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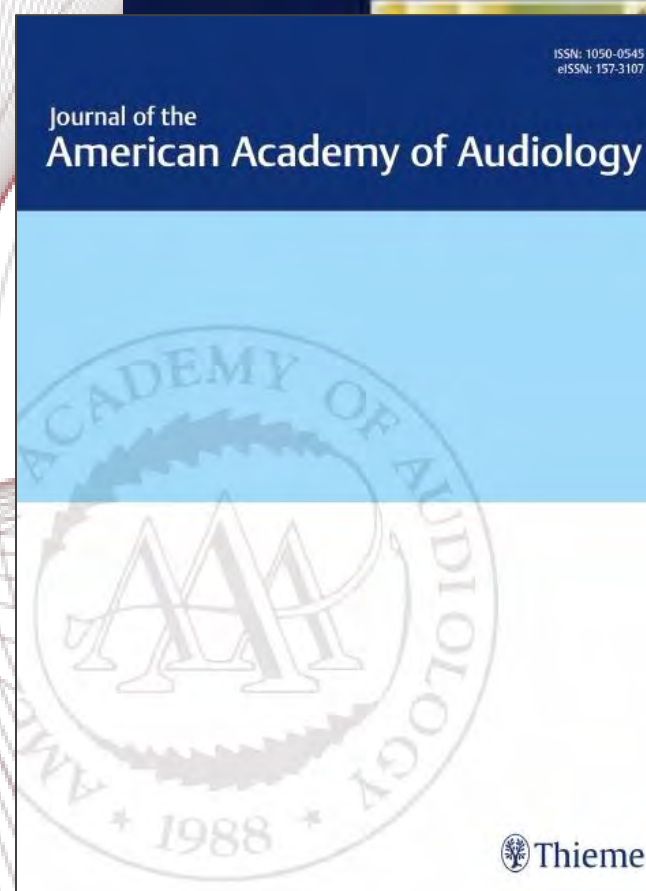
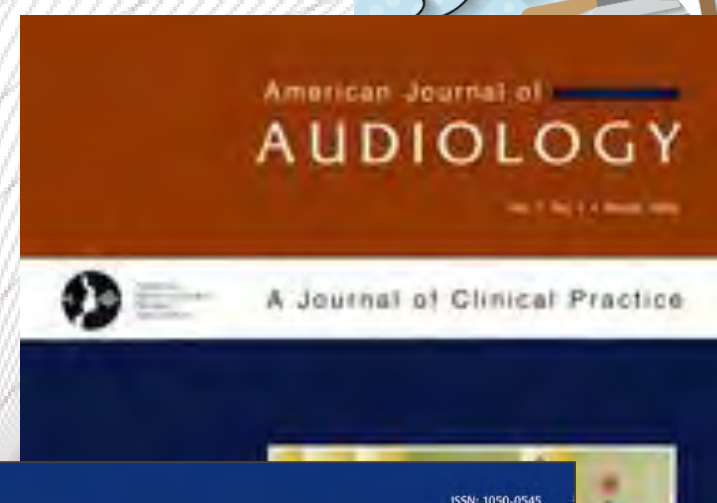
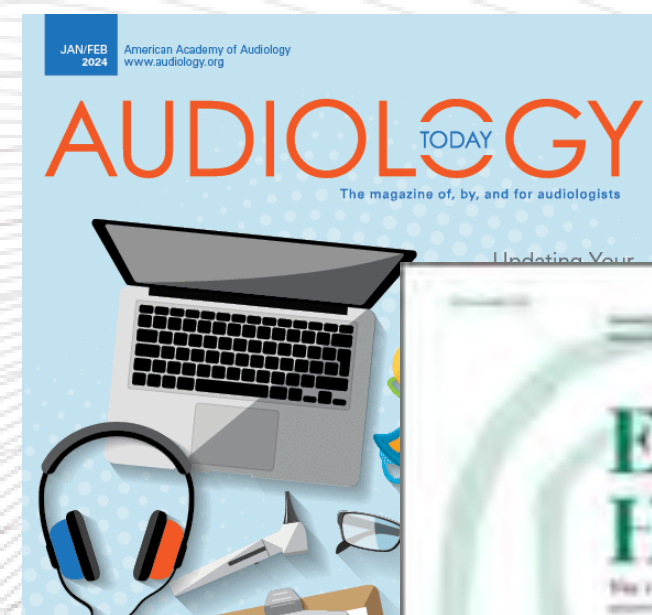
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RESEARCH QUICKTAKES

Volume 8: Hearing Aid Fitting Toolbox v2— Non-audiologic considerations in the selection and fitting of hearing aids

Brian Taylor & Gus Mueller



*“So much to read,
so little time”*



RESEARCH QUICKTAKES

Volume 8.1: Hearing loss prevalence and hearing aid adoption

Brian Taylor & Gus Mueller





Recent research from Larry Humes:

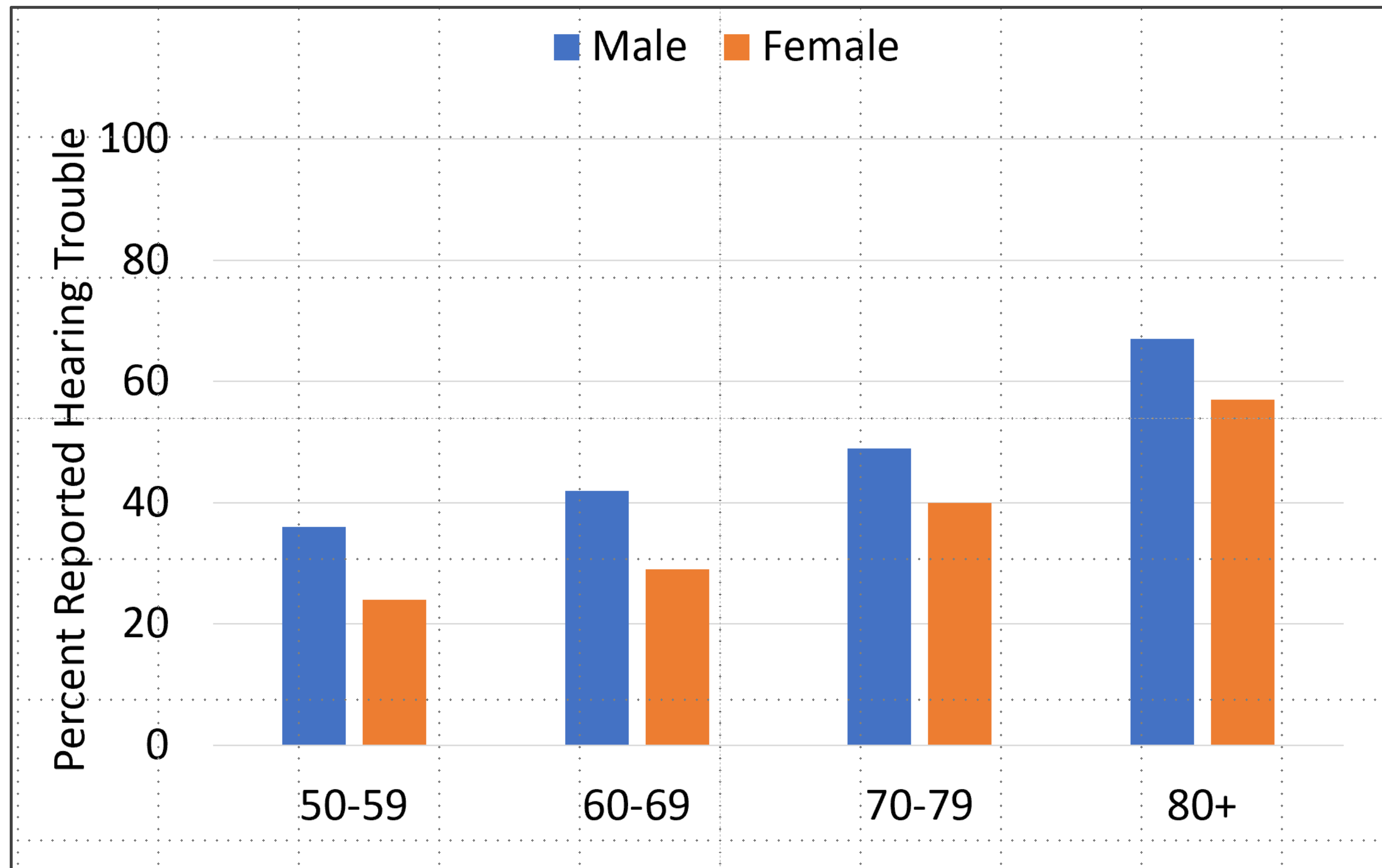
- Periodically, the National Health and Nutrition Examination Survey (NHANES) compiles data on audiometric hearing loss, self-reported trouble hearing, and the use of hearing aids.
- Recently, audiologist Larry Humes reported on the findings for the three most recent surveys (2011-12, 2015-16, and 2017-20).
- The data (n=8,795 with complete audiograms) were for adults ranging in age from 20 to 80-plus years.



Recent research from Larry Humes:

- Hearing-related questions on the survey concerned “the frequency of difficulty following conversation in noise” and “how frequently hearing caused frustration when talking.”
- An analysis of the responses to these questions, combined with the answer to the question “Would you say that your hearing is: excellent, good, that you have a little trouble, moderate trouble, a lot of trouble, or are deaf?” resulted in forming the subgroup of those respondents who have trouble hearing.

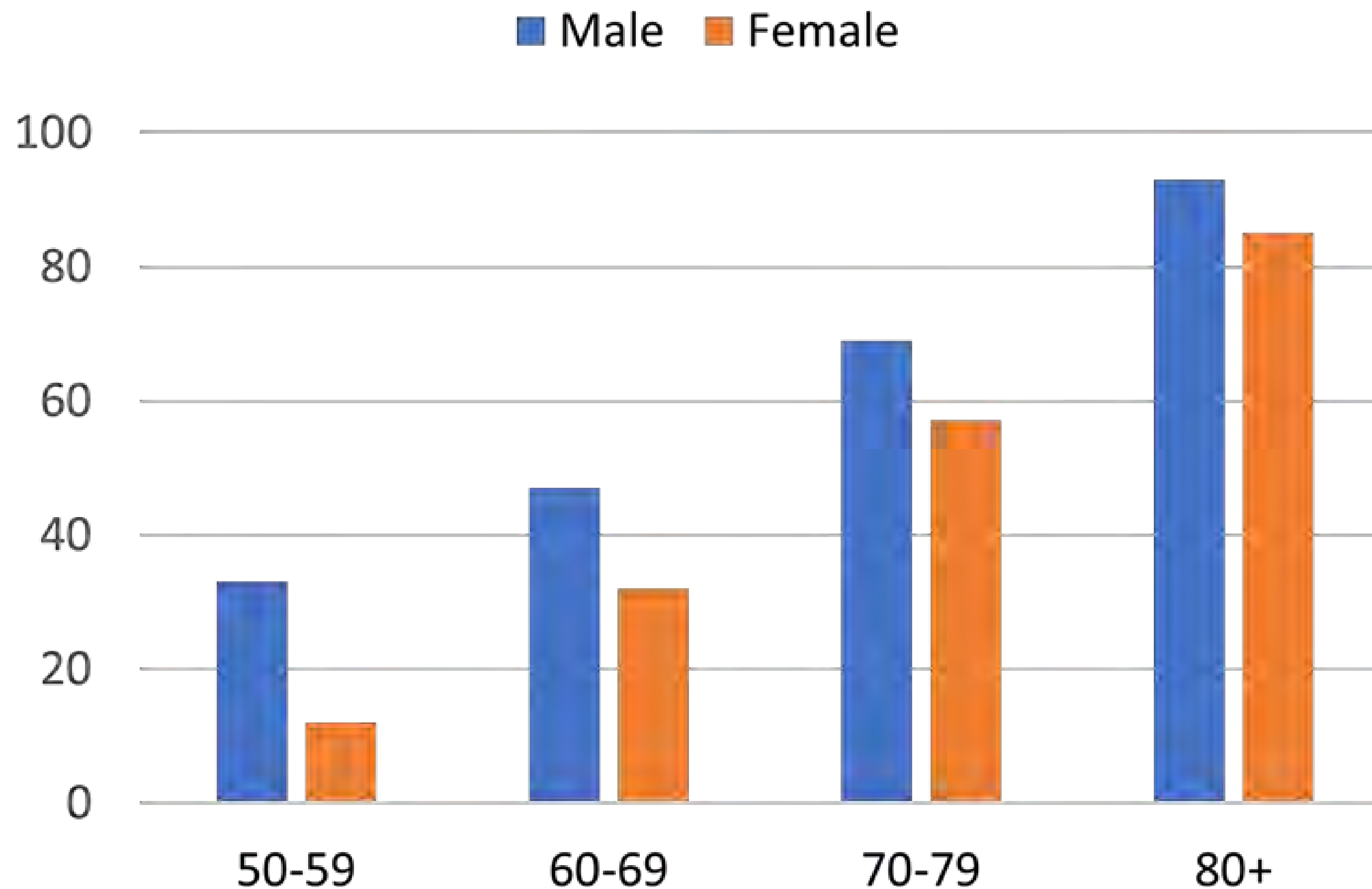
“Reported” hearing problems



Percent of male and female respondents reporting “trouble hearing.”

