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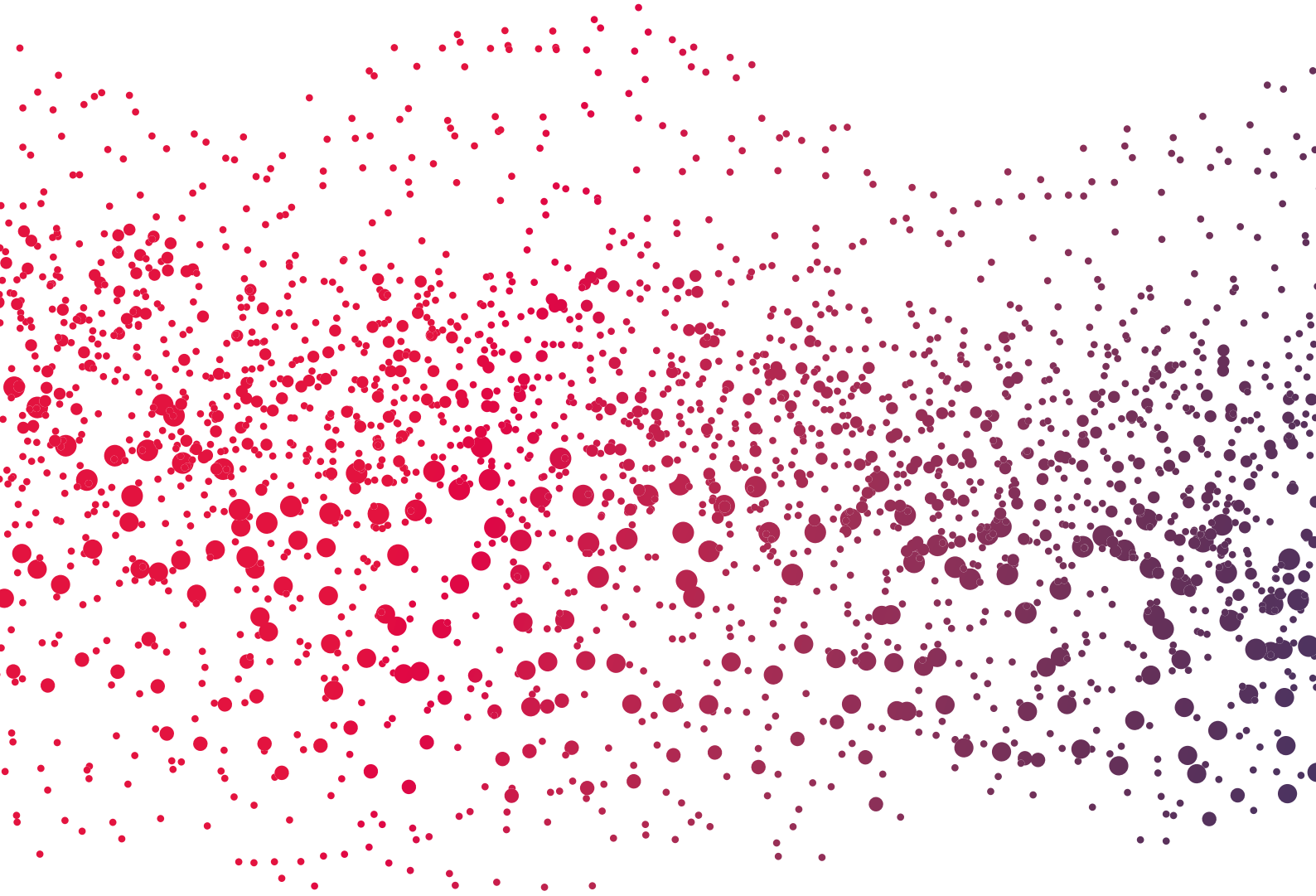
Otology & Audiology Article Review



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- Page 05: Reddy Sivaprasad ✓:
  - Understanding the psychosocial experiences of adults with mild-moderate hearing loss: An application of Leventhal's self-regulatory model.
    - *Heffernan E et al*
    - *International Journal of Audiology, 2016; Vol. 55 (S3), S3-S12.*
    - *This is a qualitative study and first of its kind in this population. The SRM model has 2 types of representations – cognitive and emotional which will lead to coping behaviours. Application of this model was successfully attempted. The study provides more clarity to clinicians on how to view a chronic ailment such as hearing loss.*
- Page 07: Tali Bar-Moshe✓:
  - The Impact of Self-Efficacy, Expectations, and Readiness on Hearing Aid Outcomes.
    - *M.A. Ferguson, A. Woolley& K.J. Munro.*
    - *International Journal of Audiology 2016; Vol. 55 (S3), S34-S41.*
    - *There is more and more evidence that non-audiological factors play a major role in the HA rehabilitation process. As professionals our responsibility is to be aware of those aspects, try to find the right ways and the correct time to assess them and use the results to help our patient move successfully in their rehabilitation journey. As a global leading audiological group we have the resources and data to keep on investigating what is the best way to treat our patients and make successful HA fitting.*
- Page 08: Reddy Sivaprasad ✓:
  - Application of the transtheoretical model of behaviour change for identifying older clients' readiness for hearing rehabilitation during history taking in audiology appointments.
    - *Ekberg K et al*
    - *International Journal of Audiology, 2016; Vol. 55 (S3), S42-S51.*
    - *This is a qualitative study trying to redefine the importance of the case history session and the need for making it open-ended. The study examined if the TTM can be applied in the initial few minutes of an audiologist's interaction with patients. The findings from 62 recorded sessions clearly showed that motivation levels of individuals can be identified at the case history session level.*
- Page 10: Reddy Sivaprasad ✓:
  - Audiology patient fall statistics and risk factors compared to non-audiology patients.
    - *Criter RE & Honaker JA*
    - *International Journal of Audiology, 2016; Vol. 55 (10), 564-570.*
    - *This is a case-controlled study where 2 groups, each of 25, people (seeking audiological services vs. not seeking audiological services) and used 4 tests to find out if there are any differences between the groups in terms of falls. The tests could not find any differences however, in spite of the history showing falls have been more frequent in people having hearing loss.*
- Page 12: Lorenzo Notarianni ✓:
  - Does clinician continuity influence hearing aid outcomes?
    - *J. Bennett, Carly Meyer & Robert H. Eikelboom.*
    - *International Journal of Audiology, 2016; Vol. 55 (10), 556-563.*
    - *The objective of this prospective cohort study was that of evaluating whether clinician continuity is associated with successful hearing outcomes or differed depending on the number of clinicians involved in patients' hearing care. No association was determined.*
- Page 13: Tine De Boodt ✓:
  - A systematic review of techniques and effects of self-help interventions for tinnitus: Application of taxonomies from health psychology.
    - *Greenwell K et al.*
    - *International Journal of Audiology, 2016; Vol. 55 (S3), S79–S89.*

        - *Nowadays, self-help techniques are already used for tinnitus patients with or without minimal therapist contact. Examples of these interventions are self-help books, internet-tools, information leaflets etc... But how effective are these self-help interventions for adults who suffer from chronic tinnitus and which techniques (CBT, TRT,…) are used to help the patient 'remotely'?*
- Page 14: Reddy Sivaprasad ✓:
    - Do Modern Hearing Aids Meet ANSI Standards?
        - *Holder JT et al.*
        - *The Journal of the American Academy of Audiology, 2016; Vol. 27 (8), 619-627.*
        - *This study measured 73 hearing aids from 4 manufacturers using ANSI S3.22 (2014). The results showed systematic discrepancies related to design with all the measured items. The biggest discrepancy was found in EIN measure. The authors remind us not to forget to do test box measurements before dispensing hearing aids to maintain quality.*
- Page 15: Reddy Sivaprasad ✓:
    - Hearing Instruments for Unilateral Severe-to-Profound Sensorineural Hearing Loss in Adults: A Systematic Review and Meta-Analysis.
        - *Kitterick PT et al.*
        - *Ear and Hearing, 2016; Vol. 37 (5), 495-507.*
        - *This is a systematic review of literature on this topic. The review of 27 studies on 4 parameters using the relevant statistics compared the outcomes from rerouting devices with restorative devices. The authors found some evidence of benefit from each of these options but it was not adequate to make a strong recommendation. The authors called for more Randomised Control Trials (RCTs) in this topic.*
- Page 17: Anna Pugh ✓:
    - A Randomized Control Trial: Supplementing Hearing Aid Use with Listening and Communication Enhancement (LACE) Auditory Training.
        - *Gabrielle H. Saunders et al.*
        - *Ear and Hearing 2016; Vol. 37, (4), 381–396.*
        - *For speech understanding in noise, the researchers found that there was no significant difference between the results of the control group of the LACE users. In fact they found no significant benefit in any of the measures.*
- Page 19: Anna Pugh ✓:
    - Effects of Age and Working Memory Capacity on Speech Recognition Performance in Noise Among Listeners with Normal Hearing.
        - *Gordon-Salant S & Samuels Cole S.*
        - *Ear and Hearing 2016; Vol. 37, (5), 593–602.*
        - *The study concludes by asserting that listeners with normal hearing and lower Working Memory capacity, irrespective of their age, are less able to manage hearing well in noisy environments. This interesting study could influence how we think about supporting people to manage their hearing in noisy environments, rather than make assumptions that younger people may manage better, or that age is the determining factor.*
- Page 21: Anna Pugh & Paul Van Doren ✓:
    - Impact of Hearing Aid Technology on Outcomes in Daily Life - I: The Patients' Perspective & - II: Speech Understanding and Listening Effort.
        - *Robyn M. Cox et al.*
        - *Ear and Hearing 2016; Vol. 37, (4), e224–e237 & Vol. 37, (5), 529–540*
        - *The researchers conclude by suggesting that there is no definable difference in premium or basic range hearing aid models, providing the fitting and programming of hearing aids is undertaken within systemised protocols, and that there is no scientific basis to support the more expensive technology over the simpler hearing aid models.*

