takeaway is that 'more gain' is not always better. Rather, the selective reduction of gain at high levels and stabilising it with slow-acting compression allows the brain to process speech more naturally. While further refinement is needed, particularly regarding ear-canal occlusion and protection against sudden loud sound, SCC represents a promising path towards HAs that truly adapt to an individual's unique 'sweet spot' of hearing. This shift towards supra-threshold optimisation may ultimately reduce device discontinuation rates due to poor performance in noisy or loud environments. •

‘I FEEL A LITTLE BIT CLUELESS’ PERCEIVED BARRIERS AND ENABLERS TO HELP-SEEKING AND INFORMED DECISION-MAKING IN HEARING CARE: A QUALITATIVE STUDY



Bothe E., Bennett RJ., Sherman KA., et al.
Int J Audiol. (2025): 64(12), 1300–09
doi: 10.1080/14992027.2025.2493918. Epub 2025 May 16. PMID: 40377338.
Jan De Sutter, Belgium

This article builds on earlier quantitative research on successful hearing care uptake by investigating qualitative aspects of help-seeking and decision-making.

INTRODUCTION

Despite the increasing number of available options to treat hearing loss (HL) and their ever-improving quality, research shows that both awareness of their existence and their accessibility remain low. This article identifies various barriers – not solely financial — – that may deter people from actively seeking help. Ultimately, these findings will inform a decision-support tool under development by the authors, HearChoice, designed to assist people with hearing difficulties in help-seeking and decision-making processes.

This study builds on earlier quantitative research on predictors of successful hearing care uptake by looking into the qualitative elements of help-seeking and decision-making. The researchers used the Capability, Opportunity, Motivation - Behaviour (COM-B) model to guide their analysis, positing that test subjects are more likely to show the target behaviour of help seeking and decision making when they have sufficient Capability, Opportunity and Motivation.

DESIGN

A total of 16 Australian participants with HL were interviewed to assess their experiences of help-seeking and decision-making. Participants were at varying stages in their HL journey, ranging from first realisation of perceived HL to experienced hearing aid (HA) users. The sample exhibited considerable heterogeneity in age, sex, self-perceived HL and time since onset of HL. Participants were split into two groups based on whether they had sought professional help.

RESULTS

The interview data (participant verbatim quotations) were classified into two categories: help-seeking; and informed decision making. For each category, the qualitative findings derived from the interviews were further organised according to the COM-B subthemes.

To substantiate each COM-B subtheme, the authors included illustrative participant quotations for both the help-seeking and informed decision-making domains, including: Psychological

CRITICAL NOTE

One limitation noted by the authors is the potential cultural bias of an all-Australian test group. In addition, generational differences may also represent an important source of variability that warrants consideration. Across all three domains of the COM-B model, it is highly plausible that a 27-year-old and a 90-year-old would differ substantially in their help-seeking behaviour. Also, related factors such as digital literacy and environmental context are also likely to influence access to information and the ease of acceptance of new technology.

Some overarching areas for improvement include strengthening the intrinsic capabilities in gaining access to relevant information, tailoring communication strategies to age and background characteristics and improving the accessibility of e-health services.

Reducing stigma and shame associated with hearing loss may require change at the structural level, for example, increasing visibility of success stories, and (somewhat paradoxically), a greater representation of hearing solutions, for example, through public role models. Although societal change is typically very slow, such measures may contribute to more favourable attitudes towards help-seeking and technology adoption over time.

capability; Environmental opportunity; Social opportunity; Reflective motivation; and Automatic motivation.

DISCUSSION AND CONCLUSION

Following the COM-B model, the authors summarise their findings and conclusions as follows:

- **Capability domain:** Access to information and relevant knowledge was considered likely to boost HA uptake, by facilitating better guidance in help-seeking and informed decision-making processes. The authors also highlight that the accessibility of the channels through which knowledge is disseminated should be considered as an important enabler in supporting individuals' acquisition of this knowledge.
- **Opportunity domain:** The study identified a large variety of factors, highlighting that increasing awareness among first-line caregivers, employers, and educational institutions may improve the identification of HL.

The authors further argue that the development of educational tools and resources and public campaigns would improve the visibility of both HL and the available options to treat it.

- **Motivation domain:** Informing on the negative consequences of untreated HL and the benefits of early intervention seems to be the conventional approach. However, this 'carrot-and-stick' approach represents only part of the picture: even very well-informed people may continue to experience barriers in terms of shame and stigma.

Interventions targeted at a single COM-B domain may positively influence other domains, as well as other factors such as the perceived cost of hearing solutions. •

FROM HEARING PATTERNS TO FUNCTIONAL OUTCOMES: QUANTIFYING AUDIOMETRIC PROFILES FOR PRECISION HEARING CARE

Morvan P., Campi M., Staerman G., et al.
Audiol Neurootol. (2026): 1–37
doi: 10.1159/000551057. PMID: 41855361.
Perrine Morvan, France

This study investigates whether classifying patients according to their audiometric profile provides additional predictive value for hearing aid outcomes, and helps identify which clinical variables best explain improvement in speech comprehension in quiet and in noise.

INTRODUCTION

Hearing aid (HA) outcomes vary substantially among patients with comparable degrees of hearing loss (HL) severity. The pure-tone average (PTA) can obscure important differences in audiometric configurations: two patients with the same average HL may present entirely different audiogram shapes, and consequently, respond very differently to amplification, both in quiet and in noisy environments.

The central research question of this study is: can audiogram shape provide clinically relevant information beyond HL severity alone?

POPULATION

This retrospective analysis included 22,694 adults aged 50 to 90 years, fitted with HAs between 2018 and 2021

CRITICAL NOTE

This study makes a significant contribution to the concept of precision audiology by demonstrating that audiogram shape constitutes an independent and clinically actionable predictor of HA outcomes. The eight-profile system achieves a relevant balance between clinical interpretability and analytical granularity, and the large, nationally representative dataset lends considerable strength to the findings. Prospective validation incorporating patient-reported outcome measures, such as satisfaction and quality of life, will be essential to confirm the clinical utility of this approach in routine care.

across 780 audiology centres in metropolitan France (Amplifon network). Inclusion was restricted to patients with symmetrical HL and with complete audiometric data, including PTA, speech reception threshold in quiet (SRTQ) and in noise (SRTN).

Additional clinical variables were collected for each patient, including: daily HA usage (datalogging); number of follow-up appointments; amplification level; stereo-configuration testing; device type; manufacturer; and technology level.

METHOD

Step 1 — Defining eight audiometric profiles

Based on existing clinical, pathophysiological, and data-driven classifications, eight profiles were defined a priori: Profile A (moderate presbycusis); B (mild presbycusis); C (ski-slope); D (advanced presbycusis >50 dB); E (moderate-severe flat loss); F (profound HL >70 dB); G (high-frequency notch)and H (U-shaped). Each patient was assigned to their closest profile using Manhattan distance, a categorisation further validated using shape correlation ($r \geq 0.5$).

Step 2 — Testing the added value of audiometric profiles

Two predictive models were built using a gradient boosting framework (XGBoost): one targeting speech reception threshold in quiet (SRTQ) and the other targeting speech reception threshold in noise (SRTN).

Among all patients meeting predefined clinical improvement thresholds (SRTQ ≥ 6 dB; SRTN ≥ 2 dB SNR), the top 25% of performers were classified as 'high improvers' and served as the modelling target. A baseline model was then compared with a second model incorporating the audiometric profile as an additional variable, in order to test whether audiogram shape adds predictive value beyond individual frequency-specific thresholds. Shapley Additive Explanations (SHAP) values were used to quantify each variable's contribution to model predictions.

RESULTS

A clinically relevant improvement in SRTQ and/or SRTN was seen in 93% of the patients following HA fitting. However, improvement patterns varied considerably across profiles: Profiles D (Advanced Presbycusis), E (Moderate-Severe Flat Loss), and F (Profound HL) showed the highest rates of dual improvement (both in quiet and in noise), each exceeding 70%. In contrast, Profiles B (Mild Presbycusis) and G (High-Frequency Notch) showed more limited benefit, with higher rates of non-response (15.6% and 16.3%, respectively).

Adding the Profile variable meaningfully improved model accuracy: +6% for SRTN (from 0.76 to 0.82) and +5% for SRTQ (from 0.87 to 0.92), confirming the added clinical value of audiogram shape beyond PTA severity alone.