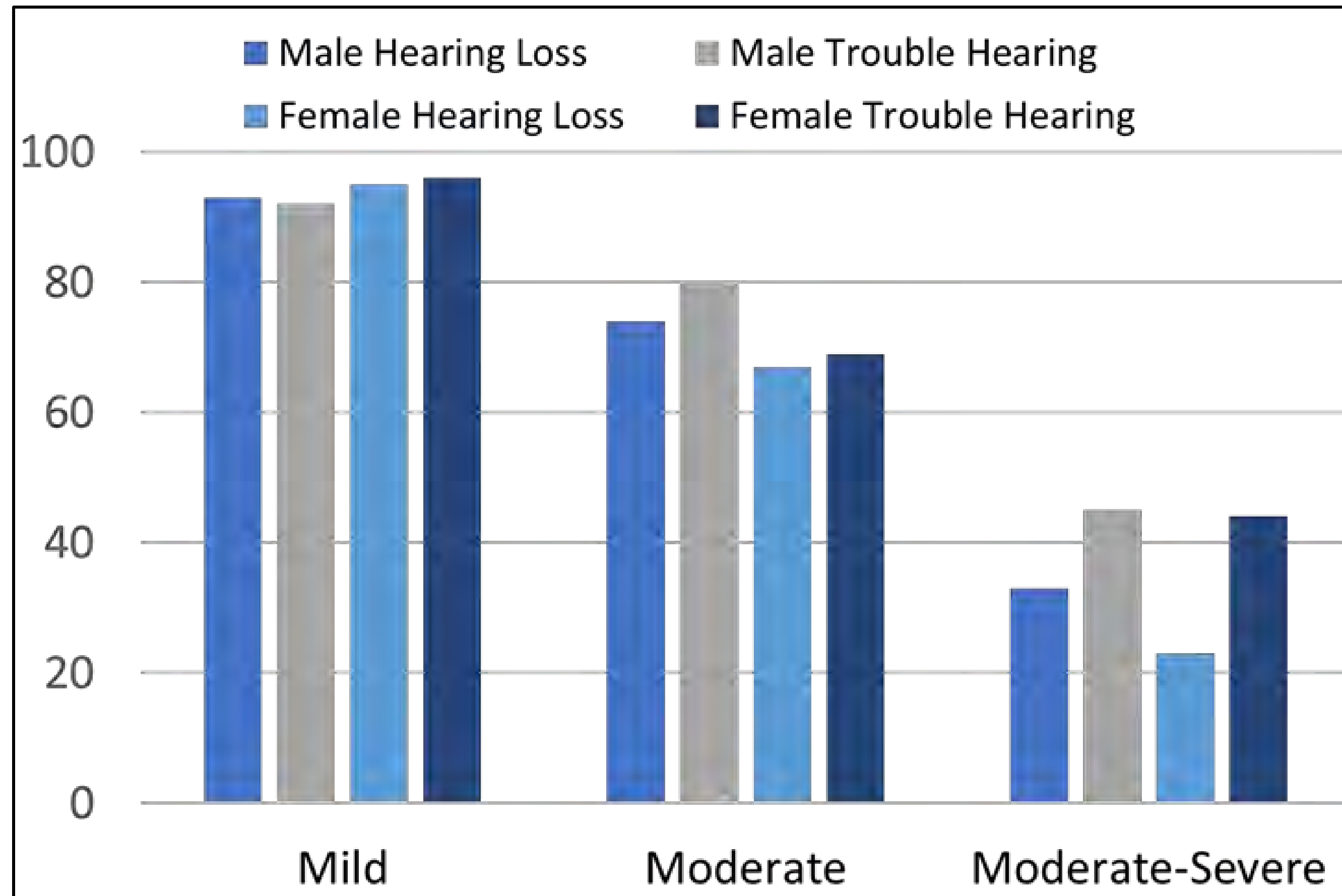
Overall, ~26% of males and ~20% of females, aged 20 to 80+ years, had self-reported trouble hearing.

"Measured" hearing problems



The definition of audiometric "impaired hearing" was a PTA (500, 1000, 2000 and 4000 Hz) in the better ear $\geq$ 20 dB.

Percent of “unmet hearing care needs”



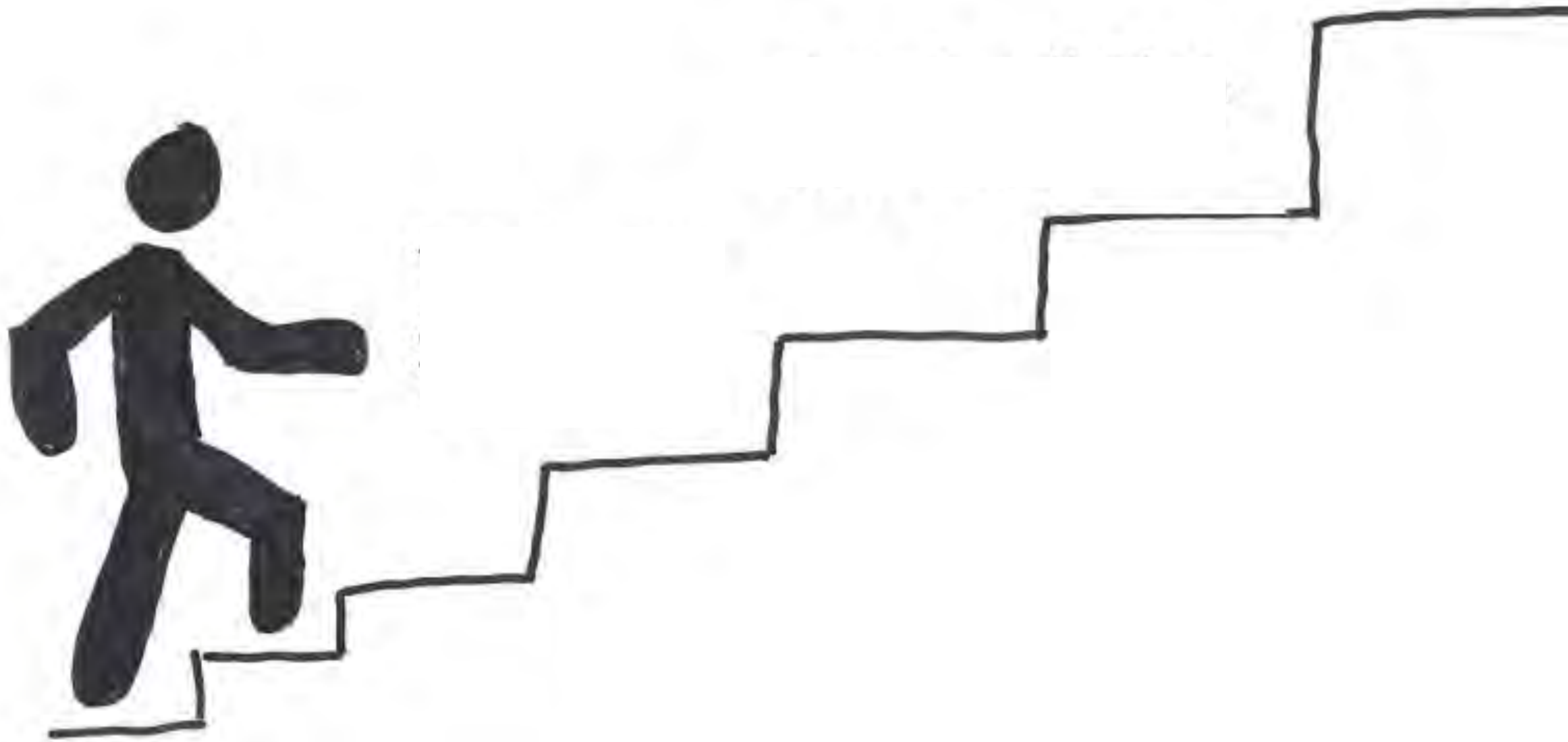
Determined by:

- Those who are using hearing aids
- Overall report of hearing trouble, or
- The presence of an audiometric PTA $\geq$ 20 dB in best ear.

Humes (2023) estimate of “unmet hearing care needs” in the U.S. (based on U.S. population of 234.2 million for those aged 20 to 80)

- Using the audiogram findings: about 21 million males and 17 million females (total 38 million).
- Based on the respondents report of trouble hearing: about 23 million males and 19 million females (total 42 million).

Candidacy to hearing aid adoption . . .



A review of the work of Simpson et al (2019)

- These authors defined hearing aids candidacy as an SRT ≥ 30 dB HL in at least one ear, or thresholds at 3000 and 4000 Hz ≥ 40 dB HL in either ear.
- This resulted in a total sample of 732, with two comparison groups of hearing aid candidates: those who never adopted hearing aids ($n = 514$) and those who adopted hearing aids while they were in the study ($n = 218$).
- Individuals who adopted hearing aids during the study were classified as “successful” or “unsuccessful” users, based on self-report.
- Demographic information was collected for: age, chronic health, race, retired, education, socioeconomic status and marital status.
- In addition to the pure-tone audiometry and SRT conducted to determine candidacy, participants received monosyllabic word testing in quiet (NU-6), speech-in-noise testing (SPIN) and also completed the HHIE/A.

A review of the work of Simpson et al (2019)