- Page 23: Lorenzo Notarianni ✓:
  - Identifying and Prioritizing Diseases Important for Detection in Adult Hearing Health Care.
    - *J. Kleindienst et al.*
    - *American Journal of Audiology, 2016 Volume 25, (3), 1-8.*
    - *The purpose of this literature review was to identify and prioritise diseases important for detection in adult hearing health care systems. 195 diseases likely to occur in adults complaining of hearing loss were identified. The presence of non-otological symptoms associated with these diseases resulted in the identification of 104 diseases. The primary objective being that of developing tools that improve the accessibility and affordability of hearing health care while maintaining public safety.*
- Page 24: Johanna Van Coillie ✓:
  - A Dynamic Speech Comprehension Test for Assessing Real-World Listening Ability.
    - *Virginia Best et al.*
    - *Journal of the American Academy of Audiology, Vol 27:7, 515-526, July 2016.*
    - *Although this test setting might improve the prediction and evaluation of the speech comprehension of hearing aid wearers, real-life situations – which are individual and personal – remain the most important trial moments to evaluate the comprehension ability of hearing aid users.*
- Page 25: Katrien Hoornaert ✓:
  - Extended bandwidth real-ear measurement accuracy and repeatability to 10 kHz.
    - *Jonathan M. Vaisberg, Ewan A. Macpherson & Susan D. Scollie.*
    - *International Journal of Audiology 2016; 55: 580-586.*
    - *Some hearing aids provide maximum audible frequencies up to 10 kHz, it is important to know if these can be verified with REM. Extended bandwidth verification may be less reliable than low frequency verification due to interactions with standing waves in the ear canal and placement of the probe tube.*
- Page 26: Katrien Hoornaert ✓:
  - Subjective hearing-related quality-of-life is a major factor in the decision to continue using hearing aids among older persons.
    - *Yukihide Maeda et al.*
    - *Acta Oto-Laryngologica, 2016, vol. 136, No.9, 919-922.*
    - *This retrospective study compared audiological data in the better hearing ear and hearing related quality-of-life of the patients who were aged ≥65 years and attended a Hearing Aid Service Unit between 2008 and 2013.*
- Page 27: Christina Röbke ✓:
  - Animal models of tinnitus.
    - *Takefumi Kamakura, Joseph B. Nadol Jr..*
    - *Hearing Research, 339 (2016), 132-141.*
    - *This study describes several animal models of tinnitus which, in spite of their limitations, have contributed significantly to the neuroscience of tinnitus.*
- Page 28: Christina Röbke ✓:
  - Correlation between word recognition score and intracochlear new bone and fibrous tissue after cochlear implantation in the human.
    - *Takefumi Kamakura, Joseph B. Nadol Jr.*
    - *Hearing Research, 339 (2016), 132-141.*
    - *The goal of this study was to evaluate the effect of delayed changes in the word recognition scores achieved after cochlear implantation.*
- Page 29: Tom De Neve ✓:
  - What Is the International Classification of Functioning, Disability and Health and Why Is It Relevant to Audiology?
    - *Carly Meyer et al.*
    - *Seminars in Hearing, Vol. 37, (3) 2016, 163-186.*

        - *This article is a good introduction in the ICF framework. The basics are well illustrated by two cases. The only two issues not covered in this article are 'motivational aspects' and 'empowerment'.*
- Page 30: Tom De Neve ✓:
    - The International Classification of Functioning, Disability and Health as a Framework for Providing Patient- and Family-Centered Audiological Care for Older Adults and Their Significant Others?
        - *Caitlin Grenness et al.*
        - *Seminars in Hearing, Vol. 37, (3) 2016, 187-199.*
        - *The article encourages reflection on your own way of working with older adults and their partners, and how the ICF could help to facilitate patient- and family-centred care.*
- Page 31: Barry Downes ✓:
    - Applying the COM-B behaviour model and behaviour change wheel to develop an intervention to improve hearing-aid use in adult auditory rehabilitation.
        - *Fiona Barker, Lou Atkins & Simon de Lusignan.*
        - *International Journal of Audiology 2016; 55:10, S90 – S98.*
        - *The objective of this article is to introduce a psychological model of behaviour, namely the COM-B model, and to describe how this has been used in combination with the behaviour change wheel (BCW) in developing an intervention which aims to promote regular, long-term use of hearing aids by adults with acquired hearing loss.*
- Page 33: Barry Downes ✓:
    - Health behavior theories as predictors of hearing-aid uptake and outcomes.
        - *Gabrielle H. Saunders, Melissa T. Frederick, ShienPei C. Silverman, Claus Nielsen & Ariane Laplante-Lévesque.*
        - *International Journal of Audiology 2016; 55: sup3, S59–S68.*
        - *This study shows that taking up hearing aids results in a positive change in attitude toward hearing and hearing aids. It confirms the importance of encouraging people with hearing loss to seek help and to try hearing aids because, as we know, negative expectations about hearing aids prove to be unjustified once an individual actually uses hearing aids.*

Understanding the psychosocial experiences of adults with mild-moderate hearing loss: An application of Leventhal's self-regulatory model

Heffernan E et al.

International Journal of Audiology, 2016; Vol. 55 (S3), S3-S12.

Hearing loss is a chronic health problem which affects the individual's health, emotional status, work opportunities etc. to name a few amongst many others. While it is clear that hearing loss can have a considerable psychosocial impact, current understanding of this impact would be greatly enhanced if it were underpinned by an established theoretical framework. There is a great need to develop such a framework that could improve the understanding of the behaviours and experiences of individuals with hearing loss.

The authors employed the well-known Self-Regulatory Model (SRM) or the common sense model which has roots in the health psychology and is very popular in studying chronic ailments such as diabetes.

A stimulus, such as a symptom or diagnosis, prompts individuals to develop cognitive and emotional representations of their condition. Cognitive representations are lay beliefs about the condition stemming from personal knowledge and experiences, information from the media, and information from significant others, whereas emotional representations are subjective reactions to the condition, such as anxiety or fear.

Cognitive representations have five main components: (1) identity, or beliefs about the symptoms and labels associated with the condition, (2) causal beliefs, or beliefs about the factors that led to the development of the condition, (3) timeline, or beliefs about the duration of the condition, (4) controllability / curability, or beliefs about the extent to which the condition can be controlled, treated or cured and (5) consequences, or beliefs about the short and long term effects of the condition. Cognitive and emotional representations influence the selection of coping responses, which in turn influence health outcomes.

The aim of this study was to explore the psychosocial experiences of adults with mild-moderate hearing loss using the SRM as a theoretical framework. Specifically, the study explored the cognitive and emotional representations of individuals with hearing loss, as well as their perceptions of their coping responses.

A group of 25 individuals with mild-moderate hearing loss (HA users) and a group of hearing care professionals were included in the study. The first author conducted a structured interview with all the participants for about 60 minutes which was audio recorded. The same was thematically analysed using a software program. In additions the participants were also subjected to pure-tone audiometry and APHAB questionnaire. The analysis showed the following:

1. Cognitive Representations of Hearing Loss:
a. Identity - Hearing loss was found to have various negative connotations, including old age, unintelligence, and unfriendliness. This aligns with previous investigations of the stigmatisation of hearing loss and its impact on one's sense of identity.
b. Causal beliefs - There was a divergence of opinion amongst the participants as regards the benefits of developing a detailed understanding of the nature and causes of hearing loss.
c. Timeline - Most individuals with hearing loss were not particularly concerned about the progression of their condition.

d. Controllability/ Curability - Most participants believed that hearing loss is not controllable or curable. Despite this belief, the majority regularly wore hearing aids.
e. Consequences - The most substantial consequences were activity limitations and participation restrictions. Individuals with hearing loss often experienced communication difficulties, strained relationships with communication partners, and difficulties taking part in social, leisure, community, and professional activities.

2. Emotional representations of hearing loss: Individuals with hearing loss had primarily negative emotional responses to the condition, including frustration, embarrassment and loneliness. The findings suggested that emotional responses can shift over time, reflecting the long-term nature of hearing loss. It is very important for the audiologist to consider these representations in planning an effective treatment.

3. Coping responses: There were two primary coping responses: disengaged coping, or avoiding addressing one's hearing loss, and engaged coping, or taking action to manage one's hearing loss. The present study has introduced the concepts of withdrawal from situations and withdrawal within situations as the two primary forms of disengaged coping.

It is important that clinicians consider these complexities, especially the potential limitations of communication tactics, when counselling patients.

The study is largely exploratory in nature but has strong framework of execution. The theoretical model selected was quite appropriate. The study provides some basic answers that plug the gaps in our understanding about people with hearing loss. More studies will help us have better understanding of the psychosocial responses which will help clinicians to plan and prepare for better counselling.

