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*Vanderbilt Audiology
Journal Club:
Hearing Aid Research
on Self-Efficacy and
Cognition*

Erin M. Picou, AuD, PhD
&
Todd A. Ricketts, PhD

27 May 2020



continued™

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▪ **Presenter Disclosure:**

Todd Ricketts: Financial: Todd Ricketts is an employee of Vanderbilt University. In lieu of an honorarium, AudiologyOnline has donated to Vanderbilt University's student educational program. He has received research funding on a topic that may be discussed in this course from: GN Resound, Sonova, Signia, Starkey, Oticon, Widex, Persona Medical, Frye Electronics, the Department of Veterans Affairs, the National Institute on Deafness and Other Communication Disorders (NIDCD), National Science Foundation (NSF) and the US National Institute of Disabilities and Rehabilitative Research (NIDRR). He also serves on the Audiology Advisor Board for Earlens. Non-financial: Todd Ricketts serves as Vice Chair of the S3 (Bioacoustics) committee of the American National Standards Institute (ANSI).

Erin Picou: Financial: Erin Picou is employed by Vanderbilt University. In lieu of an honorarium, AudiologyOnline has donated to Vanderbilt University's student educational program. She has received research funding on a topic that may be discussed in this course from: Sonova AG, Oticon, and GN Resound. Non-financial: Erin Picou is an Associate Section Editor for Ear and Hearing and is on the editorial board for the American Journal of Audiology.

- **Content Disclosure:** This learning event does not focus exclusively on any specific product or service.
- **Sponsor Disclosure:** This course is presented by Vanderbilt University in partnership with AudiologyOnline .

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Learner Outcomes

1. List new key journal articles on the topic of hearing aids that have implications for audiology clinical practice
2. Describe the purpose, methods and results of new key journal articles on hearing aids that have implications for audiology practice.
3. Explain some clinical takeaway points from new key journal articles on hearing aids.



Today's Spotlight



- Self-efficacy
- Cognition

The relationship between hearing loss self-management and hearing aid benefit and satisfaction

(2019) *American Journal of Audiology*, 28, 274 – 284

Elizabeth Convery

Gitte Keidser

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Carly Meyer

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What they asked...

- Is there a relationship between self-reported hearing loss self-management and hearing aid benefit and satisfaction – among a group of experienced bilateral hearing aid users?



A little background...

- The ability to self-manage a chronic condition (like hearing loss) is a personal factor that influences a person's experience with that condition
- Self-management is... (Clark et al 1991; Lawn & Battersby 2009)
 - "the knowledge and skills that are used to manage the effects of a chronic condition on all aspects of daily life"
 - Use and management of prescribed interventions
 - Maintaining physical and emotional well-being
 - Monitoring for and responding to changes in condition severity and functional status
 - Seeking out information, resources and support
 - Taking an active role in clinical decision making



A little background...

- Self management in hearing health care is... (Convery et al 2016; Convery et al 2017)
 - Knowing about one's condition
 - Knowing about treatment options and management strategies
 - Managing the social and emotional effects of the condition on everyday life



Why it matters...

- Self-management linked to treatment outcomes
 - Glycemic control and blood pressure (Chodosh et al 2005)
 - Day-to-day demands of chronic condition (Osborne et al 2007)
 - Self-reported health distress (Harvey et al 2008)
 - Greater feelings of empowerment, hopefulness, and motivation (Lawn et al 2007)
 - Better self-reported general health (Harvey et al 2008)

- What about hearing loss, which is a known chronic condition?

What they did...

- Evaluated the relationship between self-management and hearing aid benefit and satisfaction using questionnaires
 - Hearing aid benefit: Abbreviated Profile of Hearing Aid Benefit
 - 24 item questionnaire – ratings of degree of difficulty in everyday listening situations (always to never)
 - Hearing aid satisfaction: Satisfaction with Amplification in Daily Life
 - 15 item questionnaire – ratings of satisfaction from their hearing aids (not at all to tremendously)
 - Self-management: Partners in Health Scale
 - 10 item questionnaire – ratings of how well respondent feels they self-manage across their hearing loss (very little to very well)
 - Self-management: Cue and Response
 - Clinician asks questions related to each of the 10 items and rates the participant's self-management (very little to very well)

What they did...