The Shapley Additive Explanations (SHAP) analysis uncovered differences in the main drivers across profiles: Profile A responded most strongly to 4 kHz amplification and structured follow-up for SRTN; Profile C showed best outcomes when using premium technology and high daily use (≥10 h/day); Profile D was characterised by a response driven almost entirely by frequency-specific amplification. Profile E showed SRTQ gains with mid-frequency amplification and SRTN gains with follow-up care; Profiles F and G were most sensitive to technology level for SRTN; Profile H benefited from mid-frequency amplification for both outcomes.

At the population level, low frequencies (250–1,000 Hz) and clinical follow-up were the strongest predictors of SRTQ, whereas mid-to-high frequencies (2–6 kHz) were the dominant contributors for SRTN.

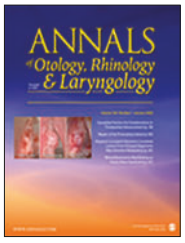
STUDY LIMITATIONS

The use of predefined profiles may have limited the ability to uncover other underlying configurations within the dataset. The substantial variation in sample size across profiles (52 to >10,500 patients) may weaken the stability of estimates for underrepresented groups. Accordingly, findings for these subgroups should be regarded as exploratory. Defining 'high improvers' as the top 25% is pragmatic but does not align with established clinically validated thresholds.

CONCLUSIONS

This study demonstrates the clinical value of audiometric profiling for optimising HA outcomes. Audiogram shape, captured by the eight-profile classification, provides significant added predictive value over traditional severity measures and reveals distinct, clinically actionable optimisation pathways for each profile.These findings support a shift from uniform fitting protocols towards truly personalised audiology. •

THE ASSOCIATION BETWEEN EXTENDED HIGH-FREQUENCY LOSS AND VESTIBULAR FUNCTION AMONG YOUNG EARPHONE USERS



Saniasiaya J., Kulasegarah J., Seluakumaran K., et al.
Ann Otol Rhinol Laryngol. (2026): 135(2), 85–94
doi: 10.1177/00034894251372217. Epub 2025 Sep 24.
PMID: 40990829

Sayantanee Ghosh, Australia

The study focuses on the effects of extended high-frequency hearing loss in young adult earphone users and the associated risk of vestibular impairment.

The present study focuses on the safe use of earphones among younger populations, and it emphasises increasing concern regarding earphone-related listening behaviours among younger generations in recent years, particularly in the context of recreational activities. Evidence accumulated over the past 20 years suggests that prolonged exposure to high-intensity sound through earphones may result in hearing loss (HL), tinnitus, otalgia, and, in some cases, psychological changes such as depression in young users. The hearing changes were noticed in the early audiograms at extended high frequencies (EHFs from 9 to 16 kHz) even when thresholds at conventional frequencies (0.25–8 kHz) remained within normal limits (0.25 to 8kHz). Preliminary reports further suggest that regular earphone users may also experience vestibular impairment, leading to the hypothesis that individuals with EHF loss from excessive sound exposure and earphone usage may exhibit early deficits in vestibular function.

PARTICIPANTS AND METHOD

A total of 131 subjects were tested following approval from the University Malaya Medical Centre Ethics Committee, in accordance with the declaration of Helsinki. Written informed consent was obtained from all participants, and, for individuals under 18 years of age, additional consent was obtained from parents or legal guardians prior to participation.

Regular earphone users aged 12 to 25 years were questioned regarding their earphone listening behaviours, with inclusion criteria defined as earphone use exceeding one hour per day for more than one year.

Based on pure-tone averages, participants were dividedinto a non-EHF group (n=111) with thresholds <25 dB HL across all frequencies and an EHF group (n=20) with thresholds <25 dB HL at 0.25 to 8 kHz bilaterally but thresholds >25 dB HL at 9 to 16k Hz.

Participant underwent cervical vestibular evoked myogenic potential (cVEMP), subjective visual vertical (SVV), and video Head Impulse Test (vHIT) to assess the function of their saccule, utricle, and semicircular canals, respectively.

EXCLUSION CRITERIA

Participants with active otological symptoms, diagnosed vestibular disorders, or prior use of ototoxic medications were excluded from the study.

STUDY PROCEDURES

The study was conducted in four main steps. The first involved a self-reported assessment of earphone use via a survey sent via Google form designed to characterise participants' listening behaviours. This included average daily listening duration, self-reported listening volume, the age at which they started using earphones, the type of earphones used, and the duration of earphone usage. Self-reported listening volume was estimated as a percentage of maximum volume at which participants typically listen on a daily basis.

A hearing assessment was then performed at a conventional audiometric threshold from 125 Hz to 8 kHz, followed by EHF testing from 9kHz to 16 kHz, administered using the modified Hughson-Westlake procedure. Participants were subsequently classified into two groups: an EHF loss group, comprising individuals with normal hearing (NH) thresholds (<25 dB HL) from 250 Hz to 8 kHz in both ears but abnormal thresholds at EHFs (>25 dB HL); and a non-EHF group, comprising participants with NH in both conventional

CRITICAL NOTE

The study provides new insights into the potential role of extended high-frequency (EHF) hearing loss as an early indicator of vestibular dysfunction, particularly saccule damage. It further suggests, early diagnosis and treatment of cochlear and vestibular damage may prevent further progression.

It further suggests that early detection of combined cochlear and vestibular changes may be important for preventing progression of auditory and vestibular pathology.

A key limitation of the study is the reliance on subjective reports of earphone usage times. Although preferred listening levels were measured using a standardised music excerpt to ensure consistency across participants, actual listening in naturalistic settings may be higher, particularly when individuals listen to preferred or emotionally engaging music.

Moreover, the sample was also drawn exclusively from a metropolitan area and collected during the post-COVID-19 pandemic, which may have hindered the inclusion of a true non-headphone-using control group, given the widespread and routine use of earphones and headphones in both educational and urban environments.

Additional limitations include the absence of assessment of unilateral EHF hearing loss as well as the use of subjective visual vertical (SVV) rather than ocular vestibular evoked myogenic potential (oVEMP), which may have provided a more direct measure of utricular function. However, the authors suggest that the combination of EHF assessment and cervical vestibular evoked myogenic potential (cVEMP) may be a more sensitive marker of early cochlear damage, potentially supporting better prevention and clinical management.

Future studies should consider the inclusion of user-selected music stimuli to better reflect real-life listening behaviours among younger populations, to gain a better understanding of recreational listening habits.

thresholds and EHF ranges. Bilateral EHF loss was included in the EHF group classification.

The third step was to measure the Earphone-Preferred Listening Level Measurement (LAEQ) where participants' selected their preferred listening level while listening to a 40-second excerpt of Just Like Heaven by The Cure, delivered through a Samsung Note 10 smartphone with Samsung AKG earphones in a quiet room. Participants set the volume to their usual preference without visual access to the volume indicator. Output sound levels (dB SPL) for each setting were measured using a KEMAR ear-and-cheek simulator, ensuring minimal inter-trial variation (±1 dB). These measurements were then recorded and converted to free-field A-weighted levels. Equivalent continuous exposure levels (LAeq40 hour) were subsequently calculated based on each participants' mean daily listening duration in hours.

The final step consisted of vestibular assessments, in which each participant underwent three tests: cVEMP; SVV; and vHIT. For cVEMP testing, participants were seated in a soundproof room with electrodes placed on specific body parts. Acoustic stimuli were delivered to assess the function of the saccule. Key parameters included VEMP response presence, p1 and n1 latencies, and p1-n1 inter-amplitude. The SVV involved aligning a projected line to assess utricle function, with deviations over 2° indicating dysfunction. The vHIT was used to evaluate all three semicircular canals. Standardised methodological controls were ensured, including consistent electrode placement and stimulus parameters for reliable measurements.

STATISTICAL ANALYSIS

Data was analysed using SPSS version 27.0. The numerical variables were assessed for normal distribution, and are presented as mean and standard deviation, while categorical data was presented as frequency and percentages. Vestibular test results were compared between earphone users with and without EHF HL. Logistic regression analyses were performed during the statistical measurement to identify factors associated with the presence of EHF loss. Simple logistic regression was used to highlight significant individual factors ($p < 0.25$). These variables were then entered into a multivariable logistic regression model, with statistical significance defined at $p < 0.05$.