The Impact of Self-Efficacy, Expectations, and Readiness on Hearing Aid Outcomes

M.A. Ferguson, A. Woolley & K.J. Munro.

International Journal of Audiology, 2016; Vol. 55 (S3), S34-S41.

Recent studies have shown that different non-audiological factors have impact on the success of hearing aid (HA) users. The purposes of this study were: 1) to investigate the impact of self-efficacy prior to HA fitting on HA outcomes of first-time adult HA users measured six weeks after HA fitting; 2) to investigate the effect of users' expectations of HA and their readiness to improve their hearing on HA outcome measures.

30 adult, first-time HA users from the public-sector funded Nottingham Audiology Services participated in this study. All the participants were fitted with Phonak Nathos Micro HA programmed to NAL-NL1. During the study they attended 3 appointments: 1) initial hearing assessment 2) HA prescription and fitting 3) follow-up for evaluation of outcome after 6 weeks.

Self-efficacy is a person's beliefs or confidence in their ability to accomplish skills needed to carry out a certain behaviour including health behaviour. Studies have shown that the level of self-efficacy can influence the self-management of chronic long-term conditions like diabetes, health behaviour and patient outcomes. Self efficacy was measured in this study using 1) the Measure of Audiologic Rehabilitation Self-efficacy for Hearing Aids (MARS-HA). This questionnaire was completed immediately prior to HA fitting. 2) the Line Question 2 (LQ2) on the Ida Institute "Line" tool which was conducted at the initial hearing assessment.

Expectations from HA and readiness to deal with the hearing loss were also reported in the literature to have an impact on HA use and success. In this study the researchers assessed the expectations from HA immediately prior to HA fitting with the Expected Consequences of Hearing aid Ownership questionnaire (ECHO). Readiness to face hearing difficulties was assessed using the Ida Institute "Line" tool (LQ1) at the initial hearing assessment.

Different outcomes of the HA fitting were assessed: 1) Satisfaction was assessed 6 weeks after fitting using Satisfaction with Amplification in Daily Life (SADL) 2) activity limitations and participants restriction were assessed at initial assessment using Part I of the Glasgow Hearing Aid Benefit Profile (GHABP) 3) HA use, benefits, residual disability and satisfaction were assessed after six weeks using GHABP Part II 4) HA use was obtained from the HA datalogging information of the participants HA.

The results have shown that the self-efficacy measurements, that were used in the study, were not good predictors of the HA outcome that were measured partly because of the early fitting stage at which they were conducted. Expectations from HA and readiness to improve hearing were found to be good predictors of satisfaction and benefit from HA. Hearing sensitivity was not associated with HA outcome.

There is more and more evidence that non-audiological factors play a major role in the HA rehabilitation process. As professionals, our responsibility is to be aware of those aspects, try to find the right ways and the correct time to assess them and use the results to help our patients move successfully in their rehabilitation journey. As a global leading audiological group, we have the resources and data to keep on investigating what is the best way to treat our patients and make successful HA fittings.

Application of the transtheoretical model of behaviour change for identifying older clients' readiness for hearing rehabilitation during history taking in audiology appointments

Ikberg K et al.

International Journal of Audiology, 2016; Vol. 55 (S3), S42-S51.

It is well known that many older adults who have their hearing tested do not subsequently go on to obtain hearing aids. A recent study found that only just over half of clients who were recommended hearing aids within an initial audiology appointment made a commitment to obtain them within that appointment. Models of health behaviour change can be useful for exploring how people make decisions to change health-related behaviours. One particular model, the transtheoretical model (TTM), views behavioural change as a process that occurs across a number of stages, rather than being a discrete event.

TTM has identified five key stages that an individual will move through in changing their behaviour. These stages include: (1) precontemplation (problem denial or lack of awareness); (2) contemplation (awareness of problem); (3) preparation (intention to change behaviour); (4) action (overt behaviour modification); and (5) maintenance (sustained behaviour change). The model purports that individuals who are in the later stages of change are more likely to succeed at help-seeking, intervention uptake, and adherence. There are three other key constructs in the model, including: decisional balance (the pros and cons of changing); self-efficacy; and processes of change. The current paper is focused on identifying clients' stage-of-change.

TTM has been widely applied in audiology, however several studies have found that questionnaires such as the URICA (University of Rhode Island Change Assessment tool) are not applicable to our settings as they are too long. This study aimed at finding an alternative solution to this problem of easily finding the readiness of change at the case history taking phase itself. This paper aims to examine: (1) how clients' readiness for change can be observed within the history-taking phase of the appointment; and (2) whether this perceived readiness has consequences for their rehabilitation decisions in the management phase of the appointment.

This study employed the video interactions between 25 audiologists and 62 patients in the case history taking sessions. They were transcribed and analysed using standard conversation analysis methods to identify the stage of change. The outcome of each session was then compared with their willingness to adopt the recommendation.

The results revealed that the following characteristics were seen among those in pre-contemplation stage: play down the impact of their hearing difficulties on their everyday life; display low concern for their hearing difficulties; provide self-initiated examples of situations where they can hear well; attribute blame for hearing difficulties to third parties (e.g. family members mumbling, or speaking softly), or situational factors (e.g. background noise); utilise interactional devices for displaying a dispreferred response when responding to history-taking questions, including delaying devices (e.g. 'um', turn-initial 'well', intra-turn pauses, cut-offs, and re-starts).

The authors conclude that audiologists should be trained to keep case history sessions more open and let individuals respond freely to open-ended questions. This should facilitate identification of the stage of change the individual is currently in, which helps in selecting the appropriate counselling procedure.

The authors made a great attempt to make the popular TTM model simpler and easier to use in clinical sessions. This study helps us redefine the importance of the case history session. A simple yet structured questionnaire meant for beginners could have been developed from this study.

Audiology patient fall statistics and risk factors compared to non-audiology patients

Criter RE & Honaker JA.

International Journal of Audiology, 2016; Vol. 55 (10), 564-570.

Falls are a common and expensive problem associated with old age, which becomes greater with advancing age. However falls can be prevented by identifying extrinsic and intrinsic risk factors. A variety of age-related changes in sensory-motor systems have implications for poor balance and falls. Vestibular dysfunctions are common in this group demonstrating significant decline in gaze stability, postural control, and gait— factors necessary to maintain adequate balance.

Hearing loss though hasn't received much attention in these groups but is now established as an independent causal factor contributing to falls. While the causal link between hearing loss and falls is yet to be fully understood, age-related hearing loss is a growing concern in geriatric medicine, with increased hearing loss leading to social isolation and cognitive decline—additional risk factors for falls.

The primary purpose of this work was to compare fall statistics, fall risk factors, and characteristics of patients who seek hearing healthcare from an audiologist to individuals who have not sought such services. Three specific aims were: to report the prevalence and annual incidence of falls of audiology patients compared to non-audiology patients; to explore the similarities and differences for fall risk factors and the characteristics between audiology patients and non-audiology patients; to describe if audiology patients differ in functional balance and mobility from non-audiology patients. Two groups (one seeking audio services and the other not seeking audio services) of 25 participants each were included in this study. They completed the Activities-Specific Balance Confidence (ABC) scale, Hearing Handicap Inventory for the Elderly (HHIE), Dizziness Handicap Inventory (DHI), a case history interview, and the Timed Up and Go (TUG) test.

ABC scores of less than 67% suggest a high fall risk relative to the general population of community dwelling older adults. HHIE scores of 0–16 represent little to no difficulty, 18–42 mild to moderate difficulty, and 44–100 severe difficulty. DHI scores of 0–14 represent little to no difficulty, 16–26 mild difficulty, 28–44 moderate difficulty, 46–100 severe difficulty. In the TUG test, time duration of 12 seconds is a risk factor for falling. The following were the results:

1. *Total number of recent falls was significantly different between the groups, with audiology patients sustaining an average of 1.83 falls/person and non-audiology patients sustaining an average of 0.84 falls/person.*
2. *Scores on the ABC and the DHI were not significantly different between groups. As expected, HHIE yielded higher scores for the audiology group.*
3. *TUG timing was not significantly different for both the groups.*

The current study provides a case-controlled statistical comparison and characterises audiology and non-audiology patient groups with validated questionnaires and a functional mobility measure. The study found a significantly higher number of audiology patients fell multiple times within the most recent year (64.7%) than the non-audiology patients (42.9%). Although audiology patients fell more often than non-audiology patients, they did not report more frequent dizziness and balance concerns or fear of falling. Results from the ABC and DHI were not significantly different between groups. Additionally, it would appear that functional balance abilities, measured by the TUG test, were not significantly different between groups.

It was clear from the findings that whatever may be causal mechanism, the risk of falls is more common amongst the patients visiting audiology clinics. The authors recommended that audiologists should address fall risk by way of case history and act on the acquired information, possibly recommending that the patient be proactive and follow-up about falls with his or her healthcare provider and/or seek community fall prevention resources.

The study design is simple yet evolved. Inclusion of diagnostic hearing tests would have made the cause of hearing loss more clear. This study adds to the mounting evidence that falls are another important consequence of hearing loss. The study calls on audiologists to be prepared for identifying falls in their population and to provide them with resources.

Does clinician continuity influence hearing aid outcomes?

J. Bennett, Carly Meyer & Robert H. Eikelboom.

International Journal of Audiology, 2016; Vol. 55 (10), 556-563.