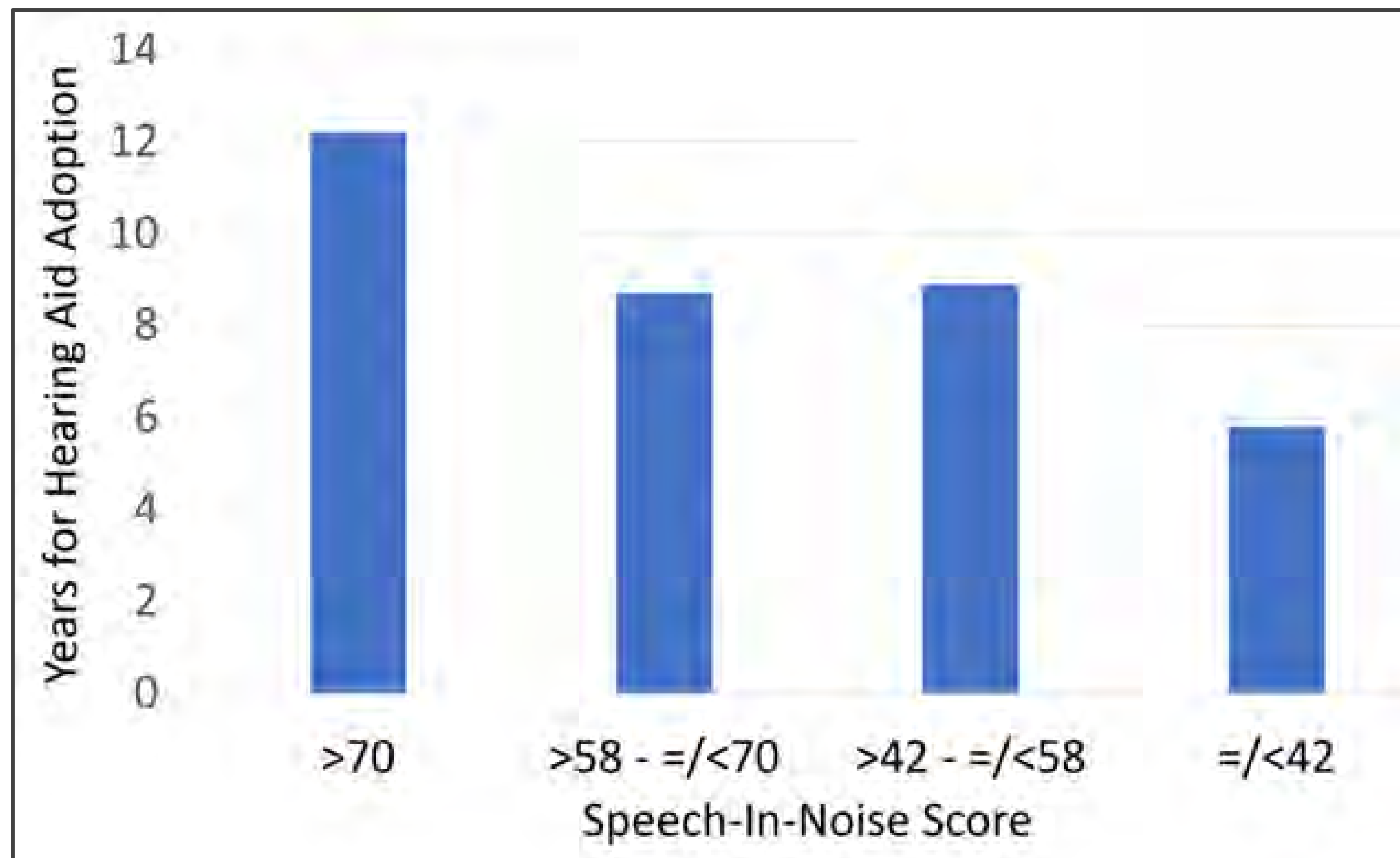
Unadjusted estimation of time from hearing aid candidacy to adoption for the full participant cohort (N = 732) was 8.9 years. In stratified analysis of time to hearing aid adoption the following was observed:

- A trend toward earlier adoption as age categories increased, with individuals aged 65 or younger averaging 9.2 years to adoption and those older than 76 years averaging 6.6 years to adoption.
- Females averaged 8.7 years to adoption compared with 9.0 years for males.
- Individuals in the low socioeconomic status (SES) category averaged 10.7 years to adoption compared with 8.7 years in the middle and 8.3 years in the high SES categories.
- Statistical significance for race was observed. Nonwhite participants took an average of 15.2 years to adopt hearing aids compared with 8.6 years for white participants.

A review of the work of Simpson et al (2019)

Regarding the audiologic measures:

- As low-frequency PTA increased from ≤ 10 dB HL to > 30 dB HL, the average time to hearing aid adoption decreased from 11.2 to **4.3 years**.
- For the high-frequency PTA, when the average was ≤ 45 dB HL, the estimated time to hearing aid adoption was 11.5 years, however, for those with PTAs > 65 dB HL, estimated time to adoption was **5.9 years**.
- For the HHIE/A, relatively small differences in scores had a surprisingly significant effect on adoption time; the 25-item version was used, and scores therefore could vary between 0 (best) and 100 (worse). When scores were ≤ 10 , estimated adoption time was 11.1 years. When HHIE/A scores were > 16 , adoption time dropped to **4.3 years**.
- Speech-in-noise testing revealed what might be predicted—those participants with poorer word recognition had less time in adopting hearing aid use. Adoption time went from 12.2 years for those with scores over 70%, down to **5.8 years** for those with score $\leq 42\%$.



The scores shown are for the keyword recognition for the low-context sentences of the Speech In Noise Test (SPIN).

The SPIN sentences were presented at 50 dB SL relative to the participant's calculated babble threshold.

Babble presented at a +8 dB signal-to-noise ratio.

MarkeTrak10 data on adoption (Jorgensen and Novak, 2020)

- Median age of hearing aid owners was 71 years.
- Survey found that from the time that the individual first noticed a hearing problem to the time that they were tested was 4.2 years.
- The first set of hearing aids was purchased at 6.2 years. In other words, after seeing an HCP (testing), on average, hearing aids were purchased within 2 years—a total of 6.2 years.

This time course is shorter than Simpson et al data, BUT . . .

- This was an “older” group.
- They probably had more hearing loss than the Simpson et al group
- These data based on memory (unlike Simpson et al data)
- Some respondents may not have wanted to admit how long they waited!

MarkeTrak10 data on adoption (Jorgensen and Novak, 2020)

Some findings which impacted adoption:

- Men are more likely to have self-perceived hearing loss—12.8 of total sample vs. 8.9% for women. When comparing the rate of hearing aid adoption, the rate was 34% for both groups.
- Both ENT and general physicians recommended only 12% of people self-identified as having hearing problems consider pursuing hearing aids. In contrast, those who reported that the first person they sought information from was an HCP, 52% had confirmed hearing loss, and 41% reported that hearing aids were recommended.
- When asked why they made the appointment to seek help with their hearing, 52% of hearing aid owners stated it was because of a recommendation from a friend, whereas only 27% of non-owners gave this reason. On the other hand, 53% of non-owners stated it was because of the recommendation of a spouse/partner; only 25% of owners gave this reason.



- The unmet hearing care needs are large, especially for those with mild-moderate hearing loss.
- The journey from candidacy to hearing aid adoption is very slow— BUT, data shows that audiologic testing may speed the process.
- The entry point into hearing healthcare service has a large impact on the hearing aid adoption time course.



RESEARCH QUICKTAKES

Volume 8.1: Hearing loss prevalence and hearing aid adoption

Brian Taylor & Gus Mueller





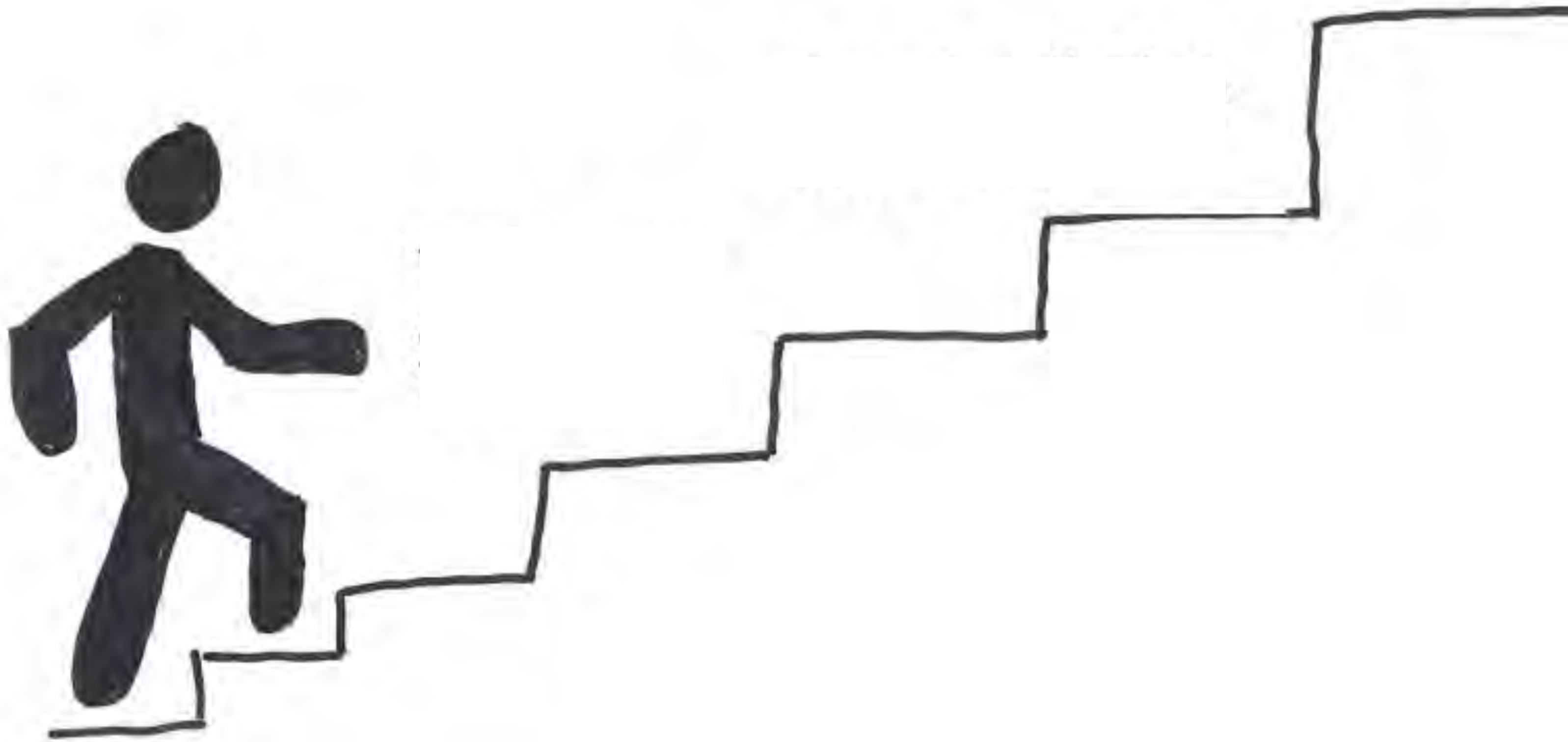
RESEARCH QUICKTAKES

Volume 8.2: Theories and models related
to the patient journey

Brian Taylor & Gus Mueller



Candidacy to hearing aid adoption—important to consider “stages of change models.”



KÜBLER-ROSS GRIEF CYCLE

● **DENIAL**
avoidance,
confusion, elation,
shock, fear

● **ANGER**
frustration,
irritation,
anxiety

● **BARGAINING**
struggling to find
meaning, reaching
out to others, telling
one's story