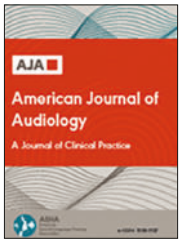
The study recruited a total of 131 participants (mean age: 19.92 ± 2.54 years), all of whom presented with normal audiograms at conventional audiometric frequencies (0.25–8 kHz) in both ears. Among the total sample, 15.3% exhibited bilateral EHF HL (n = 20). The proportion of male participants was lower in the EHF group (20%) compared with the non-EHF group (44%).

Regarding earphone use, the in-the-ear devices were most favoured by both groups, followed by on-the-ear, ear pods, over-the-ear, and bone conduction earphones/headphones. The average daily duration of earphone usage per day was significantly higher among participants with EHF loss (7.10 ± 3.11) than those in the non-EHF group (5.25 ± 2.61, ; $p < .008$). In contrast, mean listening levels (Laeq40) were comparable between the EHFgroup (56.86% ± 5.66) and the non-EHF group (56.32% ± 6.72; $p = 0.74$). Conventional frequencies remained within the normal range in both groups.

Vestibulo-ocular reflex (VOR) gain measured using the VHIT was found to be lower in the EHF group compared to the non-EHF group. However, no statistically significant differences were observed across individual SCC scores. A significant reduction in cVEMP amplitude was observed in the EHF group compared with the non-EHF group for the right amplitude ($p < .001$), while the left side showed a trend towards reduction ($p = 0.085$). No statistical difference was observed in SVV between groups ($p = 0.166$), with all participants showing normal mean function (<2.3°).

Multilinear regression analysis demonstrated that daily duration of earphone use and right-sided cVEMP were significantly associated with the presence of EHF HL after adjusting for other variables. Specifically, the authors found that each additional hour of daily earphone use was associated with a 1.3-fold increase in the odds of EHF HL, compared to the non-EHF group. •

‘DON’T ASSUME I’M TOO OLD!’: ASSESSMENT OF DIGITAL LITERACY IN A CLINICAL SAMPLE OF ADULTS WITH HEARING LOSS



Ferguson M., Sahota T. & Sucher C.
Am J Audiol. (2026): 35(1), 150–60
doi: 10.1044/2025_AJA-25-00160.
Epub 2025 Dec 23. PMID: 41432699.

Mark Laureyns, Italy - Belgium

This study evaluated mobile digital literacy in adults with hearing loss using a brief two-item self-report tool (DL-2Q) and a longer validated questionnaire (MDPQ-16). Results show that many adults aged 65–85 years report adequate mobile proficiency, challenging assumptions that age alone limits access to mobile-based hearing care technologies.

INTRODUCTION

Audiology has seen growing adoption of remotely delivered services, including online hearing screening and assessment, smartphone-linked hearing aids (HAs), remote adjustment and training, and follow-up support throughout the hearing care pathway.

These models can offer clear advantages by reducing barriers related to distance, time, and mobility, thereby improving access and equity, particularly for people living in rural or geographically dispersed regions. Remote delivery may also support more individualised care, by promoting engagement and self-management among people with hearing loss (HL). Despite these developments, the overall uptake of remote hearing care remains relatively low, especially among older adults, who make up a large proportion of the population with HL. Lower rates of internet access, device ownership, and technology use in older age groups may partly explain this limited uptake.

Digital literacy – defined as the technical, cognitive, and social skills required to use digital technologies effectively – plays a key role in enabling participation in digital healthcare. Individuals with higher levels of digital literacy are better able to use online resources to manage their health. However, disparities in digital literacy, often referred to as the ‘digital divide,’ persist and are associated with factors such as older age, HL, lower income, and lower educational attainment. Importantly, some older adults with HL report levels of digital proficiency comparable to those of younger adults, suggesting that age alone is not a reliable proxy for digital capability.

Given the association between HL, ageing, and digital literacy, adults attending audiology clinics may face additional barriers to accessing remote services. There is also a risk that assumptions about limited digital skills in older patients may further restrict access to beneficial technologies. While digital literacy has been assessed previously in older adults, brief and clinically practical measures suitable for audiology settings remain limited. Therefore, the present study aimed to assess digital literacy in adults with HL using both long- and short-form measures and to examine its relationship with key demographic variables.

DESIGN AND SUBJECTS

To avoid bias, clients from a Western Australian hearing care chain for whom audiometric data were available, and with at least mild hearing loss (HL) (WHO, 2019 classification), were invited to participate in the study. Invitations were sent by email (n = 229) or by a post with mail-back envelope (n = 270), and participants were asked to complete the Mobile Device Proficiency Questionnaire–16 items (MDPQ-16), the Digital Literacy-2 Question (DL-2Q), and to provide demographic information, including age, gender, income and education. The overall response rate was 26%, (21% for emailed invitations and 29% for mail-back invitations). In total, 110 subjects were included in the final analysis (mean age 77 years; 41% female) the remaining had to be excluded due to missing consent or incomplete questionnaires.

The MDPQ-16 consists of 16 items assessing proficiency, across eight domains, each rated on a five-point scale.

The DL-2Q consists of two questions: one on 'Mobile Skill', rated on a three-point scale ('never used a mobile'; 'beginner'; 'competent'), and one assessing 'Mobile Confidence', rated on a four-point scale ('not confident at all', 'I usually need help', 'it depends on the task', 'confident').

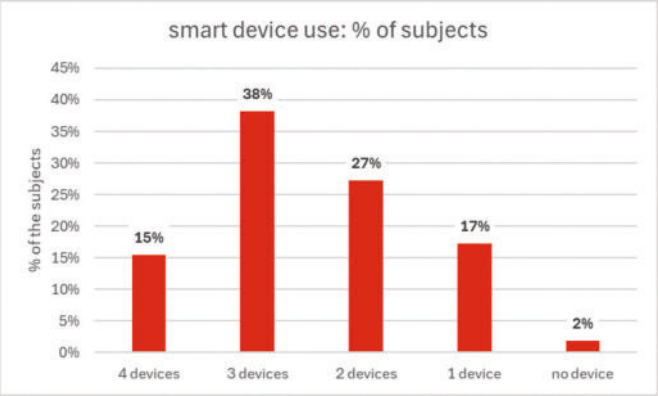
CRITICAL NOTE

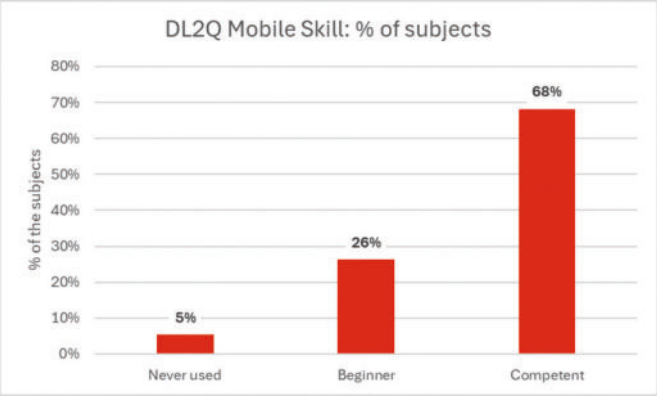
Audiologists should avoid ageism by not using chronological age as the sole determinant when recommending remotely delivered services, such as online hearing screening and assessment, smartphone-linked hearing aids (HAs), and remote adjustment and training. Many older subjects in this study scored as 'digital competent' on the digital literacy questionnaire.

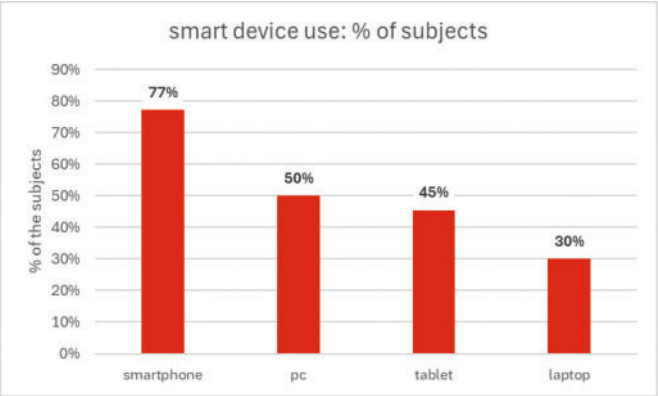
Unfortunately, the design of this study, was not optimised to study age effects, since there was an unequal distribution of age and gender groups. Furthermore, no objective assessment was conducted of participants' ability to operate digital mobile devices or engage with remotely delivered services.