468 hearing aid owners from an audiology clinic in Western Australia were recruited for this study between November 2008 and November 2010 and a total of 26 clinicians. It was requested of the participants to complete a survey set comprising items from published surveys. The questionnaires used in this research were the IOI HA (Cox & Alexander), HAUQ (Dillon et al, 1997), and the PHAST (Desjardins & Doherty, 2009). Additional questions were adopted from the MarkeTrak consumer survey (Kochkin, 2000, 2002) evaluating satisfaction with the clinician.

In contrast to studies exploring the effects of clinician continuity on patient outcomes in general medicine (Love et al, 2000; Fan et al, 2005) no significant association was found between clinician continuity and outcomes with hearing aids in this study and has demonstrated that patient management through connected and coherent clinical practices improves patient care (Haggerty et al, 2013). According to Haggerty (2003) the number of clinicians providing care is less important if the other aspects of continuity of care are met, such as a personalised and consistent care management plan. This concept is supported by Funnell and Anderson (2003).

The results shown in this paper did not find any association between clinician continuity and hearing aid outcomes and at the same time provide convincing evidence on the importance of protocols in aural rehabilitation. Patients generally demonstrated good outcomes and reported high satisfaction with their clinicians irrespective of clinician continuity. The authors conclude that within a controlled practice setting, services provided through more than one controlled practice setting and/or services provided through more than a single clinician may not adversely affect hearing aid outcomes. Future research is though needed to identify the impact of clinician continuity on the therapeutic relationship. There are some issues regarding the test set up and methodology used, meaning that further investigations are needed to better understand the relationship between clinician continuity and outcomes.

A systematic review of techniques and effects of self-help interventions for tinnitus: Application of taxonomies from health psychology

Kate Greenwell et al.

International Journal of Audiology, 2016; Vol. 55 (S3), S79–S89.

Nowadays, self-help techniques are already used for tinnitus patients with or without minimal therapist contact. Examples of these interventions are self-help books, internet-tools, information leaflets etc...

But how effective are these self-help interventions for adults who suffer from chronic tinnitus and which techniques (CBT, TRT,…) are used to help the patient 'remotely'?
Although this research question is really interesting, this study didn't find a confident conclusion regarding the effects and techniques that were used for self-help interventions with tinnitus patients.

Only 5 studies were selected to review and each study used different approaches (eg. other tinnitus questionnaire – tinnitus functional index vs. tinnitus handicap inventory).
Moreover, the selected studies were not highly qualified; therefore comparison between the studies was difficult.

In general, it is already difficult to demonstrate a significant effect for tinnitus therapies, let alone that this would be applicable for self-help interventions. Every tinnitus patient is different (varying cause of tinnitus, different personality or emotional factors etc…) and needs to be treated in an individual manner.

Self-help interventions can be appropriate for the tinnitus patient who likes to be independent. Since the hearing industry is evolving (apps, online fitting,…), remote-helping or self-help might become much more important, including for our tinnitus patients.

Do Modern Hearing Aids Meet ANSI Standards?

Holder JT et al.

Journal of the American Academy of Audiology (2016), Vol. 27 (8), 619-627.

Hearing aids need to be tested for quality control as per law. In the USA, the Food and Drug Administration (FDA) uses ANSI S3.22 (2014) to do the quality check of all hearing aids. Manufacturers should declare that they abide by these standards. As per the strong recommendations of ASHA, all audiologists should do quality check with a test box system before they dispense these aids. The highlights can be found in the table below:

Test	Gain Setting	Tolerance
Max OSPL90	Full On Gain	+3 dB
HFA- OSPL90	Full On Gain	+/- 4 dB
HFA- FOG	Full On Gain	+/- 5 dB
Total harmonic distortion (THD)	Reference Test Gain	+ 3%
Equivalent input noise (EIN)	Reference Test Gain	+3 dB
Attack/Release times	Reference Test Gain	+/- 5 msec or +/- 50%
	Max AGC	whichever is larger

There are 2 types of discrepancies from the standards: systematic and unsystematic discrepancies. Systematic discrepancies include measurements that are consistently out of specification for most of the hearing aids tested for one particular hearing aid manufacturer. Systematic discrepancies suggest a general hearing aid design or testing issue. An unsystematic discrepancy is a measurement that is out of specification for some limited percentage of hearing aids, suggesting damage, breakage, part failure, or an issue with quality control in the manufacturing process.

There are no studies reported to date about whether there are any discrepancies with modern aids. Measuring modern aids is a complex task because of the effect of special features and also because of non -availability of manufacturer specific procedures to conduct these measurements.

The purpose of this study was to determine the percentage of new hearing aids in compliance with the relevant ANSI standard, in addition to the percentage of hearing aids with functional directional processing. Further, this study aimed to assess trends associated with compliance across hearing aids, specifications, and manufacturers. 73 BTE hearing aids from 4 different brands were measured using this standard. Two test box systems (Fonix 8000 and Verifit 3.1) were used to measure them, often to cross-check.
All the hearing aids showed systematic discrepancies with this standard. The only measure that showed 100% compliance was OSPL90.
Equivalent Input Noise (EIN) was the measurement found to be most frequently out of specification for the hearing aids assessed in this study. For all hearing aids, the EIN measurements were not within specification when measured with the Verifit, whereas two of the four brands did fall within specification when measured with the Fonix, indicating that Brands 3 and 4 were positively affected by the additional 25 dB of test box isolation that the Fonix provides.
The study suggests the critical need for conducting such measurements routinely to ensure that clinicians are dealing with good quality hearing aids.

This study reminds us the basics of hearing aid dispensing which are forgotten or taken for granted in the name of modern technology. The study highlights systematic discrepancies prevalent among major brands on critical parameters such as the Equivalent Input Noise (EIN).

Hearing Instruments for Unilateral Severe-to-Profound Sensorineural Hearing Loss in Adults: A Systematic Review and Meta-Analysis.

Kitterick PT et al.

Ear and Hearing 2016; Vol. 37 (5), 495-507.

Unilateral deafness in adulthood gives rise to a variety of subtle hearing difficulties, with speech in noise and localisation being the main challenges. These difficulties and their consequences for social and vocational activities can lead to feelings of annoyance, embarrassment, and helplessness.

This problem has been offered two approaches in the literature and clinical practice using the technology of the day. Firstly, rerouting devices such as wired or wireless CROS, either air-conduction devices (ACD) or bone-conduction devices (BCD) including bone-anchored hearing aids, and, Secondly, restorative devices such as cochlear implants. As per the previous reviews on this subject, restorative devices have been shown to be widely useful whereas rerouting devices have been shown to improve only the speech in noise problem.

The purpose of the current review was to assess the evidence about whether hearing instruments, including but not limited to rerouting devices and any device that restores input to the IE ("restorative devices"), are effective in improving listening skills which are impaired in unilateral deafness (speech perception and sound localisation), reducing associated listening difficulty (hearing-related quality of life), and improving overall health and well-being (health-related quality of life). The review also sought to compare restorative and rerouting devices, and to compare air- and bone-conduction rerouting devices to the unaided condition.

Results:
Electronic databases up to Feb 2015 were searched with the following criteria: adults with a pure-tone average audiometric threshold ≤30 dB HL in one ear (averaged across 0.5, 1, 2, and 4 kHz) and >70 dB HL in the other ear; using any hearing instrument; hearing instruments and placebo devices, no intervention; speech perception in quiet and in noise, sound localisation, hearing- and health-related quality of life, complications and adverse events; controlled trials and prospective observational studies. Finally 27 studies from 30 publications were included in this study.

The majority of studies were before-after comparisons in which patients acted as their own control. The studies were judged to be of low-to-moderate quality. None reported conducting a power calculation.

- *Speech Perception in Quiet: Around 9 studies examined this parameter. There is a lack of evidence to suggest that rerouting devices or CI can provide benefits to speech perception in quiet compared with the unaided condition, or that one category of hearing instrument may be more beneficial than another.*
- *Sound Localisation: The evidence suggests that rerouting signals to the better ear does not improve the ability to determine the location of a sound. There is currently a lack of evidence to indicate whether CI can restore the ability to localise sounds and meta-analysis of the available evidence is limited by the use of inconsistent testing methodologies.*
- *Speech Perception in Noise: Both rerouting and restorative devices showed better scores when the poorer ear better SNR and when the SNRs were same for both ears, BCDs lead to better speech perception scores. Meta analyses of studies with HINT sentence test identified significant benefits from both BCD and ACD when speech was presented from in front and noise was presented toward the better ear.*

- *Hearing and Health-related Quality of life: Compared with the unaided condition, both rerouting devices and CI appear to have beneficial effects on hearing-related quality of life by reducing the level of listening difficulty experienced in everyday situations. There is currently an absence of evidence that either conduction modality for rerouting signals between the ears reduces listening difficulties more than the other. No conclusion can yet be drawn about whether CI provides additional reductions of listening difficulty compared to rerouting devices.*

The authors conclude that no recommendations for the management of unilaterally deaf adults can be made based on the current evidence. They recommend high quality Randomised Control Trial (RCT) studies with specific objectives. The authors also recommended the need to develop a patient-related outcome measure specifically for unilateral deaf adults.

This systematic review compares all types of management options available for the unilaterally deaf adults including the more recent CI option. The review measured the benefit is one or more of the parameters and quantified the same. The design and statistical measurement criteria are relevant to this burning topic.