● **DEPRESSION**
overwhelmed,
helplessness,
hostility, flight

● **ACCEPTANCE**
exploring options,
new plan in place,
moving on

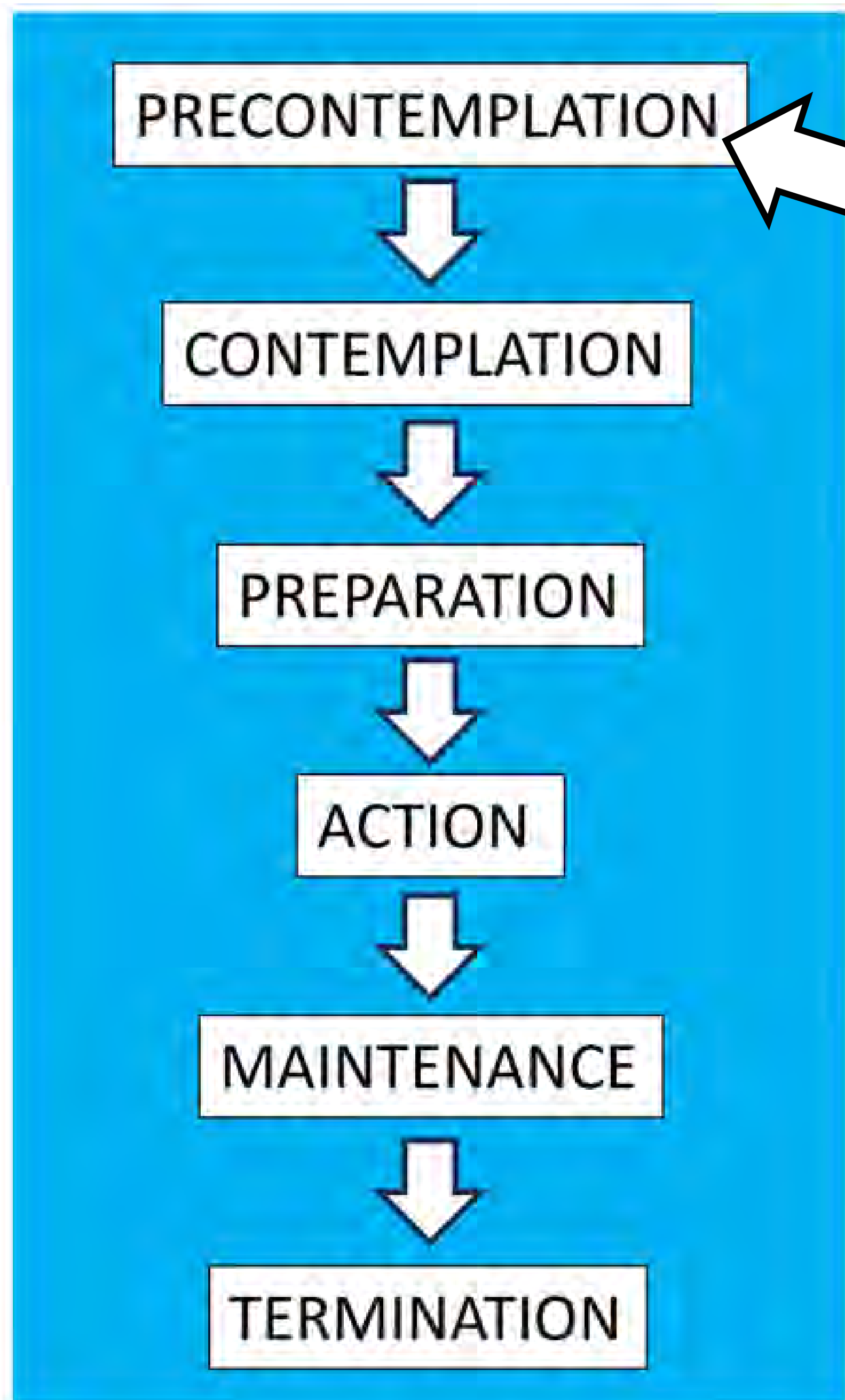
@gvcounseling



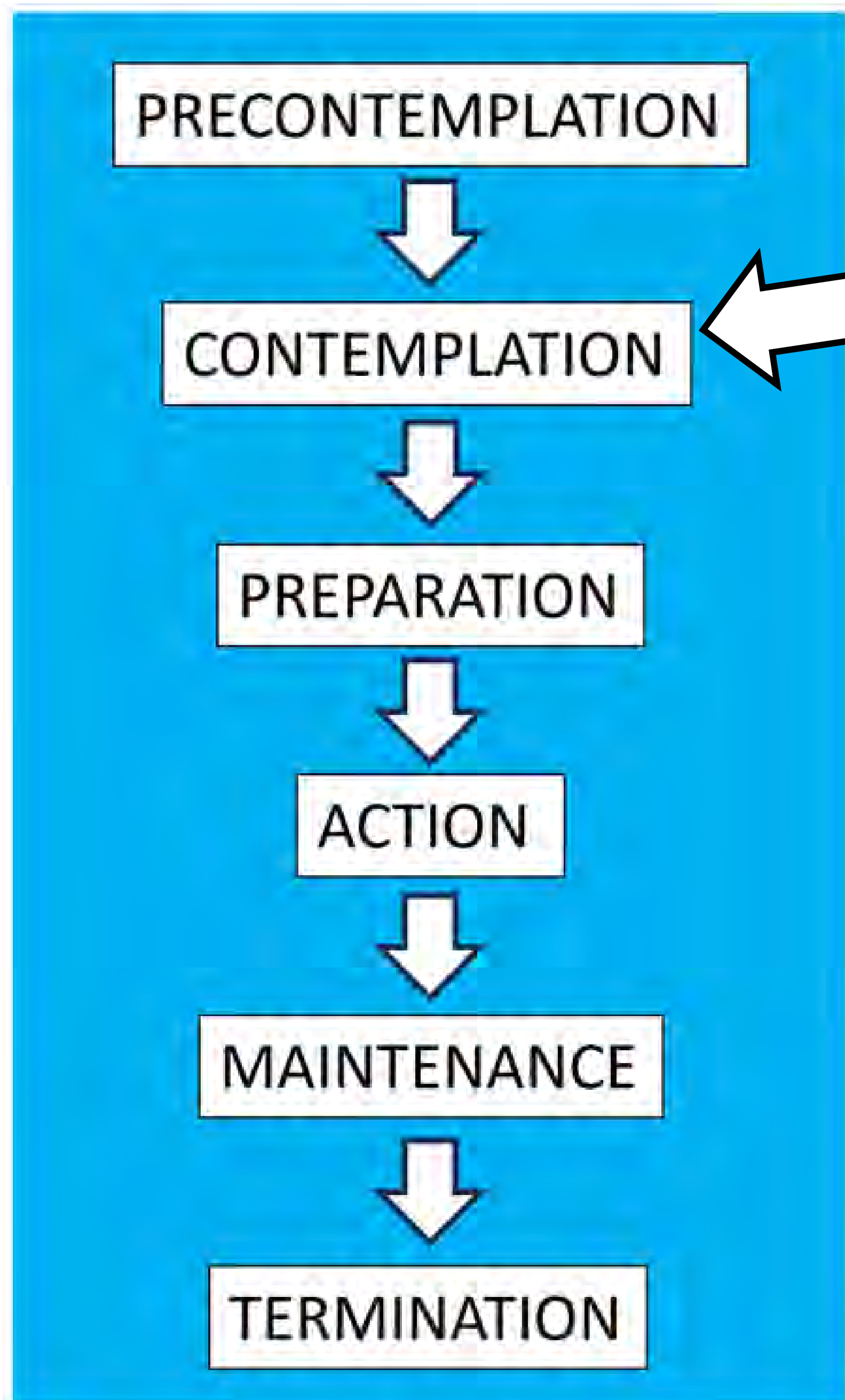
Audiology

Health Behavior: Most common is the Transtheoretical Stages of Change Model (TTM).

- Goes back at least 40 years, to the 1980s work of Prochaska & DiClemente (1983).
- Evolved through studies examining the experiences of smokers who quit on their own, compared to those requiring further treatment.
- TTM focuses on the decision-making of the individual and is a model of intentional change. It operates on the assumption that people do not change behaviors quickly and decisively.
- Has been used for numerous applications ranging from stress management, medication compliance, exercise participation, weight control, and even preventative measures, such as medical screening tests.



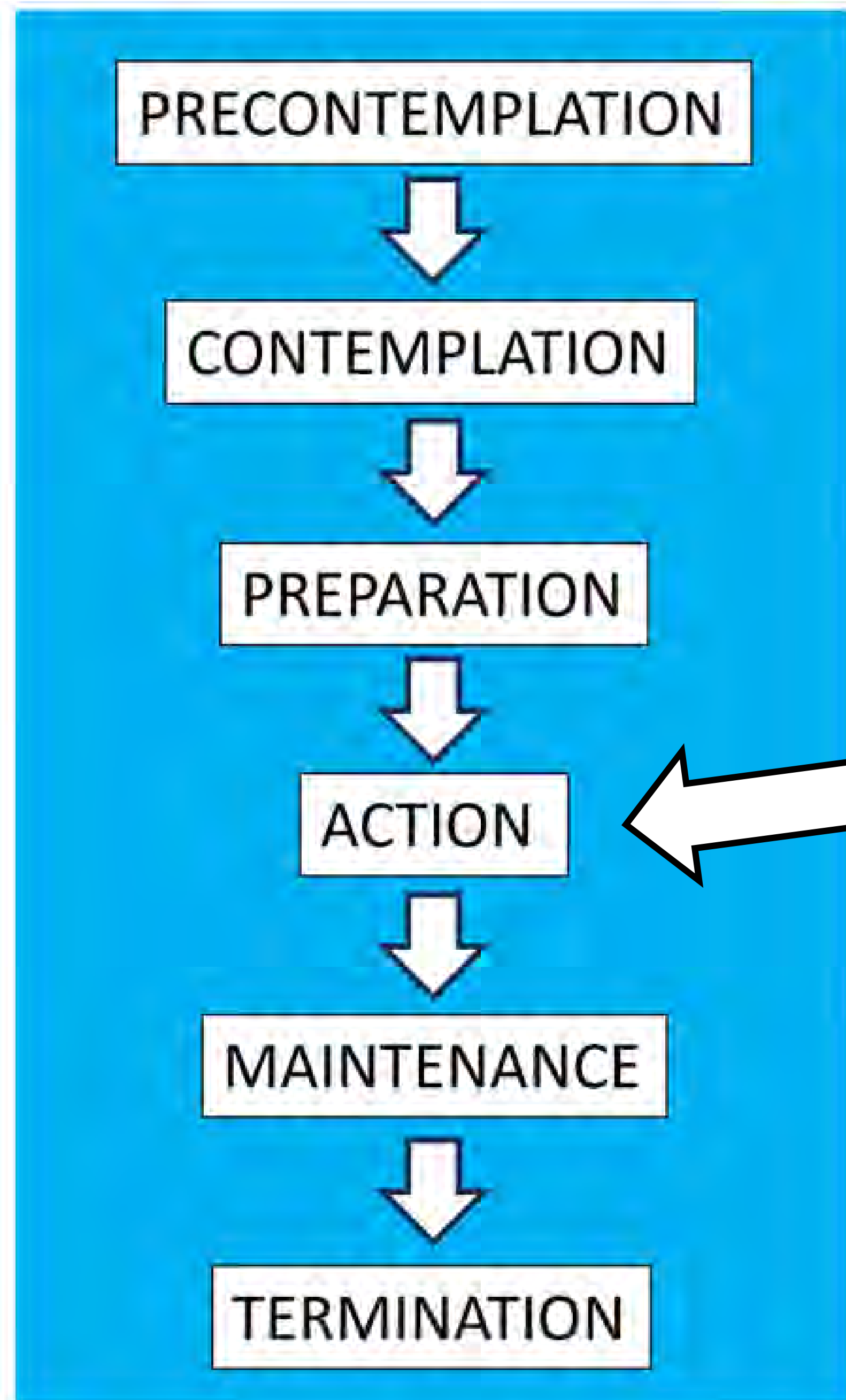
- These people might be aware that they have a hearing problem, but usually are in denial, or lack awareness that hearing loss is affecting their communication ability.
- Individuals in the contemplation stage of change often say things during an appointment like, "Other people mumble." Or "I hear what I need to hear."
- They are quick to point out the negatives (true or not) of using hearing aids.



- Might start to admit to close friends and family members that the reason they are missing parts of conversations is because of their hearing loss. BUT . . . Many are more than happy to put the onus on others.
- They may even start to take some limited action to assist with their hearing, such as positioning themselves better for conversations, asking people to repeat when they miss something, using captioning while watching TV, etc.
- They are uncertain, however, if any treatment (obtaining hearing aids) is needed.



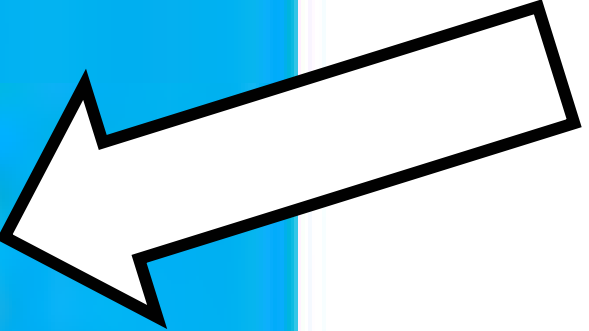
- Person acknowledges that a behavior is problematic, and is more or less ready to make a commitment to solve the problem.
- More “tuned-in” to hearing aids and hearing aid use; paying more attention to television ads and conducting Google searches.
- Start having conversations with friends and colleagues who are using hearing aids, or have tried hearing aids.
- Ask a lot of questions about hearing tests and hearing aids.