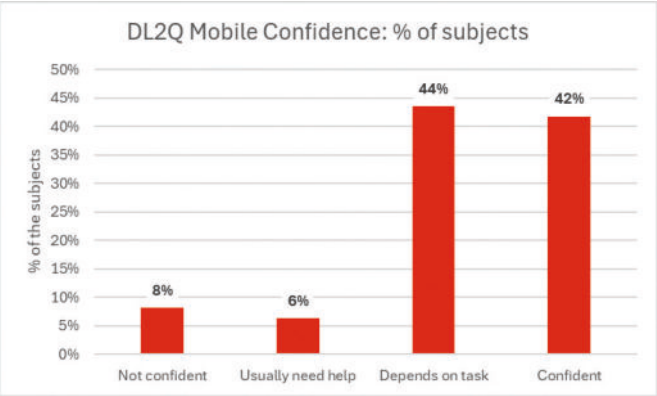
This represents an important direction for future research.

RESULTS



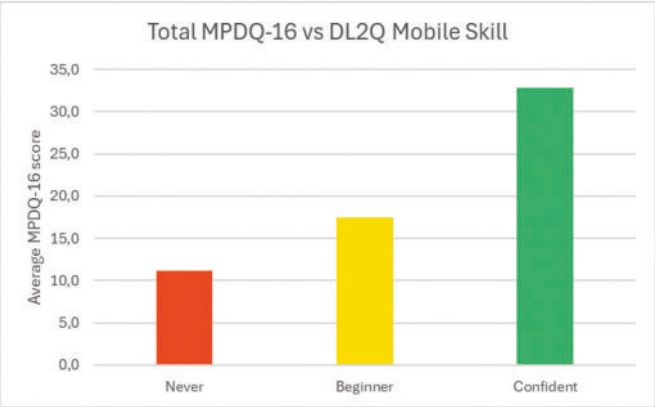


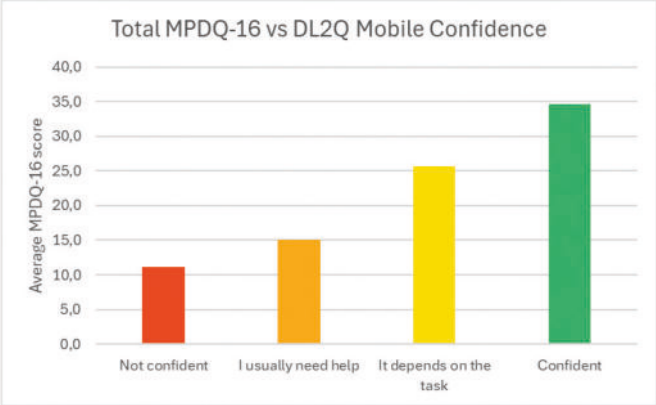




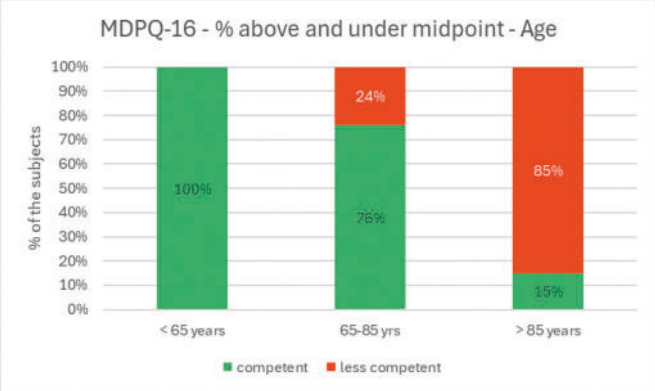
Regarding device use, 15% of participants reported using four devices; 38% 3 devices; 27% 2 devices; 17% 1 device; and 2% no devices.The most frequently used device was the smartphone (77%), followed by PC (50%), then tablet (45%) and laptop computer (30%), which was the least frequently used device.

For the DL-2Q 'Mobile Skill' item, 68% of participants rated themselves as competent, 26% as beginners, and 5% reported never having used a mobile device. For the DL-2Q 'Mobile Confidence' item, 42% reported being confident, 44% indicated that confidence depended on the task, 6% usually needed help, and 8% reported being not confident.





When comparing the results from the MDPQ-16 and the DL2Q, a clear positive relationship was observed between the two measures. Higher levels of 'mobile skill' and 'mobile confidence' were associated with higher overall MDPQ-16 scores.



Digital competence was defined based on MDPQ-16 total score above versus below midpoint, 100% of the subjects younger than 65 years, 76% of those aged 65–85 years and 15% of those aged over 85 years rated digitally competent (above midpoint). A significant negative correlation was observed between age and MDPQ-16 total score ($p < 0,05 – r = –0.45$). However, since 76% of the 65–85-year age group were classified as digital competent, we should refrain from concluding that older subjects are generally unable to manage mobile digital devices.

CONCLUSIONS

This study contributes to the current understanding of mobile digital literacy in hearing healthcare and highlights how it can be efficiently assessed in a highly digital environment. A brief two-item self-report tool measuring mobile skill and confidence (DL-2Q) showed comparable performance to the longer MDPQ-16, supporting its potential utility in busy clinical settings.

While age was associated with lower mobile literacy on the MDPQ-16, this effect was largely driven by the youngest and oldest participants. Notably, among adults aged 65–85 years, self-reported digital proficiency was more than twice as prevalent as low proficiency, indicating that many older adults are capable users of mobile technology. These findings suggest that age alone should not guide decisions about access to mobile hearing health technologies. Variability in confidence, particularly among those who reported high skill but low confidence, highlights an opportunity for targeted counselling and support by audiologists.

Recognising the great heterogeneity in digital literacy abilities among older adults can help ensure equitable access to mobile-based hearing services. Avoiding age-based assumptions and instead supporting individual needs may contribute to reducing the digital divide in hearing healthcare. •

APPLE AIRPODS PRO 2 LIVE LISTEN

AS AN ASSISTIVE LISTENING DEVICE

Foroogozar M., Seideman T., Liss J., et al.

Am J Audiol. (2026): 35(1), 267–74

doi: 10.1044/2025_AJA-25-00156. Epub 2026 Jan 7.

PMID: 41499650.

Carrie Meyer, US

This study evaluated the effectiveness of Apple AirPods Pro2 using the Live Listen feature as an assistive listening device for older adults in noisy environments similar to hospital settings. In a laboratory study of 20 adults aged 60–90, results showed significantly improved speech recognition and word recall when using Live Listen compared to unaided listening, with greater benefits observed in older individuals with higher signal-to-noise ratio loss. Study findings suggest that AirPods Pro2 may serve as an accessible, cost-effective alternative when traditional hearing aids are unavailable, though further research in real-world clinical settings is needed.

INTRODUCTION

Difficulties understanding speech in noisy environments is one of the most significant issues experienced by adults with hearing loss (HL). Hospital settings are especially problematic in this regard, as they are often acoustically challenging environments, with noise levels frequently exceeding 65 dB (A) in critical areas such as intensive care units and emergency departments. In addition, factors commonly associated with hospitalisation, such as pain, cognitive impairments, anxiety, and lack of sleep, may further compromise a patient's speech understanding.

Hearing aids (HAs) and other assistive devices are specifically designed to improve speech understanding in noise, using digital technology to separate voices from ambient sound. However, many patients with HL do not use HAs, and those who do may choose not to wear them in a hospital setting due to concerns about loss or damage.

This study was designed to evaluate the use of Apple AirPods Pro2 with the Live Listen feature, which uses the iPhone microphone as a remote microphone, sending sound captured by the device directly to the earbuds. Unlike conventional assistive listening systems, AirPods Pro 2 are commercially available, readily accessible to consumers, and do not require customisation to use. The purpose of the study was to determine the effectiveness of AirPods as an assistive listening device and assess their impact on speech recognition and recall in noise.

STUDY METHODOLOGY

This laboratory-based study followed 20 healthy, community-dwelling adults between 60 and 90 years of age (13 female; 7 male). Participants underwent standard audiometric assessment, with hearing levels ranging from normal hearing to mild-to-moderate HL. Participants also underwent cognitive testing using the Digit Span Test (DST) to assess working memory and recall. Then participants completed speech in noise (SIN) tasks using the Quick SIN. Testing was performed in a sound booth, with speech at 65 dB(A) and noise at 60 dB (A), simulating hospital noise (+5 SNR). Each participant functioned as their own control by alternating between an aided condition (with Live Listen) and unaided condition (without Live Listen). To assess recall, participants were asked to listen to blocks of five sentences, then asked to recall as many of the five final words (keywords) as possible. Recall tasks were also performed with and without Live Listen.