A Randomized Control Trial: Supplementing Hearing Aid Use with Listening and Communication Enhancement (LACE) Auditory Training.

Gabrielle H. Saunders et al.

Ear and Hearing 2016; Vol. 37 (4), 381–396.

As a Hearing Therapist I have supported the use of auditory training protocols with the rehabilitation process, particularly with patients who find it challenging to discriminate speech sounds, and have used LACE and other systems. So I was very interested to read another study considering the efficacy of this type of support.

The premise of auditory training (AT) is to optimise neural plasticity and enable the patient to optimise their residual acuity, and then transfer the skills learned into real world situations. Chien and Lin estimate that only 14% of potential hearing aid users actually use hearing aids, so it's important that those who do wear aids are appropriately supported to achieve the maximum positive outcomes. (Chien & Lin 2012)

It is recognised that whilst this is an accepted part of the rehabilitation pathway, AT is rarely undertaken in most clinics, and the researchers suggest this is due to time and cost constraints. The online or home DVD option therefore provides a further opportunity to maximise this resource.

279 US Veterans were recruited and paid to participate in this study which divided the participants into four sets. All participants had a three frequency average pure-tone average hearing impairment of ≤50dBHL , with 48.7% being new hearing aid users, and 143 experienced users
Saunders and colleagues looked at the experiences and outcomes for over 243 people over a 6 month period and gathered data from five behavioural and two self-report measurements.

This is a larger sample sized study than many previous and contrasted four groups of hearing aid wearers with four different interventions, in addition to standard hearing aid fittings. The first used LACE in the 10 session DVD format, the second using LACE again but in the 20 session online version, the third used active listening for a 10 hour period to digitised books (the placebo group), and the fourth (the control group) received educational counselling.

Outcomes measures included speech understanding in noise (WIN test), rapid speech and competing speaker, word memory and linguistic contexts tests. Standardised hearing aid benefit outcome measures used the Abbreviated Profile of Hearing Aid Benefit (APHAB) Cox & Alexander 1995), and the Hearing Handicap Inventory of the Elderly (HHIE), (Ventry & Weinstein 1982; Newman et al.1990)

The results contrast against previous reports: for speech understanding in noise, the researchers found that there was no significant difference between the results of the control group of the LACE users. In fact they found no significant benefit in any of the measures!

The researchers spent a great deal of time examining why their results were so different from other studies, in particular Sweetow and Sabes (2006) and Olsen (2013), but were unable to produce any clear reason for this.

In conclusion Saunders and her team were unable to make any recommendation for using this type of support in practice, and advised that clinicians may need to "temper the expectations" of patients embarking on these programmes.

I was quite surprised by this, and took a long time reading and reviewing the referenced research.
It certainly offers me a practice challenge and one I will take time to consider. A very interesting and challenging paper which I would recommend.

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Effects of Age and Working Memory Capacity on Speech Recognition Performance in Noise Among Listeners with Normal Hearing.

Gordon-Salant S & Samuels Cole S.

Ear and Hearing 2016; Vol. 37 (5), 593–602.

Various studies have previously demonstrated that older listeners, with or without a clinical hearing loss, have significantly lower success in speech discrimination in noise scores, than younger listeners, (Dubno et al 1984, Pichora-Fuller et al 1995), making the presumption that this is due to physiological changes within the peripheral and central nervous systems.
However this study asserts that this hypothesis does not account for the difficulties encountered in noisy and everyday listening environments by people without a clinical hearing impairment, and seeks to explore why this may occur.

In particular this study follows on from earlier research into cognitive decline and working memory performance, and considers the interface between the effects of age and working memory function on speech recognition in noise for listeners with clinically "normal peripheral hearing thresholds", and whether this interaction is influenced by the materials used in the testing protocols.

The study sample consisted of twenty-eight people between 61-75 (ONH), and twenty-five 18 – 25 year olds (YNH), with normal hearing thresholds, .
Test participants were assigned into four groups of age and working memory levels; [ONH +GWM], [OHN +LWM], [YNH+GWM], and [YNH+LWM]
Their working memory (WM) was measured by four established tests: Listening Span Test (LSPAN, Daneman and Carpenter 1980), Reading Span Test (RSPAN Rönnberg et al 1989), Paced Auditory Serial Addition Test (PASAT Rao et al 1989), and Letter Digit Substitution Test (LDST Wechsler 1997).
LSPAN requires the participants to decide whether the sentences are true or false, and by typing the last word of the sentence, so requires comprehension both of words and meaning. The standard level was set at the correct recognition of two out of three sets of sentences.
RPSAN test both working memory and verbal processing abilities, and requires participants to correctly respond to two out of three sets of absurd or normal sentences
PASAT is a numerical calculating test requiring participants to add the numbers presented as quickly as possible, to a maximum of 60 correct sums
LDST is a one minute timed speed test in which participants replace letters with numbers on a sheet from a key chart.
Both monosyllabic words and IEEE sentences were presented, and the competing noise was set at the 12 speaker babble used in SPIN test (Kalikow et al 1977)

The ease of language understanding model (ELU Rönnberg et al 2008, 2013) provides a theoretical framework for how we understand and recognise speech cues in challenging listening environments, and provides the correlation for WM, language processing in noise and hearing loss. This model states that in challenging situations, the listeners' working memory provides a mental representation of the speech, while processing context and knowledge of the language provides information to "fill in the gaps". However, when working memory is poor or reduced, or when there is excessive noise or signal deterioration, speech recognition will be reduced.

Other studies have looked at the link between contextual cues and speech understanding in noise, particularly with older people, but this study considers the need to control the test environment for

these factors to clarify the real role of WM on speech recognition. This is important as it supports and informs our choices for appropriate amplification strategies and cognitive remediation

Analysis of the experiment results showed that the YNH group had lower Signal to Noise Ratio (SNR) scores than the older adult group, but that adults with higher WM [OHN+GWM] scores also had lower SNR scores than those people with lower WM function.
However there were no age-related differences in SNR scores for people with higher WM function.

This study is the first to indicate that lower WM capacity is the primary determinant on the ability to understand speech in noise, independent of listener age, although the results do indicate that the effect of lower WM scores is stronger for older listeners than younger.

The second hypothesis established by the research was to examine whether the level of linguistic processing would affect listener success for different types of speech testing materials. Earlier research has suggested that contextual and semantic cues may provide an advantage to older listeners, but this is balanced by deterioration in their cognitive processing abilities.
The main influence on accurate contextual speech recognition in noise appears to be working memory, as those groups in both age ranges with lower WM scores also performed less successfully, although the YHN + LWM group did score higher

The study concludes by asserting that listeners with normal hearing and lower WM capacity, irrespective of their age, are less able to manage hearing well in noisy environments. This interesting study could influence how we think about supporting people to manage their hearing in noisy environments, rather than make assumptions that younger people may manage better, or that age is the determining factor.
I would recommend this paper as being a prompt to think about our practice when presented with patients expressing difficulties hearing well in noise.

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Impact of Hearing Aid Technology on Outcomes in Daily Life - I: The Patients' Perspective & - II: Speech Understanding and Listening Effort.

Robyn M. Cox et al.

Ear and Hearing 2016; Vol. 37, (4), e224–e237 & Ear and Hearing 2016; Vol. 37, (5), 529–540.

Cox et al. did a comparative study with 2 premium brands, both with basic and top models, with 45 older hearing aid wearers with a mild to moderate uncomplicated hearing loss, representing a great deal of our day to day customers, both first time users and experienced users.
Experienced audiologists fitted these clients, after being trained by the manufacturers on the purpose and application of their advanced algorithms; they programmed the HI's with 3 programs: one with the corrected factory settings, one corrected according a real ear measurement, and a third one with the best settings for understanding in background noise. Each of the 4 sets of HI went on trial during one month, first one brand, basic and premium and, after a time out of one month, the second brand, basic and premium.

Outcomes were registered both with laboratory testing and multiple questionnaires and an in depth interview afterwards. The authors took great care to cope with bias of subsequent fitting and avoided every possible way to influence the tested persons in this single blind set-up to both the manufacturers and the technology range at each part of the study.

Researchers reviewed speech understanding using the FAAF protocols [Four Alternative Auditory Feature test (AFAAF) Xu & Cox 2014, Foster & Haggard 1987], within the estimated typical speech in noise ratio calculations, following research by Smeds et al in 2015. Listening effort was measured at the same time using a Likert scale of 1 – 7 , with 7 being the most effort required.

The directionality capabilities of each set of hearing aids balanced against the manufacturers recommendations

All of this was then further measured by standardised satisfaction questionnaires, and in this case the researchers opted for the Abbreviated Profile of Hearing Aid Benefit (APHAB) (Cox & Alexander 1995), and Speech, Spatial and Qualities of hearing (SSQ) (Gatehouse & Noble 2004), and the device-oriented subjective outcome (DOSO) scale (Cox et al. 2014, 2014). After the trials the participants were also required to complete the SSQ-B (Jensen et al. 2009). The SSQ-B is a version of the SSQ which qualitatively measures the benefit of amplification.

The good news is that results show that in daily life all of the instruments are able to improve hearing performance in most cases.

A little bit less encouraging was the fact that most of the clients used the first program 85 percent of the time, regardless the fact that the second and third program could perform better. In fact, most of them reported not noticing a difference between the programs.