- Factor analysis revealed 3 domains of self-management



- Knowledge

- Knowing about hearing loss and its effects
- Knowing about appropriate treatment and management



- Actions

- Attending appointments
- Adhering to recommended treatments
- Actively sharing in decision making
- Accessing services
- Monitoring for changes and addressing them



- Psychosocial behaviors

- Managing the effect of hearing loss on emotional well-being and social participation

What they did...

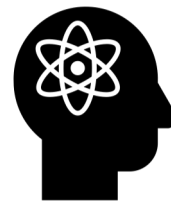
- Participants

- 37 adults (25 men)
- 52 – 83 years old
- Bilateral hearing loss (average PTA4 49 dB, 25 – 65 dB)
- Average 12 years hearing aid experience (BTE)
 - All more than 4 hours per day
 - Most more than 8 hours per day



What they found...

- Self-management: Knowledge
 - Negatively associated with age
 - Older participants demonstrated lower self-management knowledge
 - Not associated with hearing aid benefit or satisfaction



What they found...

- Self-management: Action
 - Positively correlated with satisfaction on the positive effect score (18% of the variance)
 - Higher self-management related to greater satisfaction with the extent to which hearing aids
 - Improve speech understanding
 - Reduce the need for repetition
 - Produce a natural sound quality



What they found...

- Self-management: Psychosocial Well-Being
 - Negatively correlated with benefit (25-26% of variance)
 - Better self-management associated with less self-reported aided listening difficulty in difficult situations marked by
 - Background noise
 - Reverberation
 - Positively correlated with satisfaction (21% of variance)
 - Better self-management associated with greater self-reported satisfaction
 - Appearance
 - Extent to which other perceive them as less capable



What they found...

- "...self-management statistically accounted for 18%–26% of the variance in particular aspects of hearing aid benefit and satisfaction suggests that hearing loss self-management is one of the important components of hearing rehabilitation" (pg 282)

Why is this important...

- People who are able to manage their situations and their coping skills, are more likely to do better in difficult listening situations
- Calls for greater focus of psychosocial aspects of hearing loss in patient-centered care
 - Could lead to better hearing aid satisfaction and benefit
 - Unaddressed psychosocial concerns also affect hearing aid adoption (Ekberg et al 2014)

Does it matter clinically?

- Hearing aid satisfaction rates are generally high (8/10 users are satisfied; Picou 2020)
- Factors that can increase satisfaction
 - Perceived hearing difficulty
 - Newer hearing aids
 - Hearing aid features (directivity, telecoils)
 - Relationship with clinician
 - Good sound quality
 - **Self-management**

continued

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How do hearing aid owners acquire hearing aid management skills?

(2019) *Journal of American Academy of Audiology*, 30, 516 – 532

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continued

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What they asked...

- How do hearing aid owners acquire hearing aid management skills?



continued

A little background...

- Hearing health-care clinicians provide training on hearing aid handling and maintenance as part of aural rehabilitation
- Among a group of elderly participants, 55% of them demonstrated poor to fair hearing aid handling abilities (Ferrari et al 2015)
- Some factors associated with hearing aid handling skills (Upfold et al 1990)
 - ITEs easier to manipulate than BTEs
 - Females more likely to have difficult



A little background...

- Current practice is commonly (Kochkin et al 2010)
 - 45 minutes of training
 - Across an average of 2-5 appointments
 - Over 30-45 days of aural rehabilitation
 - Face-to-face appointments
 - Might be supplemented with written or digital materials



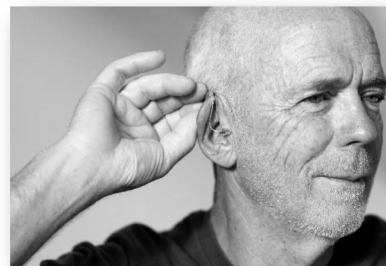
A little background...