CRITICAL NOTE

This research explores consumer technology as a potential substitute for traditional assistive listening devices. While the findings are encouraging, the small sample size and simulated laboratory environment limit application to real-world healthcare settings. The emphasis on cost effectiveness, while compelling, may oversimplify the complexities of individualised hearing care and professional hearing aid fitting. Nevertheless, this study provides a valuable foundation and outlines directions for broader, real world research.

STATISTICAL METHODOLOGY

The study used paired-sample t-tests to compare participants' speech recognition and recall performance with and without the Live Listen feature, quantifying statistical significance and effect sizes of observed differences. Additionally, multiple regression analyses were conducted to identify whether age, sex, SNR loss, and digit span test (DST) scores could predict individual improvements and recall when using Live Listen. Improvement scores were calculated by subtracting unaided from aided performance, and regression models provided standardised beta coefficients, p values, and adjusted R-squared values to assess the strength and significance of predictors.

RESULTS

Speech recognition scores were significantly higher with Live Listen than without. In addition, recall scores were also improved with Live Listen. The authors also used study data to generate predictors of improvement. Speech recognition gains were best predicted by age, SNR loss, and sex, with the greatest improvements observed in older female participants with greater SNR loss. Interestingly, no significant predictors were identified for recall improvement.

STUDY LIMITATIONS

This study was performed in a controlled laboratory environment with healthy adults; therefore, the findings may not translate to real-world hospital environments or to patients with cognitive or physical impairments. In addition, the relatively small sample size limits the ability to generalise results or explore more complex interactions. Live Listen was the only assistive device evaluated, and no comparisons were made with alternative similar assistive listening devices. The study also assessed exclusively objective outcomes, without assessing qualitative measures such as user satisfaction and listening effort. Finally, practical implementation factors, such as infection control and device availability were not evaluated in this study.

CONCLUSIONS

This small, laboratory study demonstrated that Apple AirPods Pro 2 earbuds and the Apple Live Listen feature may serve as an affordable and accessible assistive listening device for older adults when HAs are not available or impractical. Because these devices and the Live Listen feature do not require audiometric assessment or calibration, they can be used easily even in acute care settings. The Live Listen feature improved speech recognition and recall in noisy listening similar to SNR found in hospital environments. The authors recommend further research in real-world hospital settings, involving actual patients and healthcare providers to confirm the efficacy of this approach. Future studies should also incorporate qualitative outcomes, such as user satisfaction and listening effort, to better represent the patient experience. Practical considerations, such as cleaning, infection control, and device cost and availability, should also be addressed to optimise implementation. •

BARRIERS AND FACILITATORS TO IMPLEMENTING A SELF-EFFICACY-BASED AUDITORY REHABILITATION PROTOCOL IN AUDIOLOGY CLINICAL PRACTICE

Sarangi L., Mendoza M. & Brown A.
Am J Audiol. (2026): 35(1), 303–12
doi: 10.1044/2025_AJA-25-00109. Epub 2026 Feb 27. PMID: 41746202.

Tali Bar-Moshe, Israel

This qualitative study found that audiologists view hearing aid self-efficacy (HASE) as essential for successful, individualized auditory rehabilitation but face barriers to implementing the self-efficacy–based auditory rehabilitation (SEBAR) protocol, including limited knowledge, insufficient training, time constraints, and resistance to change.

INTRODUCTION

Auditory rehabilitation (AR) is becoming increasingly individualised and patient-centred; however, outcomes vary due to both audiological factors (e.g. hearing ability, training implementation) and non-audiological factors (e.g. cognition, personality, and hearing aid self-efficacy [HASE]). Despite growing evidence supporting the role of HASE in improving AR outcomes, many clinicians do not routinely use or are unaware of such approaches. This study therefore aims to identify barriers to and facilitators of implementing a self-efficacy–based auditory rehabilitation (SEBAR) protocol in clinical practice.

CRITICAL NOTE

The article discusses key barriers to and facilitators of implementing a structured self-efficacy-based auditory rehabilitation protocol. Audiologists, as healthcare professionals, aim to deliver high-quality care and recognise the importance of self-efficacy. However, the findings indicate a gap between this recognition and its practical implementation in clinical settings. The identified barriers – such as time constraints, limited financial resources, and insufficient training – are not unique to the self-efficacy-based auditory rehabilitation (SEBAR) protocol; they reflect broader challenges in auditory rehabilitation as a whole. This underscores the need for both public and private healthcare systems to address these barriers and support the effective integration of new technologies and services into clinical practice.

The term HASE refers to an individual's belief in their ability to successfully manage HA–related tasks. Many individuals with hearing loss (HL) demonstrate low HASE and difficulties in device management. Higher levels of HASE are associated with greater readiness to adopt HAs, longer daily use, higher satisfaction, and improved perceived success, leading researchers to recommend incorporating HASE into individualised AR planning.

Smith and colleagues (Smith, 2014; West & Smith, 2007) proposed a systematic SEBAR framework to integrate HASE into AR clinical practice. The approach comprises three steps: assessing HASE using tools such as the MARS-HA (covering handling, adjustment, and listening domains, with ≥ 80% indicating adequacy); identifying sources shaping HASE (e.g. mastery experience, verbal persuasion); and applying targeted techniques to improve outcomes. The MARS-HA has been shown to be a valid and reliable measure of HASE. Current evidence suggests that implementing the SEBAR protocol may improve reported HASE.

METHOD

A qualitative study using an interpretive phenomenological (IP) approach was conducted through in-depth, one-on-one, semi-structured interviews. Interview design and analysis were guided by the COM-B model to identify barriers to and facilitators of SEBAR implementation. Data collection and analysis were conducted iteratively until saturation was reached.

PARTICIPANTS

A purposive and convenience sample of five female audiologists (aged 26–36) with four months to 10 years of AR experience took part. Participants worked across varied clinical settings. All were English-speaking, in good health, and had typical hearing. Recruitment was conducted via flyers, email invitations, and word-of-mouth. The sample size was considered adequate for IP analysis.

FINDINGS

All participants emphasised HASE as critical for individualised AR, influencing both patient success and HA adoption. Most identified mastery, vicarious experience, and verbal persuasion as key contributors to HASE. However, some reported limited awareness of SEBAR resources (including MARS-HA), suggested the need for updates for additional technologies, and reported limited use of HASE-enhancing techniques despite general awareness of their importance.

- **Psychological Capability:** Psychological capability refers to the knowledge and skills needed to implement SEBAR. Despite recognising the importance of HASE, participants reported a lack of knowledge and training in relevant resources (e.g. MARS-HA) as a key barrier, highlighting the need for improved education and clinical training. Although unfamiliar with formal tools such as the MARS-HA, some participants reported using informal interview-style questions to assess patients' confidence and beliefs about HAs.
- **Physical Opportunity:** Physical opportunity covers environmental factors which influence implementation, mainly clinical time and integration into billable services. Time constraints were the most frequently cited barrier, largely due to workload demands and variability in clinic settings. Fast-paced environments and limited appointment opportunities and duration may hinder SEBAR implementation, whereas embedding SEBAR into standard, billable care was suggested as a potential facilitator
- **Automatic Motivation:** Automatic motivation involves internal processes influencing behaviour. Participants identified intrinsic motivation – the desire to help patients – as a key facilitator, noting that recognising SEBAR's potential to improve patient outcomes could drive its adoption in clinical practice.
- **Reflective Motivation:** Reflective motivation involves evaluating outcomes, planning, and decision-making. Positive outcomes, patient testimonials, and potential financial benefits were identified as facilitators of SEBAR adoption. Flexibility in changing routines was described as both a facilitator and a barrier, with resistance commonly observed among experienced clinicians, and greater openness among early-career audiologists.

DISCUSSION

The study found that audiologists recognise the importance HASE in successful AR, consistent with prior research, yet face multiple barriers to implementing the SEBAR protocol. These barriers and facilitators operate at individual, environmental, and organisational levels. Despite limited formal use of structured tools, clinicians reported relying on informal methods to assess HASE, suggesting potential readiness to adopt SEBAR once barriers are addressed.