But the real drawback was that there was no significant difference between the outcomes of the basic and the premium HI's. Test persons reported no preference at all for the premium HI's in the questionnaires, and no difference was found in the laboratory tests, which suggests that the advanced algorithms (eg. environmental classification, more sophisticated noise reduction and directionality,…) are not proving their aims.

In the discussion, the authors expressed their doubts about whether the industry is careful enough to introduce new algorithms without having enough proof on the effectiveness. They also questioned the way in which we can recommend a premium, more expensive, hearing aid instead of a basic, cheaper one.

What can be the learnings from this well conducted study?

1. *Manufacturers should take more care in testing the effectiveness of their advanced features. Nowadays, it's really hard to find any white papers on the mass of new algorithms they present. Sometimes I have the feeling that they are designed in the first place to impress audiologist, instead of improving the quality of life of the hearing impaired.*
2. *It seems that amplification technology reaches a ceiling, when added features can only prove their effectiveness with difficultly, and in some cases even result in worse performance.*
3. *Every audiologist should be aware of the pros and cons of the algorithms and use them only for well-defined reasons, to pursue the best settings for every individual client instead of letting the fitting programs decide for themselves, based on average findings and resulting in an average fitting.*

This is very challenging to us as audiologists, particularly in the private sector, where we advise our patients that they would benefit from superior efficient technologies when in noisy listening environments, and to manufacturers to demonstrate the benefits they claim.

Having read this study and looked at some of the support evidence it presents, I need to seriously consider my advice to patients, and that can only be a good thing. I feel that this research may have opened a can of worms.

This leads to the conclusion that evidence-based practice is essential in quality hearing care, one should not just select a specific technology level but specifically select the feature settings based on the needs and auditory profile of the individual user. The default settings suggested by the manufacturer are by no means individual enough to lead to optimal results.

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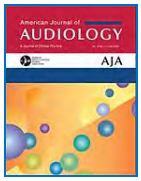
Identifying and Prioritizing Diseases Important for Detection in Adult Hearing Health Care



J. Kleindienst et al.

American Journal of Audiology, 2016; Vol. 25 (3), 1-8.

Society today faces challenges regarding how to appropriately manage the health care of a very rapidly growing elderly population.

Caring for this population with hearing loss presents challenges with regards to accessibility as the growth rate of those needing hearing health care outpaces the entry rate of hearing health care providers into relevant professions (physicians, audiologists, hearing instrument specialists) by a significant margin (Freeman, 2009; Health Resources and Services Administration , National Center for Health Workforce Analysis, 2013).

With a growing ageing population and no corresponding growth in the ranks of hearing health care providers, the public's access to affordable hearing health care has emerged as a national public health issue.

Although hearing aids and hearing-related devices are frequently available for purchase over the Internet or various large scale consumer retailers, the consumer electronic industry is also expanding to meet the growing market demand for more affordable devices by selling personal amplifier products and hearables and, by doing so, providing greater access to affordable hearing assistive products,; they're not well suited for the FDA's recommendation of a pre-fitting medical examination.

The FDA has two competing public objectives: firstly, encouraging the detection and management of potentially serious diseases and, secondly, making hearing aids more affordable and accessible. The authors envisage the use of inexpensive tools such as questionnaires to identify effective estimates risk of ear disease, serving as a triage tool prior to the fitting of hearing aids.

For this research a content domain for the disease rating system was developed in 4 steps comprising the review of textbooks, the creation of a condition rating system by using a scale from 0 to 4, and 5 experienced neuro-otologists rating 210 diseases and conditions. The goals of the research were approached by generating a ranked categorisation of ear diseases using a comprehensive literature review and quantitative ratings by content area experts.

This very significant paper presents a catalogue of ear diseases that would be important to identify in the hearing health care system to assure patient safety prior to hearing aid purchase. The results establish a set of 104 targeted diseases rated on adverse health consequences of missed diagnosis, diagnostic difficulty, and the presence of isolated hearing loss. This rating of critical areas evaluated by five experienced neuro-otologists helps to classify diseases that should be identified prior to hearing aid fitting and provides an interesting and defendable reminder about how a hearing test is much more than the audiometric configuration and this corroborates the importance of interdisciplinary collaboration.

A Dynamic Speech Comprehension Test for Assessing Real-World Listening Ability.

Virginia Best et al.

Journal of the American Academy of Audiology (2016), Vol. 27 (7), 515-526.

Most comprehension problems that challenge hearing aid wearers occur in multi-talker communication situations. Existing classic speech-in-noise tests are often not sufficient to predict and evaluate these difficulties encountered in real life. This problem was the base to create a new test to better predict hearing aid users' ability of speech comprehension in real-world communication. The article contains a validation study of a newly created test with the purpose of achieving ongoing speech comprehension even with competing conversations in the background.

Thirty listeners with normal hearing (age 17-40 years) took the test that consisted of 20 one-, two-, and three-talker passages at three different signal-to-noise ratio's (SNRs of -6, -8 and -10 dB with a fixed level of background noise at 65 dB SPL). The reading span test was also measured to identify the working memory ability of each test person.

The results of the validation experiment revealed that the comprehension performance didn't decrease when the number of talkers increased. On the contrary, the test results worsened when the SNR declined. The individual performances showed a significant relation to age and a near-significant relation to working memory ability (measured by the reading span test). Therefore, the older a test person was or the worse his/her working memory was, the poorer this person's results on the comprehension test were.

The test is valid for experimental use but demands further research before being useful as a prediction and validation instrument to evaluate hearing aid use.
The test persons were between 17 and 40 years old, which is a very young age group. Older people generally experience more difficulties with speech comprehension in a multi-talker situation and have a slower working memory due to age, which is why a validation of this test on an older age group is necessary.

Although this test setting might improve the prediction and evaluation of the speech comprehension of hearing aid wearers, real-life situations – which are individual and personal – remain the most important trial moments to evaluate the comprehension ability of hearing aid users.

Extended bandwidth real-ear measurement accuracy and repeatability to 10 kHz

Jonathan M. Vaisberg, Ewan A. Macpherson & Susan D. Scollie.

International Journal of Audiology, 55: 580-586

Some hearing aids provide maximum audible frequencies up to 10 kHz, it is important to know if these can be verified with REM. Extended bandwidth verification may be less reliable to low frequency verification due to interactions with standing waves in the ear canal and placement of the probe tube.

The purpose of this study is to compare the test-retest repeatability at 4 insertion depths and to compare the probe tube measurement accuracy, using wideband (1/3 octave) and narrow band (1/24 octave) averaging.

White noise was presented for between 5-10 seconds using a foam insert in the left ear of 14 female adults (19-31 years). 4 measurement depths were used: 30 mm, 28 mm, 26 mm and 24 mm (the clinically preferred depth for females is 28 mm). After these measurements, the probe tube was inserted a second time to do the same measurements. The article doesn't mention if it was the same person and/or probe tube that was inserted and if the person who did it was experienced in placing probe tubes.

The raw data were used to assess the repeatability within each measurement. There were no significant differences observed, indicating that the data at each probe tube insertion depth were measured reliably.

Repeatability across conditions was assessed using absolute test-retest differences. The test-retest effects did not differ across insertion depth and analysis bandwidth. But there was a main effect of frequency: for some frequencies the mean absolute test-retest differences exceeded 2 dB:
- as insertion depth decreased, there was a trend for more individuals to elicit absolute test-retest differences > 2 dB from 6,3 – 10 kHz.
- as frequency increased from 6,3 to 10 kHz, there was a trend for more individuals to elicit absolute test-retest differences above 2 dB.

To assess accuracy, the participant's frequency response was averaged across both recordings and normalised by subtracting that average from the averaged response measured at the 30 mm insertion depth. There is a significant interaction between insertion depth and frequency when collapsed across analysis band. 28 mm depth was the best predictor of ear canal levels measured at 30 mm insertion depth and deviated from the 24 and 26 mm insertion depths by more than 2 dB starting at 6,3 and 8 kHz, respectively.
There was no effect of signal analysis bandwidth on accuracy or repeatability.

A causal relationship between hearing loss and cognitive impairment.

So Young Park, Min Jung Kim, Huerxidan Sikandaner, Dong-Kee Kim, Sang Won Yeo & Shi Nae Park.

Acta Oto-Laryngologica, 2016 Vol 136 5 pag 480-483.

This retrospective study compared audiological data (pure-tone audiometry, speech discrimination score and dynamic range) in the better hearing ear and hearing related quality-of-life (hearing handicap inventory for the elderly) of the patients who were aged ≥65 years and attended a Hearing Aid Service Unit between 2008 and 2013. The patients were monaurally fitted in the better ear and could use a hearing aid for 2-5 weeks. After this period, patients could purchase the hearing aid at their own expense. The patients were classified as HA users (58,2 %) or non-users (41,8 %) according to their decision to buy the HA or not.

The audiological data showed no significant difference between users and non-users.
The self-reported QoL questionnaire was mailed to both HA users and non-users at least 4 months after the HA fitting, with a request to return them. The response rate was only 65,2%. The responders were 78 hearing aid users and 23 non-users.
The total score of the questionnaire was significantly higher (more impaired) for the HA users, as was the emotional score. For the social scores, there was no significant difference.