- Presumed limitations of this approach
 - Perceived “information dumping” (English 2008)
 - Owners unable to recall 25 – 65% of information after 4 weeks (Reese & Hnath-Chisolm 2005)
 - Clinicians underestimate the amount of information patients want (Laplante-Lévesque et al 2010)
 - Clinicians have limited understanding of health literacy (Nair & Cienkowski, 2010)



Why it matters...

- Hearing aid handling skills are important for hearing aid “success”
- People who have difficulty managing their hearing aids are
 - Less likely to use them (Bertoli et al, 2009)
 - Less likely to benefit from them (Campos et al 2014)
 - Less likely be satisfied with them (Kumar et al 2000)

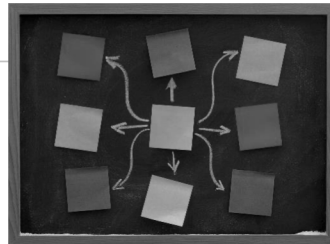


What they did...

- Concept mapping to identify key themes
 - Participants generate, sort, and rate the importance of statements
 - Data analysis determines the number and type of segments
 - “How do hearing aid owners learn the skills required to use, handle, manage, maintain and care for their hearing aids?”
 - Hearing aid owners (n = 24; 56 – 91 years old; face-to-face)
 - Clinicians (n = 22; 32 – 69 years old; on-line sessions)

Q1

What they did...



- Two sessions
 - Brainstorming activity
 - Participants generated statements answering the question
 - Statements were projected and visible to participants
 - They could expand on the statements
 - Clinicians and hearing aid owners could not see each others' statements
 - Grouping & rating
 - Sort statements from brainstorming session into at least 5 related groups
 - Rate the statements
 - Use the mode (1=never to 5=always)
 - How beneficial (1=minimally to 5 =extremely)

What they found...

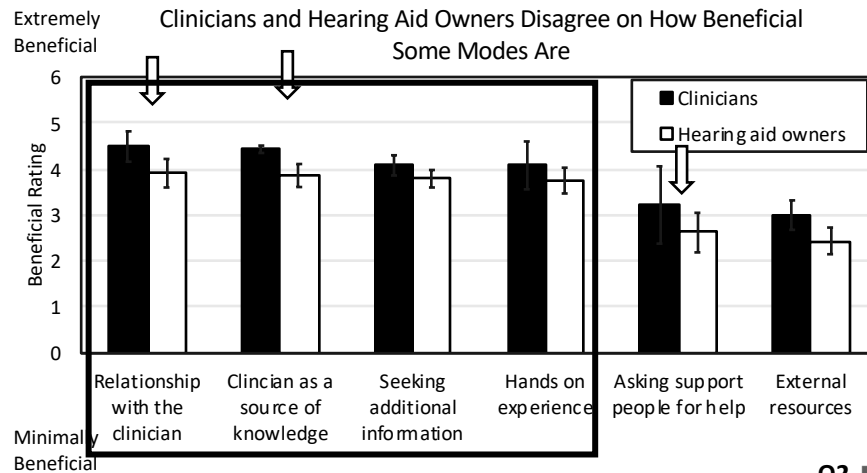
- Six main concepts
 - Relationship with the clinician
 - “with encouragement from the clinician”
 - Clinician as a source of knowledge and support
 - “going back to the clinician with questions”
 - Hands-on experience
 - “making time to practice at home in a relaxed environment”
 - Seeking additional information
 - “asking for printouts of the information”
 - Asking support people for help
 - “asking family members to do it for them”
 - External resources
 - “viewing videos that explain the different skills”

What they found...

- Of the 6 concepts, hearing aid owners and clinicians rated them used similarly often
 - Except “relationship with clinician”
 - Hearing aid owners rated using their relationship less often than clinicians rated using it



What they found...



What they found...

- Modes commonly used but judged not beneficial
 - Trial-and-error techniques
 - Skills are too low?
 - Could improve utility of this by empowering patients
 - Reading pamphlets
 - Readability of pamphlets is (was?) low



Q2

Why is this important...