A major barrier identified was limited clinical time, a challenge widely reported in implementing new clinical protocols. Participants suggested that workflow changes, organisational

support, and integrating SEBAR as a standard component of care could facilitate adoption, especially if associated services become billable. Emerging billing codes may further support incorporating HASE-related assessments such as MARS-HA into clinical practice.

Facilitators included audiologists' intrinsic motivation to improve patient outcomes, positive patient feedback, and potential financial incentives, all of which may support adoption of the protocol. Interestingly, flexibility in changing routines was described as both a facilitator and a barrier. Experienced clinicians were more resistant while early-career audiologists were more open to flexibility.

LIMITATIONS

The study is limited by a small, relatively homogeneous sample and potential researcher familiarity, which may affect generalisability despite efforts towards reflexivity. Although saturation was reached, future research should include more diverse participants in terms of gender, clinical experience, and practice settings to enhance generalisability.

CONCLUSIONS

The study identified key barriers and facilitators to implementing the SEBAR protocol using a qualitative approach guided by the COM-B model. While audiologists recognised the importance of self-efficacy in auditory rehabilitation, barriers included lack of knowledge and training, limited clinical time, and resistance to change.

Facilitators included intrinsic motivation, positive patient outcomes, and integration of the protocol into standard, billable services. Effective implementation will require collaboration among clinicians, researchers, educators, and policymakers to address these barriers and support sustainable uptake. •

HEARING LOSS AMONG OLDER ADULTS: EPIDEMIOLOGY, DISPARITIES, AND GAPS IN RESEARCH

Reed NS., Jiang K. & Deal JA.

Annu Rev Public Health. (2026): 47(1), 41–58

doi: 10.1146/annurev-publhealth-081524-110330. Epub 2025 Oct 29. PMID: 41160749; PMCID: PMC12697576.

Nicholas Reed, Italy - US

The review argues for a shift towards integrated, population-based hearing healthcare systems that embed hearing care into broader healthy ageing and health equity initiatives while addressing existing gaps in evidence, access, and infrastructure.

INTRODUCTION

Hearing loss (HL) is one of the most common chronic conditions affecting older adults and represents a growing public health challenge in the context of global population ageing. In their review, Reed, Jiang, and Deal synthesise current evidence regarding the epidemiology of age-related HL, disparities in access to care and outcomes, and major gaps which continue to limit advances in prevention, diagnosis, and treatment. The authors emphasise that HL is not merely a sensory impairment, but rather a multidimensional condition associated with communication difficulties, social isolation, cognitive decline, depression, reduced quality of life, and increased healthcare utilisation.

The review argues that despite the high prevalence and substantial societal burden of HL, hearing care remains significantly underrecognised within public health systems. Current approaches are fragmented, access to treatment is uneven, and many populations remain underserved. The paper takes a deep dive into interpreting existing literature on HL and cognitive decline and calls for a broader public health framework which integrates hearing care into healthy ageing initiatives, chronic disease management, and health equity efforts.

SUMMARY OF KEY FINDINGS

- **High Prevalence and Growing Burden:** HL affects a substantial proportion of adults aged over 65 years, with prevalence

increasing dramatically with advancing age. The authors note that demographic ageing will substantially increase the number of individuals living with HL over the coming decades, placing growing demands on healthcare systems and hearing care infrastructure.

- **Disparities in Hearing Healthcare:** Significant disparities exist across socioeconomic status, race and ethnicity, educational attainment, geographic access, and healthcare coverage. Older adults from historically marginalised communities are less likely to receive hearing testing, HAs, or speciality audiologic care despite often experiencing equal or greater burden of hearing impairment.
- **Low Treatment Uptake:** Despite the availability of effective interventions such as HAs and cochlear implants (CI), adoption rates remain low. Barriers include high costs, limited insurance coverage, stigma, insufficient awareness, transportation challenges, and shortages in hearing healthcare professionals.
- **Association With Broader Health Outcomes:** The review highlights strong associations between HL and adverse outcomes including cognitive decline, dementia risk, loneliness, depression, falls, frailty, and hospitalisation. Although causal mechanisms remain under investigation, the accumulating evidence increasingly supports hearing health as an important component of healthy ageing.
- **Population versus individual-level risk of HL contributing to dementia:** The review synthesises evidence on the link between HL and cognitive decline, highlighting consistent findings in existing literature. Most notably, the review frames this association as a public health concern while emphasising the challenges of translating population-level findings to individual-level care decisions.
- **Hearing intervention to mitigate cognitive decline:** Interestingly, the review notes that using observational studies to assess the effect of HAs on cognitive decline is biased, as adults who obtain HAs are fundamentally different (e.g. different socioeconomic status, educational attainment, and help-seeking behaviours) than those who do not. To mitigate this discrepancy, the ACHIEVE randomised controlled trial evaluated the impact of hearing care on cognitive decline over a three-year period following participant randomisation. However, the authors report that the primary findings of the study were null, although a prespecified small subgroup of participants at greater risk for cognitive decline saw a 48% reduction in cognitive decline over three years. Caution is warranted, as these findings may reflect a relatively healthy volunteer sample in which cognitive change over the study period was so minimal that it was impossible to measure intervention effects.
- **Need for Improved Public Health Infrastructure:** The authors argue that hearing care has historically been isolated from mainstream healthcare systems. They advocate for population-level screening approaches, integration of hearing services into primary care, expanded workforce models, and improved surveillance systems to better address HL at scale.

CRITICAL NOTE

Overall, this review provides a strong and timely synthesis of the current literature and serves as an important foundation for future public health, clinical, and policy-driven efforts in hearing healthcare. However, the review fails to draw deeper mechanistic frameworks for how hearing loss may be linked to other healthy ageing outcomes. Moreover, the review would benefit from clearer clinical implementation and policy frameworks to help guide the high-level concepts discussed in the article (e.g. screening, direct-to-consumer hearing care, and reimbursement). In its current form, the proposed concepts lack the detailed implementation steps necessary or a more explicit articulation of the research required to fill any evidence gaps and translate these ideas into practice.

STRENGTH POINTS

- **Comprehensive Public Health Perspective:** One of the paper's major strengths is its framing of HL as a population health issue, rather than solely an audiologic condition. The authors effectively connect hearing health to ageing policy, chronic disease management, and healthcare equity.
- **Integration of epidemiology and policy:** The review combines epidemiologic data with discussion of healthcare systems, reimbursement structures, and disparities, providing a multidimensional understanding of why HL remains undertreated despite technological advances.
- **Focus on health equity:** The paper strongly emphasises disparities in access and outcomes, highlighting structural and socioeconomic barriers which disproportionately affect vulnerable populations. This equity-focused lens strengthens the relevance of the review for policymakers and healthcare organisations.
- **Identification of research gaps:** The authors clearly outline areas where evidence remains insufficient, including longitudinal intervention studies, implementation science, culturally tailored hearing care models, and mechanisms linking HL with cognitive and physical health outcomes.

WEAK POINTS

- **Limited evidence for causality:** Although strong associations exist between HL and outcomes such as dementia, the authors acknowledge that causal pathways remain poorly understood. Further randomised and longitudinal studies are needed to determine whether hearing interventions directly modify these risks.
- **Underdeveloped discussion of emerging technologies:** While the review extensively discusses challenges in traditional hearing care delivery, it places comparatively less emphasis on emerging technologies such as over-the-counter HAs, AI–driven diagnostics, teleaudiology, and consumer wearable devices, all of which may substantially reshape access in the near future. Future papers could more explicitly tie these

emerging pathways into the framing of HL as a chronic condition within person-centred care models.

- **Implementation challenges:** Many proposed solutions – including universal screening, integration into primary care, and expanded public health infrastructure – would require substantial policy reform, workforce development, and changes to reimbursement structures, which may be difficult to implement broadly.

GLOBAL GENERALISABILITY:

Much of the evidence discussed is centred on the United States and other high-income countries. The epidemiology of HL and associated healthcare barriers in low- and middle-income countries may differ substantially and require distinct public health approaches.

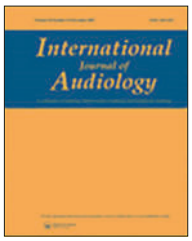
CONCLUSIONS

Reed, Jiang, and Deal provide a comprehensive and timely review demonstrating that HL among older adults is both a major clinical concern and an under-recognised public health priority. The paper highlights that untreated HL contributes to substantial individual, social, and economic burdens, while hearing care remained marked by persistent disparities in access.