Remarks:
Almost all enrolled patients were thought to have presbycusis, so a bilateral hearing loss, but monaurally fitting!
It's not just because someone decides to buy a hearing aid, you can assume that they will continue to wear it. The title of the article is somewhat misleading.
The response rate of the questionnaire was only 65.2 %, The responders were 77% users and 23% non-users. This may have influenced the results.

Animal models of tinnitus.

Thomas J. Brozoski & Carol A. Bauer.

Hearing Research, 338 (2016), 88-97.

The first animal model for tinnitus was established by Jastreboff et al. in 1988 (Jastreboff, 1988). Since then a diversity of models have been developed, each with its own strengths and limitations.

The authors divided the animal models in two groups: interrogative or reflexive models compared them and described the advantages and limitations of several models.

Interrogative models use emitted behaviour und voluntary control to indicate hearing such as pressing a lever to obtain food in the presence of a particular sound. The reflexive models employ acoustic modulation of an auditory reflex, such as the acoustic startle response. The advantage of animal studies over human clinical studies are several, the most notable being: direct control over history and aetiology, availability of a large number of experimental tools, extending from behavioural to molecular, when required, use of invasive methods not appropriate for humans, and the random assignment of subjects to experimental and control groups thus enabling the use of more powerful inferential statistics as well as attribution of cause. The central problem all models face is establishment of reliability and validity (Brozoski and Bauer 2014).

The first published animal model of tinnitus was that reported by Jastreboff et al. A key feature of this model and one that has been incorporated to all subsequent models is that, while tinnitus might sound like anything to an animal (or human), by definition it cannot sound like silence.
Comparing interrogative and reflexive animal models, interrogative models have the advantage of relying on auditory perception while reflexive models rely on unconditioned reflexes and do not require either training or motivation management. Being the advantages for the reflexive models, these are the limitations for the interrogative models: training is required and motivation management is needed. Both can be time consuming and demand careful experimental control. The limitations for the reflexive models are that questions remain regarding its mechanism, sensitivity and reliability.

There are several possibilities to induce tinnitus in the animal models. Animal models that employ acoustic overexposure to induce tinnitus, or those that examine the influence of presbycusis, probably reflect factors at work in the human condition more realistically than pharmacological induction procedures, such as those relying on high doses of tinnitogenic agents such as salicylate or quinine.

The authors conclude that animal models have had reasonable success in characterising the sensory features of tinnitus, and have been used to reveal an unexpectedly complex neurophysiology.
Despite this success, animal models have not addressed the potential cognitive and emotional aspects of tinnitus. In summary, animal models have significantly contributed to the neuroscience of tinnitus and will continue to do so in future.

I would recommend this paper since it is a really good overview about the animal models for tinnitus. Several models were described with test methods, advantages and limitations.

Jastreboff, P.J., Brennan, J.F., Coleman, J.K., Sasaki, C.T., 1988. Phantom auditory sensation in rats: an animal model for tinnitus. Behav. Neurosci. 102, 811e822.
Brozoski, T.J., Bauer, C.A., 2014. Auditory neuronal networks and chronic tinnitus. In: Faingold, C.L., Blumenfeld, H. (Eds.), Neuronal Networks in Brain Function. Academic Press, Waltham, MA, USA, pp. 261-275.

Correlation between word recognition score and intracochlear new bone and fibrous tissue after cochlear implantation in the human.

Takefumi Kamakura & Joseph B. Nadol Jr.

Hearing Research, 339 (2016), 132-141.

The goal of this study was to evaluate the effect of delayed changes in the word recognition scores achieved after cochlear implantation.
Surgical insertion of the electrode induces various changes within the cochlea. Immediate changes include insertional trauma to the cochlea. Delayed changes include a tissue response consisting of inflammation, fibrosis and neoosteogenesis induced by trauma and an immunologic reaction to a foreign body (Li et al.,2007; Somdas et al., 2007; Fayad et al., 2009).
Seventeen human temporal bones from patients who in life had undergone cochlear implantation using various electrode designs were evaluated. Histological techniques were used and postoperative last-recorded word recognition scores (CNC [Consonant-Vowel Nucleus-Consonant Word Test] scores) were available.
In this study CNC word score had a significant positive correlation with total residual spiral ganglion cell counts and a significant negative correlation with the % volume of new bone within the cochlea and the length of electrode located in the scala media/vestibuli and spiral ligament. CNC word score had a significant negative correlation only with the % volume of new bone in the scala tympani, scala media/vestibuli and the cochlea
Comparing the results of this study to others, the authors concluded that further studies will be needed to confirm the correlation between spiral ganglion cell counts and word recognition scores following cochlear implantation, because of the different results of the studies. The conflicting results may be at least in part the results of the fact that the numbers of all studies including the current study are small, and also because the otological histories of patients were different.
Given the results that there was no correlation between word recognition score and fibrous tissue in the scala and 3 others studies, the authors hypothesised that although fibrous tissue increases the auditory thresholds, it may not have much influence on post-operative word recognition.
Previous studies have reported that a perimodiolar positioning of the electrode achieved both lower thresholds of electronically evoked auditory brainstem response (EABR) and a wider dynamic. The results of the current study are consistent with these findings, and cochlear implant manufacturers have introduced electrodes designed to achieve a juxtaposition of the implanted electrode and the modiolus. Neither age at implantation nor duration of implantation was significantly correlated with CNC word score.
The authors finally end with the suggestion that atraumatic insertion of the cochlear implant electrode into the scala tympani and other steps to reduce intracochlear new bone formation may promote improved word recognition using the implant.

The study is interesting and some results of other studies were confirmed. The authors conclude that further studies will be needed to confirm some other results.

Li, P.M., Somdas, M.A., Eddington, D.K., Nadol Jr., J.B., 2007. Analysis of intracochlear new bone and fibrous tissue formation in human subjects with cochlear implants. Ann. Otol. Rhinol. Laryngol. 116 (10), 731-738.
Somdas, M.A., Li, P.M., Whiten, D.M., Eddington, D.K., Nadol Jr., J.B., 2007. Quantitative evaluation of new bone and fibrous tissue in the cochlea following cochlear implantation in the human. Audiol. Neurootol. 12 (5), 277e284.

Fayad, J.N., Makarem, A.O., Linthicum Jr., F.H., 2009. Histopathologic assessment of fibrosis and new bone formation in implanted human temporal bones using 3D reconstruction. Otolaryngol. Head. Neck Surg. 141 (2), 247e252..

What Is the International Classification of Functioning, Disability and Health and Why Is It Relevant to Audiology?.

Carly Meyer et al.

Seminars in Hearing, Vol 37 (3) 2016, 163-186.

Introduction and goals of ICF:
It is common for audiologists to encounter patients with similar degrees of hearing loss who experience different impacts and who respond differently to audiological intervention and hearing rehabilitation. This is because patients will experience hearing loss differently, depending on the types of activities they do, social roles they have, who they are, and the environment in which they participate.
The World Health Organization's International Classification of Functioning, Disability and Health (ICF), provides audiologists with a framework to explore the impact of hearing loss on all facets of the individual's life and identify factors that influence these impacts.

The ICF considers a person's health in two ways:
- *Firstly, through functioning and disability:*
  - *Body functions and structures. Negative impacts of the health condition are described using the terms 'impairments' (e.g. hearing loss)*
  - *Activities: described in 'Activity limitations' refer to the execution of a task or an action (e.g. watching television, using the phone).*
  - *Participation: 'Participation restrictions' describe an individual's involvement in a life situation (e.g. difficulties forming relationships in work and social settings).*
- *Secondly, through contextual factors:*
  - *Impact of environmental factors: e.g. attitude of family, friends and health professionals, organization policies (third-party hearing disability)*
  - *Personal factors: e.g. age, gender personality*

Applying the ICF to audiological management
There are two reasons why application of the ICF model to audiological management can help facilitate patient-centred care by focusing on the individual needs of the patient and relevant contextual factors.
- *Importance of individualised hearing health care and need for implementation of patient and family-centred practices for adults and children.*
- *There is strong evidence that activity limitations, participation restrictions and personal factors have greater impact on hearing rehabilitation than measured hearing loss alone*

The article adds an appendix with the ICF core sets for hearing loss (established by Granberg in 2013). The comprehensive core set for hearing loss comprises 117 categories, the brief core set 27. Three quarters of the codes describe activities, participation and environmental components. Only 19 % pertained to body functions (e.g. sound discrimination) and only 3% to body structures (e.g. inner ear structure). This can support audiologists to implement patient-centred care and not only focus on body function and structure in hearing assessment appointments.
The overall aim of the ICF is to provide a common language and framework for the description of health- and health-related states. The ICF has been widely applied in speech pathology, physiotherapy, occupational therapy, social, medicine and more, and, therefore, should be expected to improve interprofessional discussions. In research and clinical practice, it will be possible to compare health conditions, services and countries.

This article is a good introduction in the ICF framework. The basics are well illustrated by two cases. The only two issues not covered in this article are 'motivational aspects' and 'empowerment'.

The International Classification of Functioning, Disability and Health as a Framework for Providing Patient- and Family-Centered Audiological Care for Older Adults and Their Significant Others.

Caitlin Grenness et al.

Seminars in Hearing, Vol 37 (3) 2016, 187-199.