- The role of the hearing healthcare clinician is critical for providing training, support, and an ongoing professional relationship to help patients acquire hearing aid handling skills
- Family, friends, and other health professionals play lesser roles
 - Consider explicitly training them



Does it matter clinically?

- Clinicians may enhance hearing aid owners' acquisition of skills by further diversifying the methods of skill training used to include
 - (a) use of personalized training programs,
 - (b) opportunity to learn, demonstrate and practice physical techniques during appointments,
 - (c) use of written, pictorial, or digital supplemental materials to support learning, and
 - (d) greater client empowerment throughout the hearing aid fitting process.

Does it matter clinically?

- Authors recommend
 - Increasing use of tactile training methods
 - Patients practice and demonstrate physical tasks
 - Personalize training goals
 - Focus only on specific tasks in the first few weeks
 - Supplement hands-on training
 - Written or digital material
 - Training significant others or care takers
 - Develop strong therapeutic relationship
 - Patience-centered approach to care
 - Unbundled price structures
 - Put a value on services provided

Factors associated with successful setup of a self-fitting hearing and the need for personalized support

2019, *Ear and Hearing*, 40, 794 - 804

Elizabeth Convery

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University of Queensland, Australia

What they asked...

- Are there factors associated with the ability to successfully set up a pair of commercially available self-fitting hearing aids?
- Are there factors associated with the need for knowledgeable, personalized support in performing the self-fitting procedure?
- Possible factors of interest:
 - Cognitive status
 - Locus of control
 - Hearing aid self-efficacy
 - Problem-solving skills



A little background...

- Changes in health care delivery system are coming here
 - Over-the-counter hearing aids
 - Limited service delivery models
 - Global pandemic



A little background...

- Self fitting hearing aid – personal amplification device designed to be set up and managed by the user (Keidser & Convery, 2016)
 - Select, connect and adjust components (e.g., tubing)
 - Complete *in situ* audiometry (e.g., thresholds measured through the hearing aid)
 - Hearing aid applies prescriptive fitting rationale to the measured thresholds
 - User fine-tunes or trains the settings

A little background...

- Factors associated with successful hearing aid use
 - Intact cognitive status (Meyer et al 2014)
 - Higher self-efficacy (Meyer et al 2014; Hickson et al 2014)
 - Internal locus of control (Cox et al 2005)
 - Extent to which individuals believe they can influence events in their lives
- Factors associated with day to day hearing aid management tasks
 - Manual dexterity (Kumar et al 2000)
 - Health literacy (Caposecco et al 2016)

Why it matters...

- Establishing factors that facilitate limited service delivery options can help expand clinical practice
- Understanding who needs help and with what aspects of hearing aid fitting can help provide more involved services for those people
- Help establish individualized hearing healthcare reaching broad spectrum of patients with hearing loss



What they did...

- Measured patient factors
 - Health locus of control – Multidimensional Health Locus of Control
 - Internality, powerful others, chance externality
 - Hearing aid self-efficacy – Measure of Audiologic Rehabilitation Self-Efficacy for Hearing Aids
 - Basic handling, advanced handling, adjustment, aided-related skill
 - Problem solving skills – Twenty Questions subtest of the Delis-Kaplan Executive Function System
 - Series of yes/no questions to figure out what the experimenter has in mind
 - Cognitive status - MoCA
 - Demographic data
 - Hearing thresholds

What they did...

- Asked participants to self-fit the hearing aids
 - Instructions in PowerPoint slide deck
 - 9 step process
 - 1- pair hearing aids to mobile device via Bluetooth
 - 2 – identify the R and L aids
 - 3 – select the correct ear tip size
 - 4 – adjust the length of the tubing
 - 5 – insert the hearing aids into the ear
 - 6 – ensure the fitting app correctly identified the aids
 - 7 – use the app to perform audiometry
 - 8 – adjust the settings
 - 9 – learn how to clean and care for the aids

What they did...