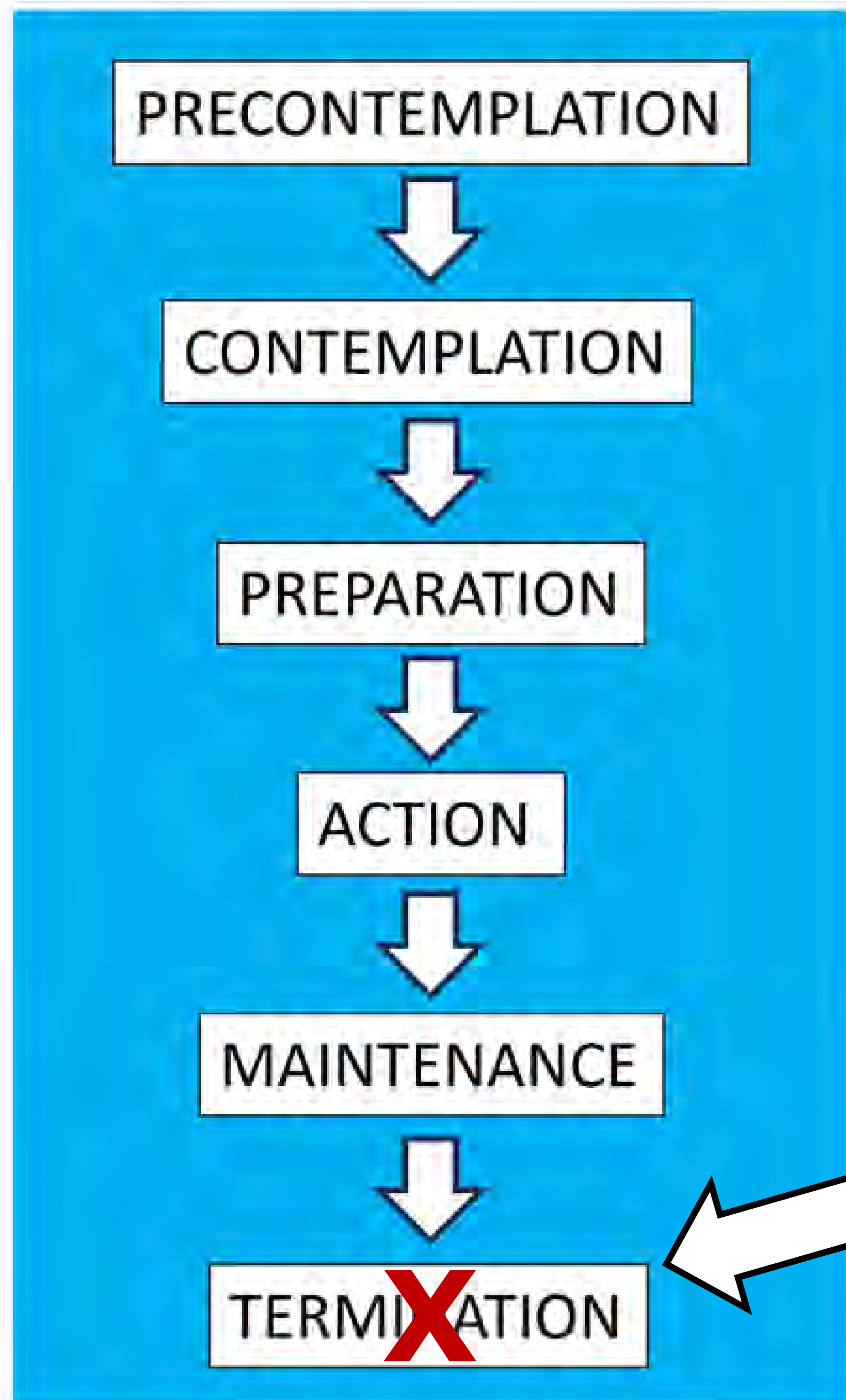


- People gain confidence in their decision and are willing to receive assistance and support.
- People who are truly in the action stage readily follow the recommendations and guidance of the hearing care professional.
- Importantly, in this stage, change is not only the action, itself, but all the prerequisite work required to act on changing the behavior.
- Prematurely jumping to this stage, without adequately preparing can lead to difficulty



In a later section of this Volume, we'll talk about the AIMER program, which can be used to assist in this stage of hearing aid adoption.

- 
- As people progress through this stage, the more confident they become that obtaining the treatment was a wise decision. They have a new status quo.
 - The HCP follows up with counseling, problem solving, programming changes are made if necessary, and re-instruction of patient-controlled features.
 - Patient completes self-assessment inventory to assess if fitting goals have been met.
 - Future return visits scheduled periodically and communication is maintained through teleaudiology.
- 



- This stage doesn't apply to hearing aid adoption, as our patients stay in "maintenance" for the life of the hearing aids.

Some modifications of the TTM have used the term “relapse” for the sixth stage.

While we don't usually use the term “relapse” with our hearing aid patients, did you know:

- Dillon et al (2020), conducted an extensive survey of hearing aid owners in the UK and determined that 20% of the respondents did not use their hearing aids at all, and another 30% of respondents reported that they used them sporadically.
- Hearing aid manufacturer data from the US and Europe show similar trends with 20 to 40% of hearing aid owners reporting that they use their hearing aids four hours/day or less (EHIMA, 2018-2022)
- In the US, where direct-to-consumer (DTC) products have been available for several decades, these “non-use” numbers are harder to track. Some estimate that of those who make the decision to purchase hearing aids, 30% or more do not use them.

Our best guess is that many of these are patients who skipped the planning stage, and maybe even the contemplation stage, and went directly to action—perhaps because of pressure from family members.

Moving on to the “Health Belief Model”

- The HBM is one of the oldest models, and has been applied to a very broad range of health behaviors and populations.
- The model is based on six constructs that influence the likelihood that people will take action to prevent, screen for, or control health conditions.

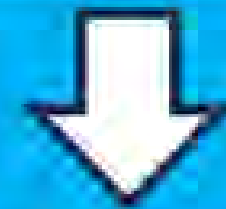
The general premise of the model is:

People are more inclined to change behavior when they believe that doing so might reduce a threat that is probable, and that would have severe consequences if it occurred.

Perceived Susceptibility



Perceived Severity



Perceived Benefits



Perceived Barriers



Perceived Self-Efficacy

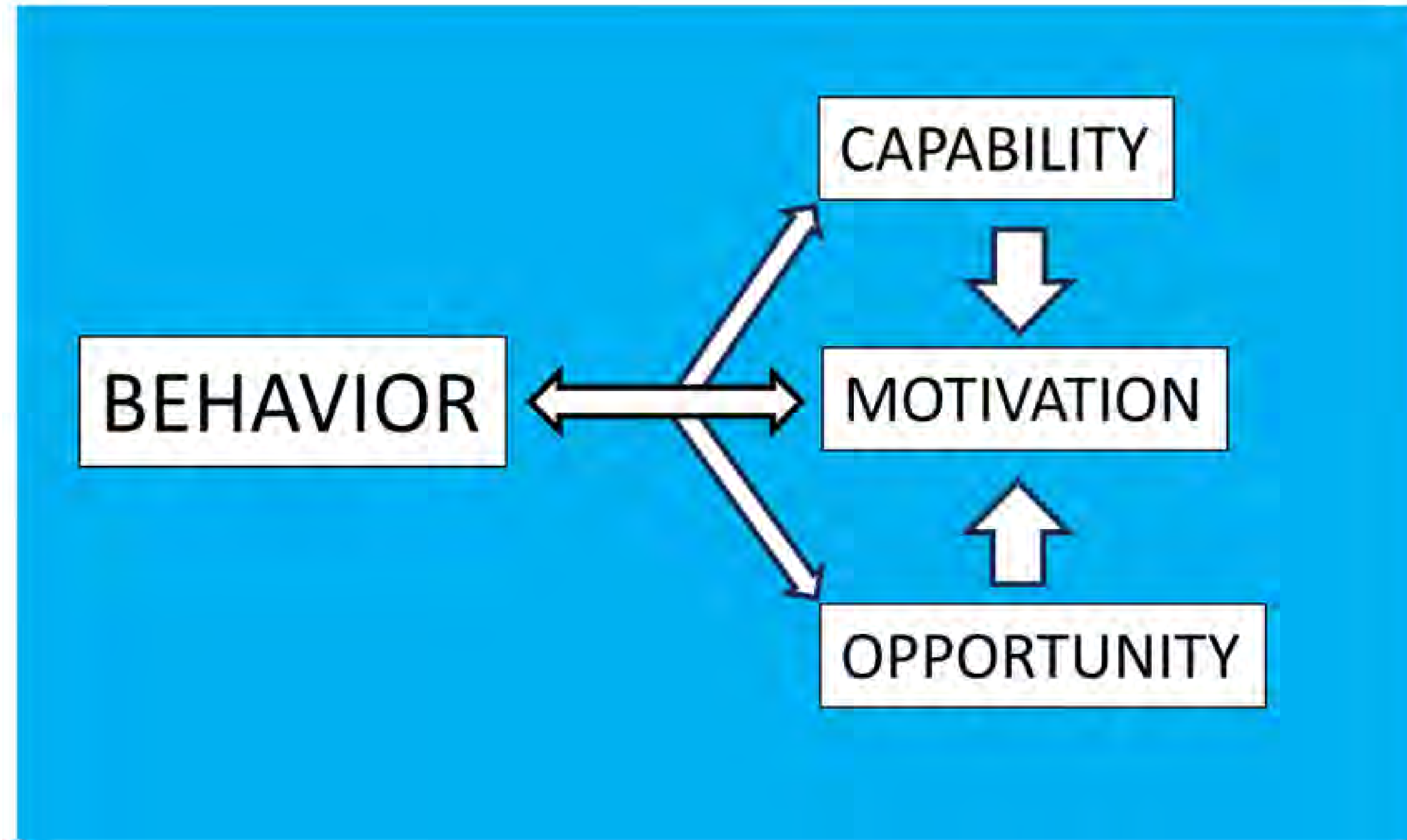


Cues To Action

Saunders et al (2016) review the six constructs of the HBM:

- Perceived susceptibility: feeling of being vulnerable to a condition and/or the belief of being at risk of acquiring the condition.
- Perceived severity: Belief in the seriousness of the health and social consequences incurred if affected by the condition.
- Perceived benefits: Belief that an intervention will result in positive benefits.
- Perceived barriers: Barriers believed to be needed to be overcome to effectively conduct an intervention.
- Perceived self-efficacy: Belief in one's ability to use and gain benefit from an intervention.
- Cues to action: Prompts to take action, which could be internal, such as symptoms of a health problem, or external such as communication from healthcare providers, other people, or media.

And yes, yet another model . . . The COM-B



Components of the COM-B

- **Capability.** Refers to an individual's psychological and physical ability to make a change, or to participate in an activity. Relating to a delay in hearing aid adoption, this could be related denial or minimizing hearing problems, a perceived stigma regarding the use of hearing aids, or the belief that hearing aids are not helpful.
- **Opportunity.** Refers to external factors that make a behavior possible. Factors could be things like social environments, an improved financial situation, or effective marketing regarding the cost of hearing aids.
- **Motivation.** The conscious and unconscious cognitive processes that direct and inspire behavior. Often, the decision to obtain hearing aids is related to positive reports from friends and family who are hearing aid users, or a significant event where the hearing loss caused more problems than usual.



Some final thoughts, based partly on the literature review of Manchaiah et al. (2018):

- There are positive associations between stages of change and help-seeking, intervention uptake, and hearing rehabilitation outcome, such as benefit and satisfaction.
- Understanding the readiness toward help-seeking and uptake of intervention in people with hearing loss based on stages of change may help clinicians develop more focused management strategies.