The aim of the article is to describe how the ICF can be used to optimise patient and family-centred care as a contrast to typical clinical practice. The description of a case guides the reader through audiometric assessment, management planning and problem solving in the context of a typical older patient and their significant other. The first part of the article illustrates the scope and limitations of working without the guidance of the ICF framework. The second part illustrates how use of the ICF facilitates holistic and ultimately patient- and family-centred audiological rehabilitation.
By presenting two versions of the same case (the first using standard practice, the second using ICF), the article illustrates how audiologists can implement patient-and family-centred care when working with older adults and their significant others. The authors illustrate how audiologists can implement patient-and family-centred care when working with older adults and their significant others. Clinicians are encouraged to reflect on their own practice and consider how they can implement the ICF in clinical practice:

- *What components of the ICF are covered in their audiological rehabilitation appointments now?*
- *What else do they need to know about their clients and their families?*
- *How will they find out the perspectives and experiences of clients and families?*
- *Do they invite family to join the conversation during appointments?*
- *How can they change their practice to be more patient and family-centred?*

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Personal comment:
The article encourages us to reflect on our own way of working with older adults and their partners, and the way in which the ICF could help to facilitate patient- and family-centred care.

Applying the COM-B behaviour model and behaviour change wheel to develop an intervention to improve hearing-aid use in adult auditory rehabilitation

Heffernan E et al.

International Journal of Audiology, 2016; Vol. 55: 10, S90-S98.

The objective of this article is to introduce a psychological model of behaviour, namely the COM-B model, and to describe how this has been used in combination with the behaviour change wheel (BCW) in developing an intervention which aims to promote regular, long-term use of hearing aids by adults with acquired hearing loss.

The COM-B model is so named because people need capability (C), opportunity (O) and motivation (M) to perform a behaviour (B). It was developed to guide understanding of behaviour in context and develop behavioural targets as a basis for intervention design.

The model proposes that for someone to engage in a particular behaviour (B) at a given moment they must be physically and psychologically able (C) and have the social and physical opportunity (O) to do the behaviour and, in addition, to want or need to do the behaviour more than any other competing behaviours at that moment. It is an inclusive definition of motivation (M).

The COM-B model has been developed as part of a larger system of behaviour which is the behaviour change wheel (BCW).

The COM-B model has been applied successfully in a number of contexts but not yet in audiology. This article details a worked example of how the COM-B model and BCW have been applied in the context of hearing healthcare to guide the development and design of an intervention to improve adherence to hearing aid use. So, the behaviour of interest is the regular, long-term use of hearing aids. In much of the literature on behaviour change, healthcare professional behaviour and patient behaviour are treated separately, using different models to analyse the two behaviours.

The BCW process is to select a target behaviour which could address the behavioural problem. In the case of hearing-aid use, research suggests that patient behaviour may be partly dependent on a range of other peoples' behaviour, including hearing healthcare professionals.

This qualitative structured interview study used the COM-B model to identify what determined the behavioural planning by audiologists as a potentially important factor in encouraging long-term hearing aid use. A sample of 10 audiologists participated in this study with a range of experience from eighteen months to over ten years. Despite this range of experience, there was considerable consistency in the audiologists' responses such that data saturation was reached after only six interviews. Consistent with the COM-B model and interview structure, responses were grouped into those relating to capability, opportunity and motivation.
A scoping review of reasons for non-use of hearing aids resulted in a 'conceptual map' of the system of behaviours that might be relevant in encouraging long-term, regular hearing aid use.

Four behaviours presented promising targets for intervention development:-

- *Providing information about the benefits of hearing aid use*
- *Providing information about the consequences of poorly managed hearing loss, i.e. the negative consequences of non-use*
- *Providing prompts or triggers for hearing aid use*
- *Developing a plan to promote habitual hearing aid use*

Early development work following the BCW process and other research suggest that these behaviours are not routine in audiological practice even though they are easy to implement. Changing

these behaviours is likely to influence patient behaviour and their implementation should be reasonably easy to measure.

The analysis described in this article suggests that behavioural planning might be more likely to occur if audiologists' psychological capability, physical and social opportunity, and reflective and automatic motivation were addressed. This analysis forms the basis of an intervention design, using the BCW, to encourage behavioural planning by audiologists to improve the long-term regularity of hearing aid use and will be tested in a future clinical trial.

Conclusions
The COM-B model and BCW can be applied successfully in the context of audiology to analyse the behaviour both of people with hearing loss and of the professionals working with them to inform improvement in intervention design.

Although the model for achieving behaviour change described in this article has not previously been applied in the field of adult audiology, it presents an interesting but challenging argument that audiologists should not expect patient behaviour to change unless professionals themselves are prepared to change their behaviour. It broadens the definition of truly patient-centred practice.

Health behavior theories as predictors of hearing-aid uptake and outcomes

Gabrielle H. Saunders, Melissa T. Frederick, ShienPei C. Silverman, Claus Nielsen & Ariane Laplante-Lévesque

International Journal of Audiology 2016; 55: sup3, S59–S68

Acquired hearing impairment often goes untreated, and has been described as a major public health problem and uptake of rehabilitative interventions is low. This is not unique to hearing impairment as it is observed among many other chronic health conditions. Successful rehabilitative outcomes for adults with hearing impairment require cognitive and behavioural changes in the form of acknowledging a hearing disability, seeking professional help, and following through with recommendations for rehabilitation. To understand hearing health behaviours, it is useful to study them from a health psychology perspective and examine them through the lens of health behaviour theories.

The overall objective of this study was to understand hearing behaviours of adults seeking help for the first time through the application of two models of health behaviour change, the transtheoretical model (TTM) and the health belief model (HBM). The TTM includes these concepts: six stages of change, ten processes of change, the pros and cons of changing, self-efficacy, and temptation. The HBM is based upon six constructs that influence the likelihood that people will take action based on the proposition that people are more inclined to change behaviour when they believe that doing so might reduce a threat that is probable, and that would have severe consequences if it occurred.

Previous studies have shown that the attitudes and beliefs described by the TTM and the HBM are predictive of hearing behaviours. This study examines whether the TTM and HBM provide complementary information about hearing health behaviours, and whether, in combination, they can shed further light on hearing health behaviours (hearing-aid uptake) and hearing-aid outcomes. The TTM maps an individual's readiness for change but does not attempt to examine why an individual is at a particular stage of change. The HBM, on the other hand, describes an individual's predisposition to behaviour change, although it does not suggest specific strategies for promoting health behaviour change. Applying the two models together could yield further insight into what determines hearing health behaviours, and guide the development of behaviour change strategies.

Methods
160 adults completed the University of Rhode Island Change Assessment (URICA) which targeted the TTM, and the Hearing Beliefs Questionnaire (HBQ) which targeted the HBM. The Hearing Handicap Inventory (HHI) and the Psychosocial Impact of Hearing Loss Scale (PIHLS) within two months of an initial hearing assessment. Six months later, participants completed these same questionnaires, while those who had taken up hearing aids also completed hearing-aid outcome questionnaires, e.g. IOI-HA. The participants had mild to moderate hearing loss, mild to moderate hearing handicap, the majority did not work, had self-referred for a hearing test, and had noticed hearing difficulties for more than five years.

Results
The relationships between the attitudes and beliefs at baseline and hearing behaviour, i.e. hearing aid uptake, at follow-up are presented in Figures 1 and 2 below.
As can be seen from Figure 1, participants who had taken up hearing aids (light bars) had lower TTM 'precontemplation' scores and higher 'contemplation and action scores than participants who had not taken up hearing aids (dark bars). Participants who took up hearing aids within the six-month study period were, at baseline, more ready to change than participants who did not.

A similar pattern of results was seen for the HBQ data, such that individuals who had taken up hearing aids at follow-up had significantly higher perceived severity, benefits and cues to action scores than those who had not taken up hearing aids, which according to the HBM would be associated with more likelihood of behaviour change.

For the relationships between attitudes and beliefs at baseline and hearing-aid outcomes at follow-up, total IOI-HA scores of the 120 individuals who had taken up hearing aids by the six-month follow-up were high indicating good hearing aid outcomes for the group as a whole.

Conclusions
Previous research supports the notion that attitudes and beliefs are predictive of the hearing behaviours of help-seeking and hearing aid uptake. This study lends further support to this in that individuals who took up hearing aids were significantly more ready for change than individuals who did not, and they had more favourable attitudes measured by the HBQ in the form of higher severity, benefits and cues to action scores. In addition, self-efficacy and benefits were significant predictors of whether or not an individual acquired hearing aids.

The interplay between cognitions (attitudes and beliefs, often driven by knowledge and experience) and behaviours is apparent from the data. However, much remains to be understood regarding the nature of this interplay. How behavioural experience shapes attitudes and beliefs and how decisions shape attitudes and beliefs is of interest for the successful rehabilitation of people with hearing impairment.

Because a relationship exists between attitudes and later hearing health behaviours, the authors of this study concluded that a counselling-based intervention targeting the attitudes and beliefs assessed by the TTM and the HBM has the potential to increase uptake of hearing health care. Such an intervention based on the constructs of the TTM and HBM has been developed and its effectiveness is being investigated.

This study has shown that taking up hearing aids results in a positive change in attitude toward hearing and hearing aids. It has confirmed the importance of encouraging people with hearing loss to seek help and to try hearing aids because, as we know, negative expectations about hearing aids prove to be unjustified once an individual actually uses hearing aids. An interesting, well written and very relevant article.