- Support for participants
 - Instructions written at 5.8 grade level
 - Videos of many steps were embedded and captioned
 - Telephone available to all the clinical assistant
 - Assistant monitored the participant's progress through webcam and headphones
 - Yes/no score on “accuracy” and “independence”
- 
 - Successful self fitters
 - Accurately completed all steps independently
 - Sought help from the assistant to complete all steps
- 
 - Unsuccessful self fitters
 - Unresolved error that prevented them from self fitting

What they did...



- Participants
 - 60 adults (50-85 years)
 - PTA4HL between 25 and 65 dB HL
 - 30 participants experienced hearing aid users
 - 1.5 to 37 years experience
 - 30 participants no hearing aid experience
- Hearing aid
 - Sound World Solutions Companion self-fitting hearing aid
 - 16 channel
 - Noise reduction
 - Directional microphone
 - Rechargeable
 - Feedback cancellation

What they found...

- Two-thirds of participants were successful (41/60)
- One-third of participants were unsuccessful (19/60)
- Successful fitters more likely to:
 - Have hearing aid experience
 - Own a mobile device



Q5

What they found...



- Of the successful self-fitters, 63% sought help from the assistant
 - 15 of 60 people self-fit the hearing aids successfully without help from the assistant
 - Locus of control accounted for 11% of the variance
 - Those who needed assistance were more likely than those who were independently successful to have an external locus of control

Q5

What they found...

- No systematic error – no single step lead to more success than any other step
- 1 participant could not do any tasks
- Participants requested help more often when they needed a mobile device (e.g., pairing) than when the step was specific to a hearing aid



Why is this important...

- A large portion of the population might not be independently successful with self-fitting hearing aids
- Limited service delivery models might be better suited for patients who already have hearing aids
- Inexperience with mobile devices might be a barrier to limited service delivery models that require self-fitting



Does it matter clinically?

- Yes
- Might expect success to be somewhat lower in the general population
- Study provides evidence of the necessity of trained support personnel in a limited service delivery model



Does it matter clinically?

- Notes from the assistants (who were not audiologists)
 - The telephone support was challenging
 - Couldn't see the problem
 - Participants couldn't always describe the problem
 - Participants with hearing loss had difficulty hearing
 - Troubleshooting via video teleconferencing might have been easier



The Effect of Hearing Aid Use on Cognition in Older Adults: Can We Delay Decline or Even Improve Cognitive Function?

(2020) Journal of Clinical Medicine, 9(1), 254

Julia Sarant

David Harris

Peter Busby

Paul Maruff

Adrian Schembri

Ulrike Lemke

Stefan Launer

University of Melbourne
CogState
Sonova AG

What they asked...

- Is degree of hearing loss related to degree of cognitive impairment prior to hearing aid use?
- Is hearing aid use over 18 months related to changes in cognition in older adults? Does it affect quality of life?



A little background...

- The prevalence of dementia is predicted to double over the next 30 years (131 million individuals will be affected).
- 2/3 of dementia risk is genetic, but the remaining 1/3 of cases MAY be preventable through modifying risks such as improving education, reduced smoking; and managing hearing loss, diabetes and obesity.

A little background...

- Hearing loss has been identified as one modifiable risk factor for dementia in older adults (those over 60), possibly accounting for up to 9.1% of the modifiable risk.
 - However, hearing loss appears to be most strongly associated with dementia in middle aged adults (45-64 yo).
- However, only a fraction of older adults with hearing loss use hearing aids.
- A meta-analysis suggests those who used hearing aids had better cognition than those who remained untreated.
 - No evidence that this relationship is causal.

A little background...

- Not causal? If increased hearing loss is related to cognitive decline, Why does that not mean increased hearing loss increases the risk for cognitive decline?
- Those with better cognition may be more likely to seek hearing treatment.
- Underlying causality related to aging.
 - Neuropathic changes and microvascular pathology associated with aging increase the risk of both hearing loss and cognitive decline.



continued

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What they did...

- Participants
 - 99 participants; 60 – 84 year old
 - No past history or previous diagnoses of cognitive impairment.
 - 71% percent of participants were retired, and 67% had postgraduate tertiary education.
 - All clients of the University of Melbourne Academic Hearing Aids Clinic.

What they did...