RESEARCH QUICKTAKES

Volume 8.2: Theories and models related
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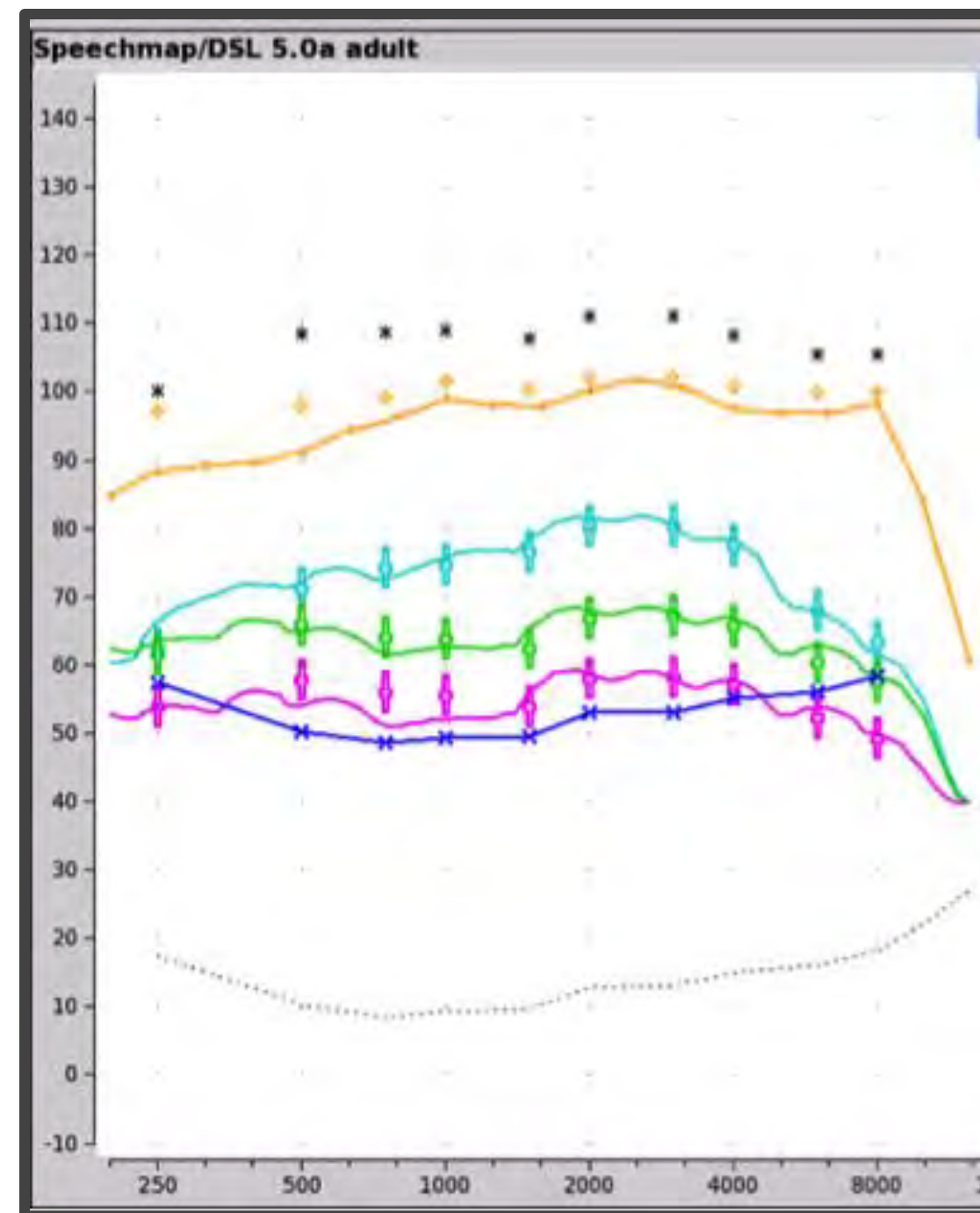
Audiology

RESEARCH QUICKTAKES

Volume 8.3: Before the fitting—
Understanding patients' emotional and
psychosocial concerns

Brian Taylor & Gus Mueller





You just finished a long day of fitting hearing aids—all new users. You're giving yourself a little pat on the back, as in all cases:

- Your fittings were quite close to NAL-NL2 targets
- The MPO was adjusted to just below the patient's LDLs.
- Unaided vs. aided QuickSIN testing gave the patients a good "shot-in-the-arm," showing that hearing aids really do work in background noise.

All is well. Or, maybe not.

You know that there's a good chance that one of those patients probably won't be a happy hearing aid user . . .
at least not initially. Why?

It's complicated.



We often fail to address the hearing-loss related social and emotional distress— Research of Bennett et al (2022):

Examined the social challenges and emotional distress in relation to hearing loss, as well as the coping mechanisms employed.

Their data was collected in focus groups for 21 adults who had hearing loss, and reported emotional distress due to the hearing handicap.

Their findings revealed that individuals described their social and emotional experiences of hearing loss in terms of:

- Negative consequences (social overwhelm, fatigue, loss, exclusion)
- Identity impact (how they perceive themselves and are perceived by others).
- Emotional distress (frustration, grief, anxiety, loneliness, and burdensomeness).

Coping strategies that were reported included: avoidance, controlling the listening environment, humor, acceptance, and assertiveness.

Ekberg et al (2014) conducted systematic research exploring how patients' concerns are addressed by audiologists during the clinic visit.

- A total of 63 consultations with 26 different audiologists (62% women) were filmed.
- All appointments reflected the initial hearing assessment with an adult patient (>55 years old) involving a discussion about hearing rehabilitation options; or it was a follow-up appointment in cases where rehabilitation options were not discussed during the first appointment.
- Companions were present in 17 of the 63 consultations. The video data were transcribed, and the transcripts included details of pauses, overlapping talk, cutoffs, intonational contours, and nonverbal communication, all found to be useful for how participants understand conversation.

Some key findings from Ekberg et al (2015):

- Patients raised concern about the use of hearing aids in 51% of the appointments where hearing aids were recommended.
- When patients expressed concerns regarding hearing aids, these concerns usually were psychosocial in nature. Typically, the concerns were expressed in a way that carried a negative emotional stance.
- Audiologists' responses usually did not align with the psychosocial nature of the patient's concern.
- Patients then, tended to escalate their concerns in subsequent speaking turns.
- And perhaps most importantly, when patients' concerns remained unaddressed, it was often the case that they left the appointment without making a decision regarding the use of hearing aids.

Ekberg et al (2015) conclude that there appears to be a need for further development in this area within audiology practice.

Grenness et al (2014a) specifically studied relationships from the perspective of older adults who had owned hearing aids for at least one year:

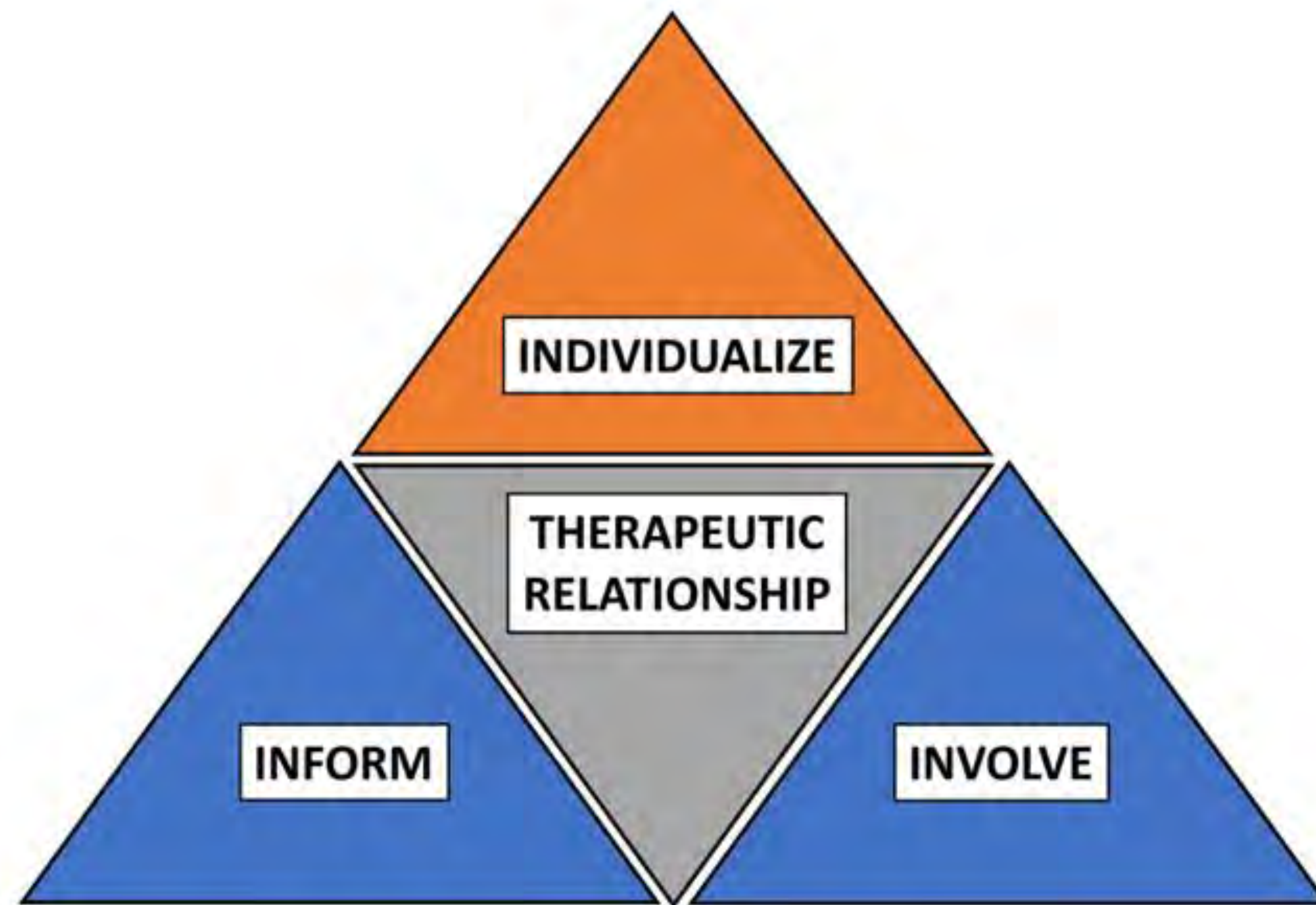
Their data analysis revealed three important dimensions:

- The therapeutic relationship
- The players (audiologist and patient)
- The clinical processes.

Key ingredient in developing a therapeutic relationship was *trust*.

Descriptions of audiologist behaviors consistent with a trustworthy professional were: interpersonal skills such as caring, listening, friendliness, and providing ample time for the patient to respond to the audiologist's open-ended questions.

Grenness et al (2014a) developed a simplified clinical model for operationalized patient-centered audiology hearing-aid related services

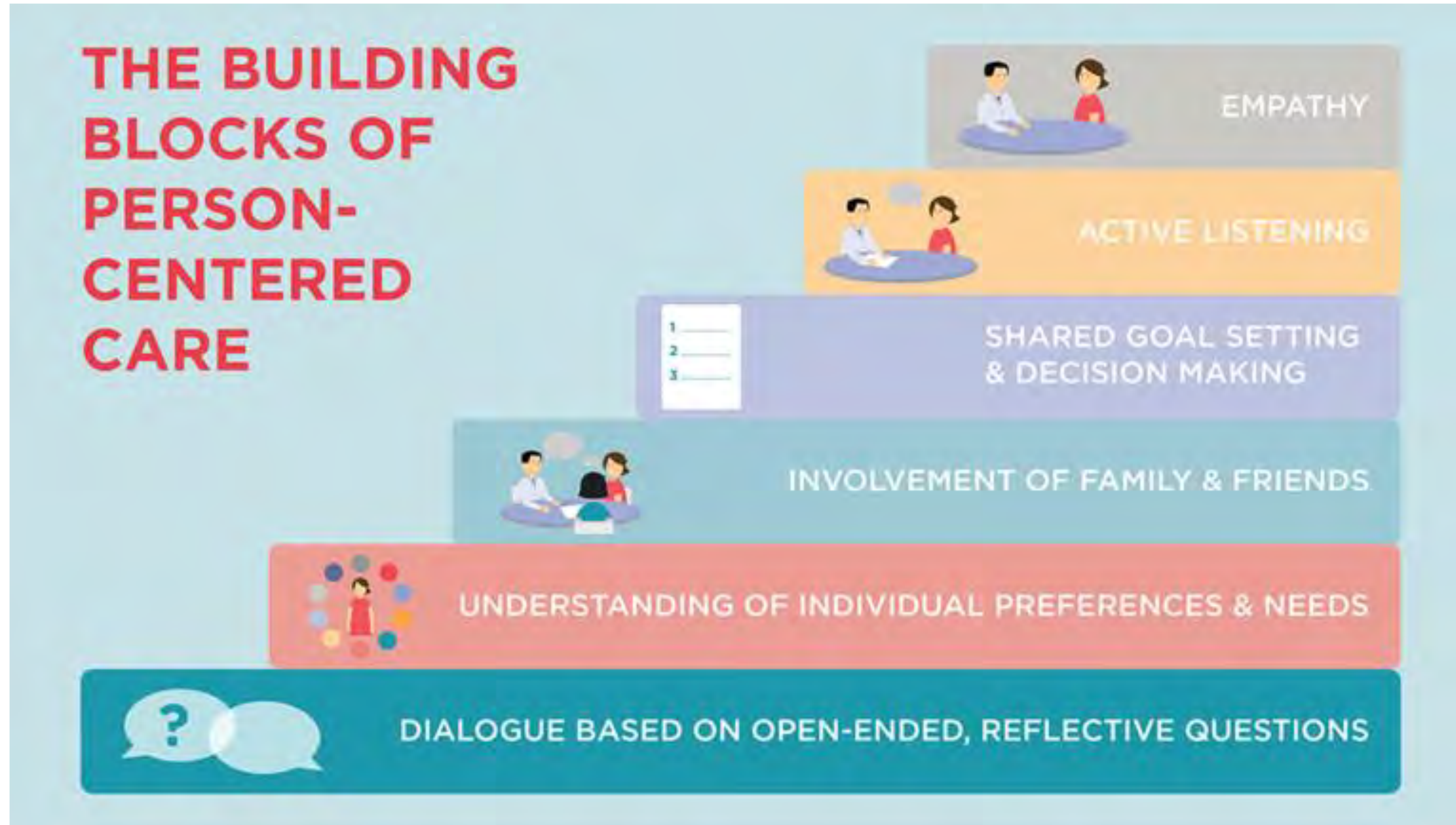


Maintaining a therapeutic relationship.