The authors argue that future progress will require moving beyond isolated audiological treatment models towards integrated, population-based hearing healthcare systems. Expanding access, improving affordability, strengthening public health surveillance, and embedding hearing care into broader healthy ageing initiatives are presented as essential next steps.

A key takeaway from the review is that hearing health should be viewed as foundational to overall health and ageing, rather than a secondary quality-of-life issue. By reframing HL within public health and health equity frameworks, the paper provides a roadmap for future research, policy development, and healthcare transformation aimed at improving outcomes for older adults worldwide. •

HEADPHONE LISTENING LEVELS, ATTITUDES TO NOISE, AND AUDITORY SYMPTOMS AMONG CHILDREN AND ADOLESCENTS



Elmazoska I., Waye KP., Mäki-Torkko E., et al.

J Speech Lang Hear Res. (2026): 69(1), 347–61

doi: 10.1044/2025_JSLHR-25-00397. Epub 2025 Dec 16. PMID: 41401778.

Mark Laureyns, Italy - Belgium

Adolescents with more positive attitudes towards noise are more likely to listen to music through headphones at higher levels and for longer durations, thereby increasing their risk of noise-induced hearing damage.

INTRODUCTION

The use of headphones for recreational music listening is now deeply embedded in the daily routines of children and adolescents. Despite widespread awareness that excessive sound exposure may damage hearing, adolescents often listen at high volumes and for prolonged periods. This is causing growing concern about early noise-induced hearing loss (NIHL) as a public health issue.

Traditionally, NIHL research has focused on occupational exposure. However, recent evidence highlights recreational noise as a growing risk, particularly during adolescence. Prior studies have reported inconsistent associations between headphone use and measurable changes in hearing, partly because many rely on participant self-reports of exposure rather than acoustic measurements. Furthermore, early auditory damage may not be detectable in conventional audiometric tests, which has increased interest in high-frequency audiometry and distortion product otoacoustic emissions (DPOAEs) as early indicators of cochlear stress. Against this background, the authors aim to bridge behavioural, perceptual, and audiological perspectives by examining how attitudes towards noise and perceived auditory symptoms relate to objectively measured headphone listening levels in young people.

CRITICAL NOTE

This study is strengthened by its integration of behavioural theory with objective sound level and advanced hearing measurements, addressing a major gap in existing recreational noise research. However, its cross-sectional design and small, self-selected sample limit causal inference and generalisability. While attitudes towards noise emerge as a robust predictor of risky listening, reliance on self-reported listening duration introduces potential bias. The weak associations between listening levels and audiometric outcomes suggest that early auditory effects may be subclinical and difficult to detect. Overall, the study provides valuable insights but would benefit from longitudinal follow up-and broader sampling.

In the work for the WHO Make Listening Safe and Workstream initiatives, a key challenge is striking the right balance between promoting the enjoyment of music and the sounds of nature in a safer way, while ensuring that young listeners do not focus on, or develop positive attitudes towards, excessive loudness as a desirable listening norm.

STUDY AIMS AND DESIGN

The study pursued three main objectives:

to describe music listening habits, hearing health, and attitudes towards noise among children and adolescents;

to examine associations between attitudes towards noise and both self-reported and measured music listening levels; and

to explore how perceived auditory symptoms relate to hearing and sound level measurements.

A cross-sectional design was used, combining questionnaires, pure tone audiometry (including extended high frequencies), DPOAEs, and sound pressure level (SPL) measurements. Participants were 10–20 years old, recruited through convenience sampling in Örebro, Sweden. While 71 participants completed questionnaires, 53 also underwent hearing assessments and SPL measurements. Ethical approval and informed consent procedures followed established standards for research involving minors.

METHODS AND MEASURES

Hearing assessments included standard audiometry (0.125–8 kHz), extended high frequency (EHF) audiometry (up to 16 kHz), and DPOAEs, allowing the detection of subtle or early cochlear changes. Importantly, all participants demonstrated clinically normal hearing thresholds at baseline, ensuring that observed associations reflected early risk rather than established impairment.

Sound level measurements were conducted using a KEMAR manikin, replicating real-ear acoustics. Participants selected typical listening levels using their own devices and headphones. Measurements were taken under both quiet conditions and simulated traffic noise, reflecting real-world listening environments. Listening duration was self-reported and combined with SPL measurements to estimate daily noise dose, normalised to World Health Organization (WHO) recreational noise guidelines.

Behavioural data were collected using a questionnaire that included the revised Youth Attitude to Noise Scale (YANS R) This scale captured tolerance of loud sounds, beliefs about regulation and hearing protection, and preferences for high volume music, including headphone-specific items. Perceived auditory symptoms—such as tinnitus, sound sensitivity, auditory fatigue, and need for auditory recovery—were also assessed.

RESULTS

Music listening habits and exposure

Most participants reported frequent headphone use, with older adolescents listening more often, at higher levels, and for longer durations than younger participants. While average SPLs generally remained below WHO reference thresholds, listening volumes increased significantly in noisy environments, reflecting a common tendency to raise volume to drown out background noise. A subset of participants exceeded recommended exposure limits, particularly when longer listening durations were considered, illustrating how cumulative noise dose—rather than volume alone—drives risk.

Attitudes towards noise and listening behaviour

One of the most significant findings was the strong association between positive attitudes towards noise and higher measured SPLs. Adolescents who viewed loud music more favourably or as socially acceptable tended to select higher headphone listening levels. Regression analyses demonstrated that these attitudes remained a significant predictor of SPLs and noise dose even after adjusting for age and gender. Older participants also displayed more positive noise attitudes, suggesting that tolerance for loud sound increases with age during adolescence.

These results align with behavioural theories such as the Theory of Planned Behaviour, which emphasises attitudes as key determinants of intentional behaviour. The findings indicate that risky listening is not merely accidental but is influenced by personal beliefs and values surrounding noise and music enjoyment.

Auditory symptoms and hearing measures

In contrast to attitudes, perceived auditory symptoms showed limited associations with objective hearing measures. Most participants had normal audiometric thresholds and generally robust DPOAE responses. However, individuals reporting a greater need for auditory recovery showed increased variability and reduced DPOAE amplitudes, suggesting early cochlear stress not yet reflected in hearing thresholds. Several auditory symptoms were linked to self-reported listening behaviours rather than measured SPLs. For example,

tinnitus was associated with longer listening durations, and attenuated auditory sensation correlated with higher estimated noise dose. Interestingly, participants reporting tinnitus tended to lower their preferred listening levels, implying that symptoms may act as a behavioural warning signal, prompting temporary protective responses.

Discussion and interpretation

The study highlights a critical disconnect: while most young people maintain clinically normal hearing (NH), behavioural indicators – particularly attitudes towards noise – strongly shape exposure levels and potential risk. The lack of clear associations between SPLs and audiometric thresholds does not imply absence of harm but instead suggests that subclinical or 'hidden' auditory changes may precede measurable HL. DPOAE findings support this interpretation, reinforcing their value as sensitive indicators in young populations.

From a health belief perspective, perceived symptoms may increase awareness but do not necessarily translate into sustained preventive behaviours. Adolescents may recognise discomfort or fatigue yet continue unsafe listening behaviours due to the emotional and social benefits of music. This underscores the limitations of risk-only messages and highlights the importance of addressing motivational and attitudinal factors in prevention strategies.

Strengths, limitations, and implications

A major strength of the study is the integration of objective sound-level measurements with advanced hearing assessments and psychological constructs. This integrated, multimethod approach improves exposure accuracy compared with self-report alone. However, the cross-sectional design prevents causal inference, and voluntary recruitment may have introduced selection bias. Additionally, the relatively small sample limits generalisability and statistical power.

Despite these limitations, the findings carry important implications. Prevention efforts should move beyond simple volume warnings and target attitudes, listening duration, and contextual behaviours—such as listening in noisy environments or during sleep. Early strategies which frame safe listening as compatible with enjoyment and personal identity may be more effective than fear-based messaging.

CONCLUSIONS

The authors provide valuable evidence that attitudes towards noise play a central role in shaping headphone listening behaviours among children and adolescents. While most participants retained NH, behavioural patterns and early cochlear indicators point to potential long-term risk. Perceived auditory symptoms may emerge before detectable threshold shifts, offering a window for early intervention. Overall, the study supports a more comprehensive approach to hearing health promotion – one that integrates behavioural science, objective exposure assessment, and sensitive auditory measures – to protect young listeners in an increasingly noisy world. •

DEVELOPMENTAL CHANGES IN SPEECH FREQUENCY WEIGHTING IN CHILDREN

Bosen AK, Frenette A, Spratford M, et al.