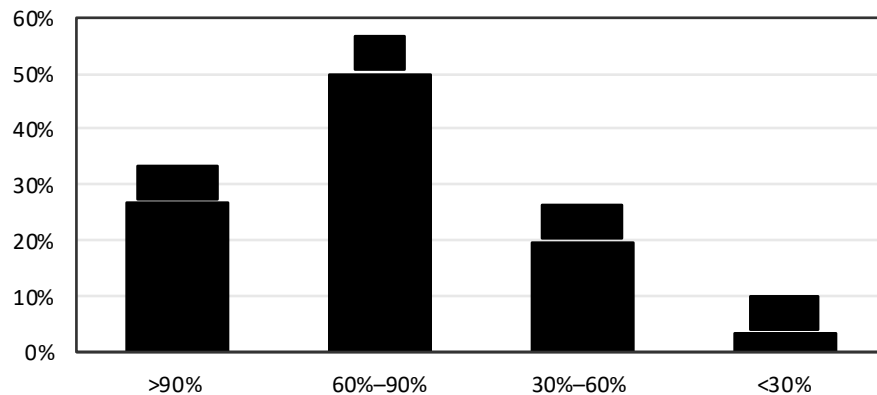
- All participants completed a pre-operative (baseline) assessment battery:
 - Audiometry
 - speech perception testing (Words, BKB-SIN)
 - cognitive testing (MMSE, CogState battery)
 - health, quality of life, lifestyle and ease of listening questionnaires.
- Hearing aids were chosen through a “needs discussion” with participants (NAL-NL2 prescription).
- Thirty-seven assessed 18 months later using an identical assessment battery and also reported hearing aid use.

What they found (Baseline)...

- Increased age, less education and greater hearing loss was significantly correlated with poorer executive function.
 - An additional 10 dB of hearing loss was associated with a decrease of executive function of 7.4% relative to the mean score (controlling for the other explanatory variables including age);
 - An additional 10 years of age was associated with a decrease of executive function of 14.3% relative to the mean score.
 - Having more than 15 years of education was associated with an increase of executive function of 19.8% relative to the mean score.

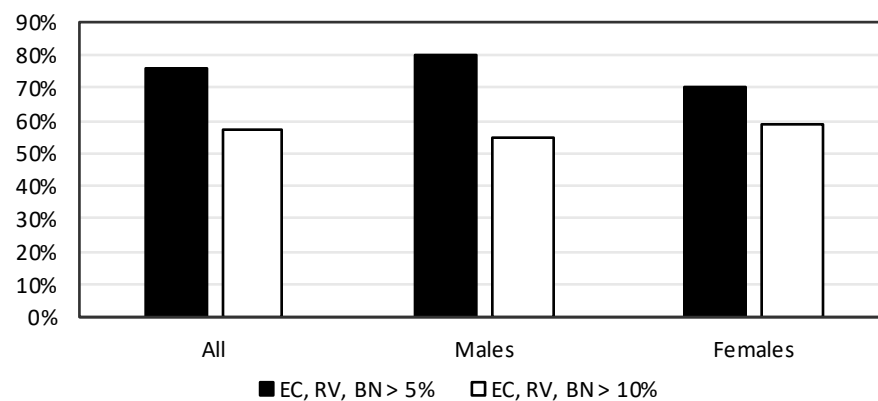
What they found (Follow-up)...

Hearing Aid Use (percent of hours awake)



What they found (Follow-up)...

APHAB Benefits



What they found (Follow-up)...