This involves:

- Listening
- Being sympathetic
- Showing emotional interest.

Patient (Person)-Centered Care



Example of Doctor-Centered Care



Gus, if you really want to live a few more years, you need to lay off the wine! No more than one glass a day!

No problem Doc, you're the boss! One-a-day is what it will be!



Example of Patient-Centered Care



Gus, I'd like to hear your thoughts about you cutting your wine intake down to one glass a day.

My thoughts?!?
Crazy idea. I don't even get a buzz on until the third glass! Let's go for a bottle a day, Doc!



Grenness et al (2014b) published an excellent review article on how patient-centered care can be applied in rehabilitative audiology (hearing aid fitting):

- What is patient-centered care?
- What are the outcomes of patient-centered care?
- What are the factors contributing to patient-centered care?
- How is patient-centered care measured?
- What are the implications for audiologic rehabilitation?

What is patient-centered care?

- Biopsychosocial perspective: Health care should take into account a person's psychological and social states as well as the biological impact of the health condition.
- Patient as person: The health professional should try to understand the patient as an individual within his or her own context.
- Sharing power and responsibility: Importance is placed on the patient's lay knowledge and self-expertise, and encourages equality in power.
- Therapeutic alliance: The relationship between health professional and patient is important and has in itself therapeutic effects.
- Practitioner as person: The health professional brings value and subjectivity to the relationship; self-awareness is important.

What are the outcomes?

- Patient satisfaction: Not surprisingly, numerous studies have reported an association between patient-centered interactions and improved patient satisfaction, although it's important to point out that not all patients prefer this approach.
- Patient adherence and health outcomes: Involving the patients in decisions regarding their treatment has been found to improve adherence, increased self-management and the overall interest of the patient regarding their care.
- Practitioner outcomes: In many cases, benefits for the practitioner (HCP) also exist. For example, research shows that fewer malpractice cases are filed when patient-centered care was employed. Higher job satisfaction for the practitioner exists when the patient's treatment adherence and outcomes are more positive.

What are the factors contributing to patient-centered care?

Patient-related factors.

- Gender: Women tend to be given more information, be asked more questions, and tend to respond in a more emotionally expressive style.
- Ethnicity: Caucasian patients receive more information, higher quality interpersonal connection, and more skilled questioning and empathy from their practitioner.
- Age: Older patients prefer, on average, a more paternalistic model of healthcare.
- Education: Patients with higher levels of education are more likely to be able to express their preference for involvement in decision-making to their practitioner and prefer a more patient-centered approach.

What are the factors contributing to patient-centered care?

Patient-related factors.

- Socio-economic status: Patients from high socio-economic backgrounds made more attempts at active participation; patients from a lower socio-economic background received less information and less partnership building attempts from their practitioners.
- Health status: Patients who report a better health status are more likely to receive a patient-centered interaction; patients with a lower health status acted more negatively and passively towards their practitioners.

What are the factors contributing to patient-centered care?

Practitioner-related factors.

- Female or Caucasian practitioners with more years of experience have been found to be more patient-centered.
- Female practitioners seeing female patients more effectively used non-verbal cues, and spent more time than with male patients.
- Male-male encounters yielded the least patient-centered interactions.

What are the factors contributing to patient-centered care?

Organizational-related factors.

- Studies have shown that patient-centered appointments do not necessarily take longer than practitioner-centered ones.
- While longer would seem better, two different studies have shown that the amount of time spent in an encounter was not linked to patient satisfaction (Grenness et al, 2014b).

What are the factors contributing to patient-centered care?

Research and implementation-related factors.

- Most of the research regarding patient-centered care and audiologic rehabilitation has only occurred in the past ~20 years. The findings, however, are similar to that from medicine and other disciplines.
- Trusting the practitioner, being informed and educated, and being provided with options.
- A separate study found that important concepts included the patients' want for empowerment, for the audiologist to understand their needs, and their want to feel comfortable and be supported in shared-decision making.

How is patient-centered care measured?

- There is no well-established gold standard for its measurement.
- Historically, methods usually have included observational techniques using audio or video footage, and patient or practitioner questionnaires
- Over 50 instruments exist which examine the nature of the interaction through rating scales, checklists or verbal/non-verbal coding schemes.
- It is helpful if the measurement of patient-centeredness is accompanied by a measure of its effect on outcome.

What are the implications for hearing aid dispensing and audiologic rehabilitation?

There are some issues related to patient-centered care in audiologic rehabilitation that make it somewhat different than the application in general medicine, such as the sale of a product (hearing aids).

Grenness et al (2014b) had two general comments:

- They believe that a definition of patient-centered care specific to audiologic rehabilitation is required, including qualitative studies that take the patient's perspective into account.
- Through identification of what patients want from audiologic rehabilitation, we then can investigate whether audiologic rehabilitation is patient-centered, and identify the barriers and facilitators to its implementation.



Some final practical thoughts about
implementing patient-centered care

Some practical thoughts about implementing patient-centered care:

- During the in-take appointment, collaborate with the patient on setting treatment goals. Record these goals on the Client Oriented Scale of Improvement (COSI)03a). This collaborative process should permeate all appointments.
- There is a difference between standard instructions and joint goal setting. For example, at the initial fitting a standard instruction might look like this:
"You will still have problems in noise. It's unavoidable."
- In contrast, joint goal setting for this standard instruction would sound like this:
"It's quiet in the fitting room right now, but let's think about noisy situations for you. What might those be in your life? Let's talk about some things you can do to improve communication there."

Some practical thoughts about implementing patient-centered care:

- Encourage a family member to attend appointments with the patient. When making appointments say: “Our experience is that it is very helpful if you can bring a friend or a loved one along to the appointment. Who would that be?” If the patient asks for more information, we could say “There is a lot to discuss and it helps to include family and friends in the process.”

Added Bonus: Recall from QuickTakes Volume 7, hearing aid adoption is ~10% greater when the patient brings a family member to the consultation.

- Ensure that the physical environment is comfortable for the patient and family members.

Some practical thoughts about implementing patient-centered care:

- Start off the appointment by encouraging dialogue and inclusiveness among all participants in the appointment by saying something like:

"We are going to do a lot today. For the next 10 minutes, I want to find out about your hearing and communication (directed to the patient) and then I want to find out about this from your perspective [directed to the significant other]."

- Finally, at a minimum, we recommend that HCPs incorporate the Patient-Centered Observation Form (Cox, 2013) into their counseling approach. This decision aid is a simple way to better inform patients about their treatment options and it allows for more dialogue about the pros and cons of these options.



Audiology

RESEARCH QUICKTAKES

Volume 8.3: Before the fitting—
Understanding patients' emotional and
psychosocial concerns

Brian Taylor & Gus Mueller





RESEARCH QUICKTAKES

Volume 8.4: During the appointment--
Assessment tools beyond routine
audiometrics.

Brian Taylor & Gus Mueller



Six important domains relative to hearing adoption, that you probably haven't thought much about:

- Perception of problem
- Listening fatigue
- Social and emotional impact
- Locus of control
- Empowerment
- Self-esteem

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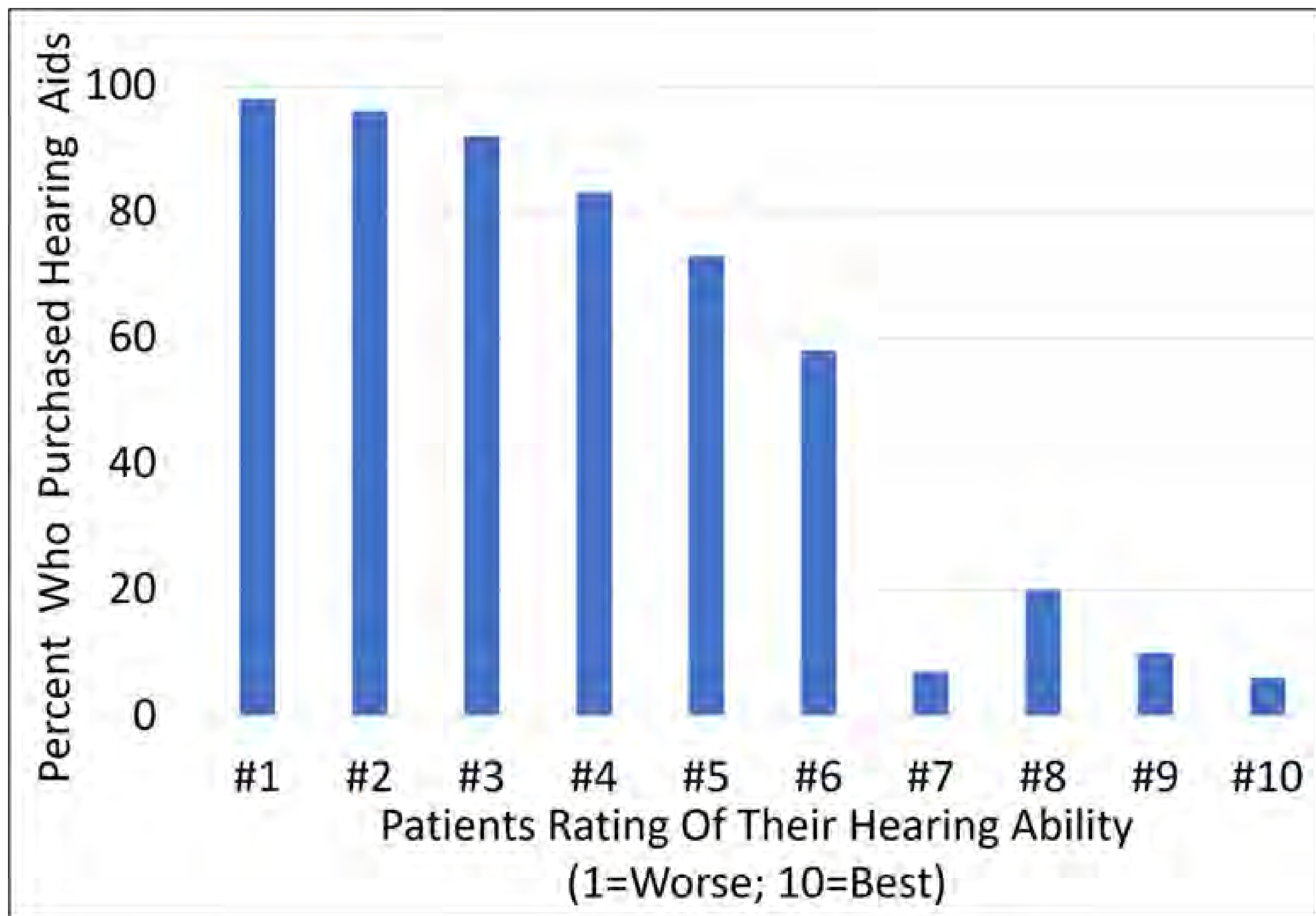
- Perception of problem
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Helena Solodar

Self-assessment scales can be useful without being long and cumbersome!