Ear Hear. (2026): 47(2), 548–57

doi: 10.1097/AUD.0000000000001749. Epub 2025 Nov 7. PMID: 41199448; PMCID: PMC13163190.

Pierre Devos, France

Within a scientific context that has, in recent years, been re-evaluating objective indices such as the Speech Intelligibility Index (SII) as predictors of auditory competence and as tools for early intervention, the authors sought to determine whether the frequency weighting differs between children and adults. In other words, do children and adults rely on the same frequency information for speech understanding?

For approximately ten years, various authors have been working on the Speech Intelligibility Index (SII) in the context of the care of hearing-impaired children. They have established intervention criteria for mild hearing loss (HL) (SII < 80%), overall values associated with favourable developmental prospects for hearing-impaired children using hearing aids (HAs) (SII > 70%), 'at-risk' values (55% < SII < 70%), and minimum target values (SII > 55%). Paediatric-specific

CRITICAL NOTE

This original study concludes that predictive models of speech comprehension based on objective indices such as the Speech Intelligibility Index (SII) should be interpreted with caution. The SII appears to overestimate children's functional abilities before adolescence, until they learn to use the frequency cues of their native language more accurately.
Further, more focused research is required to determine whether these findings are universal or language-specific, particularly with respect to differences between tonal and non-tonal language. Such work may support the development of age-, and potentially language-, appropriate frequency band weighting to obtain a more reliable SII value.

amplification protocols also provide SII targets based on the degree of HL. Collectively, these frameworks support clinicians in assessing interventions in paediatric populations.

The SII calculation is based on frequency-band weighting according to their relative importance in speech discrimination, with a typically greater weighting for the 2000–4000 Hz bands. The central question of this article is whether this weighting is appropriate for all age groups. Specifically, do younger children use the same frequencies (and therefore the same information) as adults to understand spoken language?
The authors recruited 42 typically-hearing children aged 6 to 13 years, divided into age groups of four to seven subjects, with one group for each year within the defined age range. Each child completed word-based and non-word-based recognition tasks filtered by frequency bands to isolate specific frequencies. Each item consisted of six one-octave-wide bands. Participants were required to choose three out of the six bands for each stimulus, and all 20 possible band combinations were tested to model age-related differences in frequency-band weighting. Cognitive tasks were also administered to study the potential influence of cognitive factors on frequency importance, which was ultimately found to be negligible.

RESULTS AND DISCUSSION

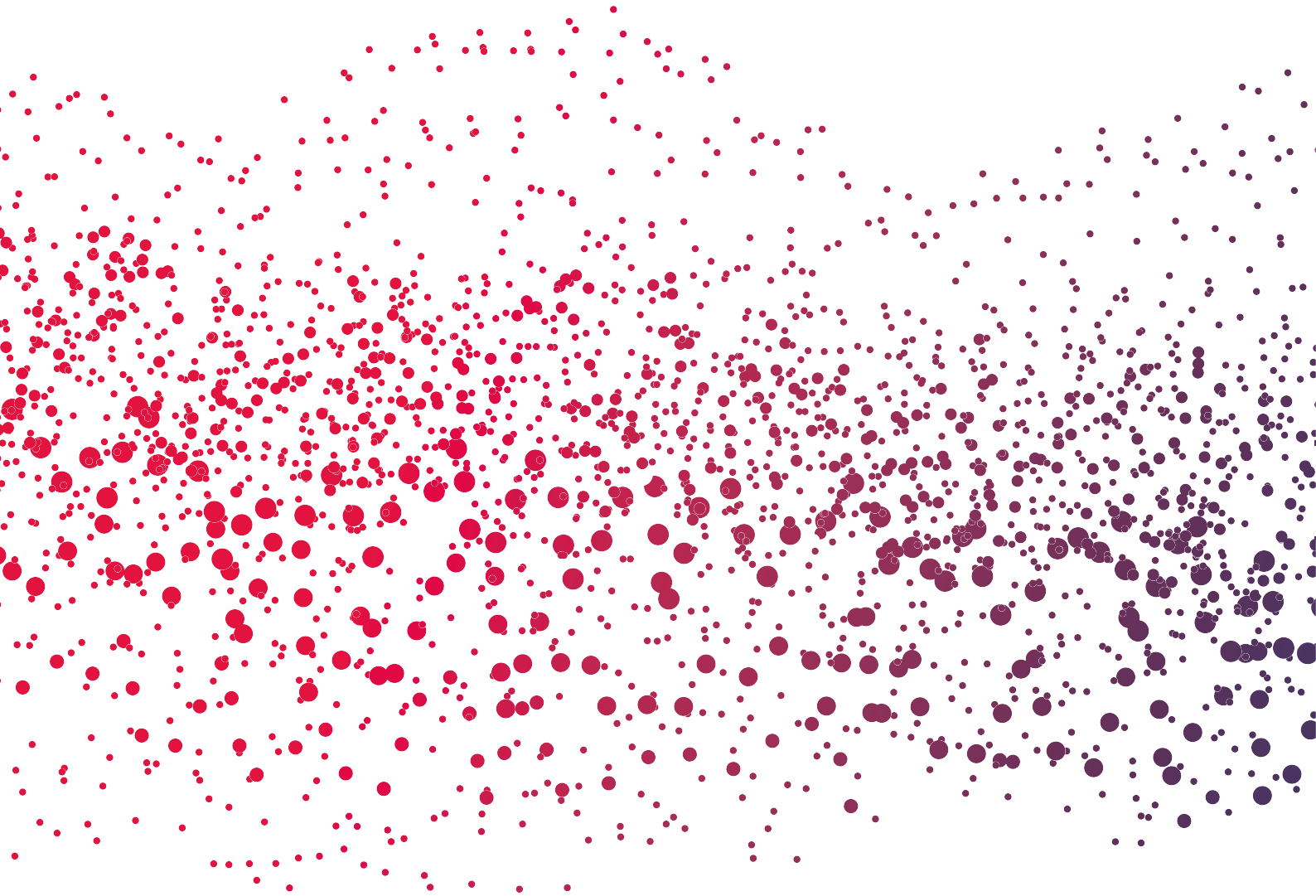
The historical importance attributed to the 2000–4000 Hz frequency range appears to emerge only gradually, with auditory experience.
Regarding word recognition, the 500, 1000, and 2000 Hz bands are more important than for non-words.
Regarding non-word recognition, the 250 and 8000 Hz frequencies are more important than for real words.
With age, the importance of the 500–1000 Hz frequency range remained relatively stable, whereas the importance of the 250 and 8000 Hz frequencies decreases.

These observations are interesting because they suggest a developmental shift in frequency weighting in speech perception mechanisms. It would appear that in early childhood, words are processed as a whole unit. It is only later, with auditory experience, that children seem to develop the ability to process the detailed phonetic cues of their native language. This may imply that younger children require broader frequency bandwidth than older children allowing them to gradually specialise in the phonetic cues of their native language.

The apparent importance of extreme frequencies (250 and 8000 Hz) in non-word recognition may reflect the importance of these frequencies for very young children (around six years of age). Indeed, they are constantly exposed to new learning environments (new situations, new concepts, new vocabulary) which places them more often in situations where they need to understand non-words rather than 'known words'.

TAKE HOME MESSAGES

The older a child gets, the more their brain understands which frequencies are important for identifying words.
These findings support a critical re-examination of predictive models of speech comprehension based on the SII in very young children, since SII weightings are derived from adult weighting. In light of the present results, children under 12 years of age do not appear to use the 2000–4000 Hz range to the same extent as adults, suggesting that SII could overestimate speech recognition performance in this population.
When fitting HAs for children under 12, the importance of 'extreme frequencies' should not be underestimated. Efforts should ensure audibility in these frequencies (250 and 8000 Hz). At the same time, audibility must also be maintained in the 2000–4000 Hz band to facilitate the progressive specialisation in the native language. Overall, amplification calculations that prioritise audibility and sufficient dynamic range in the upper half of the spectrum seem justified. DSL 5.0 is widely praised in the literature and appears well suited to this approach, although it can still be criticised for too excessive compression in the low frequencies and for lacking targets below 250 Hz. •



AMPLIFON CENTRE FOR RESEARCH AND STUDIES

amplifon