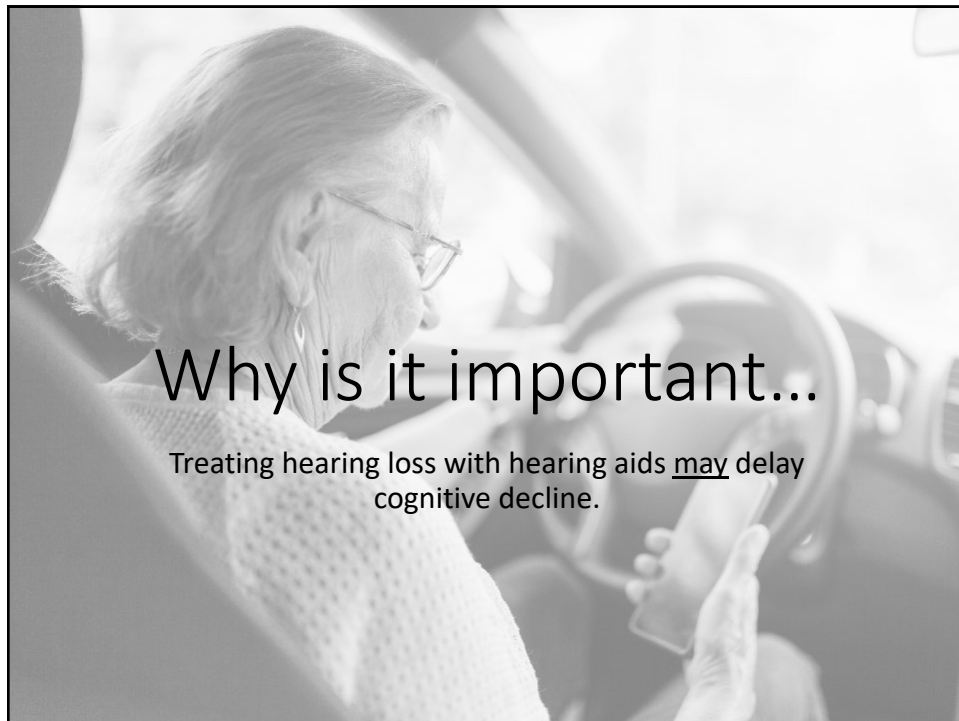
Reliable Change Index: Improved 29.7%, No Change 67.6%, Declined 2.7% (1 Male)

Q8

Hearing Aid Use Helps?

- In this relatively small group of 37 participants a significant improvement was noted in executive function with 18 months of hearing aid use.
 - All but one male showed stable or improved cognitive function (executive function).
- Stable or improved psychomotor function, working memory, visual attention, and visual learning was observed in 73-81% of participants (particularly women).
-

Q7



continued

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Does it matter clinically...

- Yes, but...
 - Small sample size
 - Not definitive evidence that hearing aids actually slow cognitive decline.
 - First evidence that hearing aid use can significantly improve executive function in some older adults (particularly women).

continued

Other Considerations...

- The Sarant et al., study examined the relationship between cognition and hearing aid use in healthy older adults with no history of cognitive decline.
- It will also be very interesting to examine the potential benefits of hearing aids use in individuals with mild cognitive impairment (or greater).
 - Expected benefits related to cognition?
- Are there challenges related to hearing aid use in this population?

Experiences of hearing aid use among patients with mild cognitive impairment and Alzheimer's disease dementia: A qualitative study

(2020) *SAGE Open Medicine*, 8, 2050312120904572

Sarah Gregory

Jo Billings

Danielle Wilson

Gill Livingston

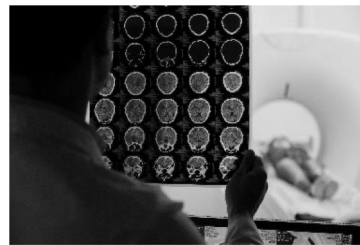
Anne GM Schilder

Sergi G Costafreda

University of Edinburgh
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What they asked...

- Those with dementia are at elevated risk for experiencing reduced quality of life and increased social isolation and depression. Hearing aid use has been shown to improve these factors in older adults with normal cognition.
- What are the barriers to hearing aid use in individuals with mild cognitive impairment?



Q9

A little background...

- Over half of 85-year-olds reported that using their hearing aids made their quality of life either 'quite a lot' or 'very much' better (hearing aid users).
- Hearing loss is more common in people with dementia and has been identified as a risk factor for dementia development.

A little background...

- Perceived hearing handicap, comfort, perceived benefit, costs, and perceived difficulty have previously been identified as barriers to hearing aid use in healthy older adults.
 - However, cognitive ability has been under studied.
- Research has also shown that cognitive decline at the time of hearing aid fitting is associated with hearing aid non-use.

Why it matters...

- Individuals with mild cognitive impairment (and their caregivers) have the potential for multiple benefits associated with hearing aid use (potentially slowing cognitive decline, improved communication, decreased isolation, etc.); however, they are more likely to not use hearing aids than those with normal cognition.
- Identifying (and eliminating) potential barriers may help increase hearing aid use in individuals with MCI.

What they did...

- Participants
 - 10 adults (6 men, 4 women; 75-86 yo), with mild cognitive impairment (2) or mild Alzheimer's disease (8)
 - MMSE > 21
 - Recruited from four memory clinics within one mental health system (UK).
- Research design
 - Qualitative Design: Semi-structured interviews exploring hearing aid experiences and attitudes.

What they did...

- Participants were interviewed either in the research facility or in their own home
- Family members were sometimes present but did not contribute.
- A semi-structured interview guide was developed and used that included questions about the participants' experiences with hearing loss, how participants used hearing aids, what helped and what hindered participants from using their hearing aids.


What they found (Themes)...

- Theme #1: There are memory and cognitive barriers to using hearing aids.
 - Misplacing hearing aids, forgetting to use them, etc.
- Theme #2: There are device use barriers
 - Need help with use/insertion/batteries, too loud in some situations, interfere with glasses

Q10 

What they found (Themes)...

- Theme #3: Hearing aids provide benefits
 - “There a help, at least in some places”
- Theme #4: There are barriers related to ambivalence and stigma.
 - I am not sure they really help that much.
 - People will view me as disabled and there is not as much support (in the general population) for hearing loss as (for example) blindness.

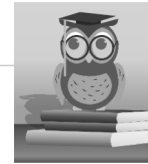
Q10 

Conclusions...

- Many of the barriers associated with hearing aid non-use in those with normal cognition, were also identified in this study; however, participants in this study clearly viewed memory loss and cognitive impairment as detrimental to hearing aid use.
- Some talked about how they overcame their memory-related difficulties including: reinforcing device benefits, continued perseverance, and the importance of family support.

Does it matter clinically...

- Understanding the additional challenges to hearing aid use faced by those with MCI is important relative to device counselling of both these patients and their caregivers.
 - i.e. Highlighting the potential for benefits and the importance of caregiver support.



Summary and Conclusions

- Convery et al (2019) evaluated the relationship between self-management and hearing aid benefit and satisfaction using questionnaires
 - Those with higher self-management reported more hearing aid benefit / satisfaction
 - Particularly strong relationship between psychosocial self-management and speech understanding in noise and reverberation
- Bennet et al (2019) evaluated how hearing aid users acquire hearing aid handling skills using concept mapping and brainstorming
 - Clinicians generally perceive strategies as more useful than do hearing aid owners
 - Least useful strategies were supplemental materials and outside sources (both of which could be improved through advancements in clinical practice)

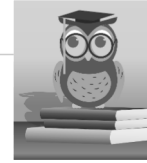
Q1, Q2, Q3, Q4



Summary and Conclusions

- Convery et al (2019) evaluated participants' ability to self-fit a hearing aid using a mobile device
 - Only 2/3 of participants could successfully self-fit and those who did were more likely to be existing hearing aid users and mobile phone owners
- Sarant et al (2020) evaluated the relationship between hearing loss, hearing aid use and cognition.
 - More hearing loss is associated with decreased cognition.
 - Out of the 37 older adults who used hearing aids for 18 months, all but one male showed stable or improved executive function. Clinically significant improvement in working memory were also found, but only in women.

**Q5,
Q8**



Summary and Conclusions

- Gregory et al (2019) examined the hearing aid experience and potential barriers to hearing aid use in those with mild cognitive impairment and mild Alzheimer's disease.
 - While many of the barriers to hearing aid use in the general population also exist for this population, there are additional barriers related specifically to memory and cognition.
 - Support from caregivers is likely even more important for hearing aid success in this population.

How can these learnings translate in the COVID-19 era?