- In a retrospective study of over 800 adults, aged 18-95 years, Palmer et al (2009) examined the relationship between the patient's rating of his or her hearing ability, and their subsequent decision to purchase hearing aids.
- The patients were asked the following question:
"On a scale from 1-10, 1 being the worst and 10 being the best, how would you rate your overall hearing ability?"
- The answer to the above question was then compared with whether the patient purchased hearing aids.



Another short self-assessment scale of perception of problem:

Researchers modified the Tinnitus and Hearing Survey (THS; Henry, et al 2015) to quantify the degree of self-reported hearing difficulties in a group of young and middle-aged US Service Members (Davidson et al, 2023).

The THS-H is comprised of four questions of the THS; the THS-H was completed by study participants in about 45 seconds.

- Over the last week, I could not hear or understand what others were saying in a noisy crowded room.
- Over the last week, I could not hear or understand what was being said on TV or in movies.
- Over the last week, I could not understand people with soft voices
- Over the last week, I could not understand what was being said in a group conversation.

Another short self-assessment scale of perception of problem:

- The THS-H scores each of the four questions on a 0 to 10 scale, with 0 “being not a problem” to 10 “being a very big problem.”
- Based on their statistical analysis, only 5% of Service Members surveyed with clinically normal hearing scored above 27 on the 4-question THS-H.
- Thus, a score of 27 was selected as a cutoff for “clinically significant hearing problems.” (Davidson, et al, 2023).

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The Connection Between Stress, Listening Fatigue And Hearing Loss



LISTENING FATIGUE

WHY IT HAPPENS

Your brain works extra hard to capture, interpret & understand sounds - limiting energy & ability to focus elsewhere.

MENTAL FATIGUE

EXTRA BRAIN WORK

AUDITORY FATIGUE

HYPER-VIGILANT LISTENING

PHYSICAL FATIGUE

STRESS & ANXIETY TO KEEP UP



@LISTEN.EAR



signia

Audiology

Life with Hearing Loss: What Listening Fatigue Can Look Like



Sleepy



Irritable/out of sorts



Decreased sensitivity



Crashing



Listening but
nothing registering



struggling to stay
present



Increased sensitivity



Headache



Withdrawn



Considerable work with “listening fatigue” in recent years at Vanderbilt University

- Listening fatigue is related to listening effort. You might recall that a decade or so ago, there was a burst of research that studied listening effort, and how it can be reduced with hearing aids—some better than others..
- At one time or another, we most all have listening fatigue. It's simply when we become mentally and/or emotionally drained from working hard to hear and understand; feel like we need a rest, and simply give our brain a break.
- If a hearing loss is present, the onset of fatigue will be more rapid. When listening-related fatigue is recurrent and/or severe it can have significant negative effects on quality of life in people with hearing loss.
- In recent years, there has been considerable study of listening fatigue conducted at Vanderbilt University, originally focused on children, but now also including adults.



Vanderbilt 10-Item Adult Fatigue Scale

Sometimes communicating with others, or just listening, can be physically, mentally, or emotionally tiring. For each item below, select the **SINGLE** response that best describes how often you experience the following in a typical **WEEK**.

		Never/ Almost Never	Rarely	Sometimes	Often	Almost Always/ Always
1.	I feel worn out from everyday listening.	0	1	2	3	4
2.	Struggling to listen and understand makes me feel tired.	0	1	2	3	4
3.	I get so exhausted from listening that I cannot do the things I enjoy.	0	1	2	3	4
4.	I schedule my day to avoid getting tired from listening.	0	1	2	3	4
5.	I get so tired from listening that I start to miss details in a conversation.	0	1	2	3	4
6.	I get so exhausted from listening that I go to bed early.	0	1	2	3	4
7.	I withdraw when I am unable to follow conversations in noisy places.	0	1	2	3	4
8.	Feeling tired from listening causes strain on my relationships.	0	1	2	3	4
9.	I feel emotionally drained when it is hard for me to listen and understand.	0	1	2	3	4
10.	It takes a lot of energy to listen and understand.	0	1	2	3	4

- There currently are three pediatric versions of the Vanderbilt Fatigue Scales (the VFS-Peds)—a child self-report version (VFS-C), a parent proxy-report version (VFS-P), and a teacher proxy-report version (VFS-T).
- A 40-item version of the VFS also has been developed for the adult population, which has been shown to have good test reliability and construct validity.
- Good news—there now is also a 10-item version of this scale.

The Vanderbilt adult screening tool

- The VFS-A-10 is simple and easy to use. The patient is instructed to respond to the frequency of listening-related fatigue problems being experienced in a typical week. Most adults can complete the scale on their own in 2 to 3 min. It is scored by simply summing the responses for the 10 items—a maximum score is 40 (excessive fatigue).
- The data of Hornsby et al (2023) found that adults who reported no hearing loss had VFS-A-10 scores ≤ 26 ; the majority ($\sim 53\%$) had VFS-A-10 scores ≤ 5 , and $\sim 88\%$ had scores ≤ 15 .
- In contrast, for respondents with self-reported hearing loss, $\sim 25\%$ had scores > 26 , and $\sim 13\%$ had scores ≥ 30 , suggesting their problems were occurring often to always.

Recent research using the VFS-A-10

Taghveai and Taylor (2024)

- Collected VFS-A-10 scores on 42 patients pre- and post-hearing aid fitting.
- The mean score on the VFS-A-10 in the unaided condition was 13, with seven of the patients having an unaided score of 25 or higher.
- Approximately one month after their fittings, the VFS-A-10 was re-administered. The mean aided score was six.
- Interestingly, all seven patients with an unaided score of >25 had aided scores of 10 or less, showing substantial improvement on the VFS-A-10 with hearing aid use.

Six important domains relative to hearing adoption, that you probably haven't thought much about:

- Perception of problem
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- Self-esteem

The Revised Hearing Handicap Inventory (RHHI)

- We've talked about the HHIE or the HHIA self-assessment scales in earlier Volumes of Research QuickTakes.
- These are two of the first scales to be used frequently in clinics and research, and include statements that the patients rates relating to both social and emotional aspects of having a hearing loss.
- To refresh your memory, historically, the HHIE (E=Elderly) was for people 65 or older, and the HHIA (A=Adult) were for patients under the age of 65.
- In recent years, these scales have been merged and a new 18-item scale is available: Revised Hearing Handicap Inventory (RHHI; Cassarly et al, 2020).
- There also is a 10-item screening version that has been shown to have acceptable reliability for clinical use.

RHHI Screening Version

Instructions: The purpose of this scale is to identify the problems your hearing loss may be causing you. Answer YES, SOMETIMES, or NO for each question. Do not skip a question if you avoid a situation because of your hearing problem. If you use a hearing aid, please answer the way you hear without the aid.

	YES (4)	SOME- TIMES (2)	NO (0)
1. Does a hearing problem cause you difficulty when listening to TV or radio?	—	—	—
2. Does a hearing problem cause you difficulty when attending a party?	—	—	—
3. Does a hearing problem cause you to feel frustrated when talking to members of your family?	—	—	—
4. Does a hearing problem cause you to feel left out when you are with a group of people?	—	—	—
5. Does a hearing problem cause you difficulty when visiting friends, relatives or neighbors?	—	—	—
6. Do you feel handicapped by a hearing problem?	—	—	—
7. Do you feel that any difficulty with your hearing limits or hampers your personal or social life?	—	—	—
8. Does a hearing problem cause you to feel uncomfortable when talking to friends?	—	—	—
9. Does a hearing problem cause you to avoid groups of people?	—	—	—
10. Does a hearing problem cause you to visit friends, relatives or neighbors less often than you would like?	—	—	—

For the screening version, if a score of 6 or higher is obtained, a hearing problem is expected.

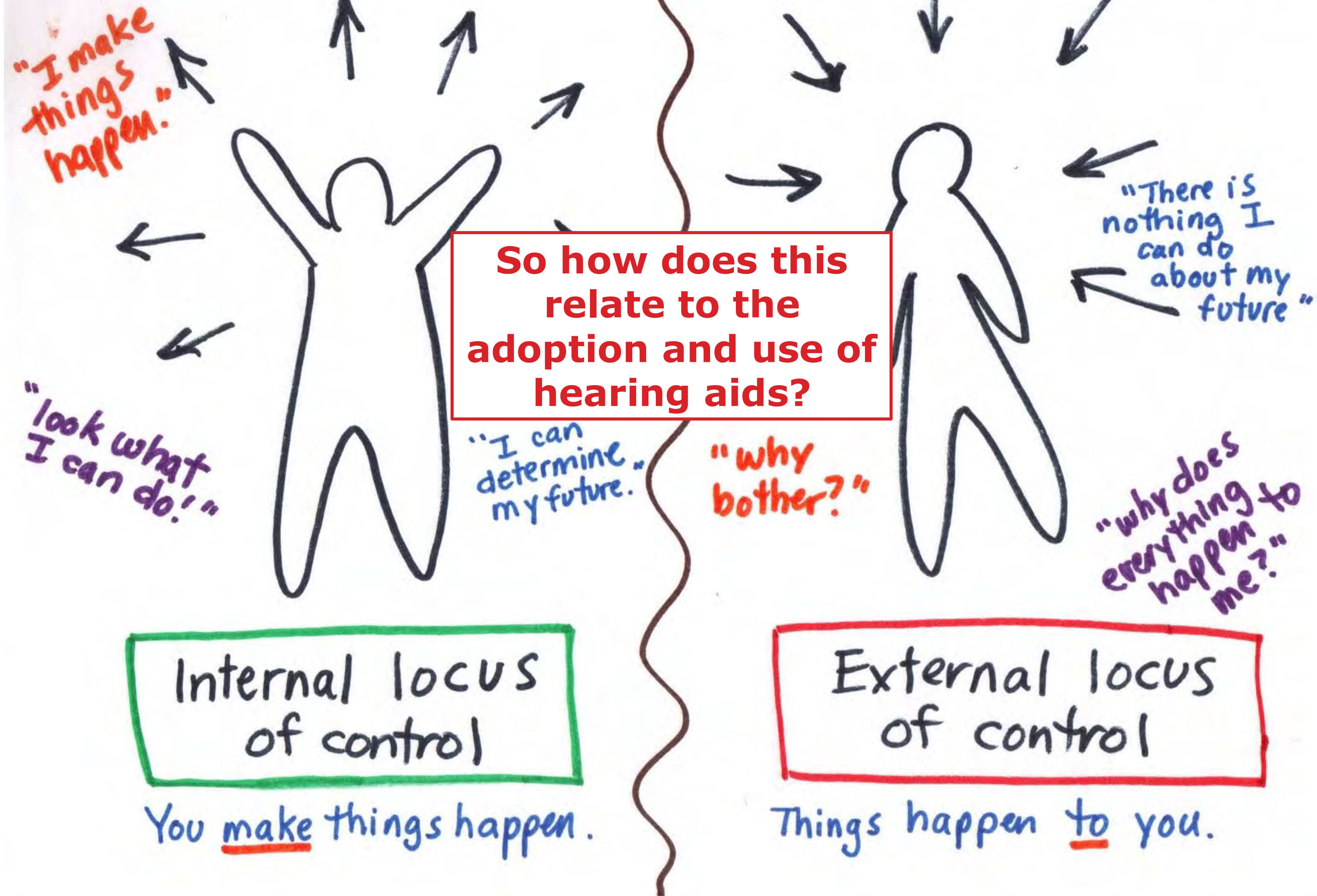
Six important domains relative to hearing adoption, that you probably haven't thought much about:

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About health locus of control (HLOC)

- Locus of Control (LOC) refers to an individual's perception about the underlying main causes of events in your life.
- That is, do you believe that your destiny is controlled by yourself, by external forces (e.g., god, powerful others), or things just happen by fate?
- In the world of health, Health-LOC refers to people's attribution of their own health to personal (Internal) or environmental factors (External).

WHICH IS YOUR — LOCUS OF CONTROL?



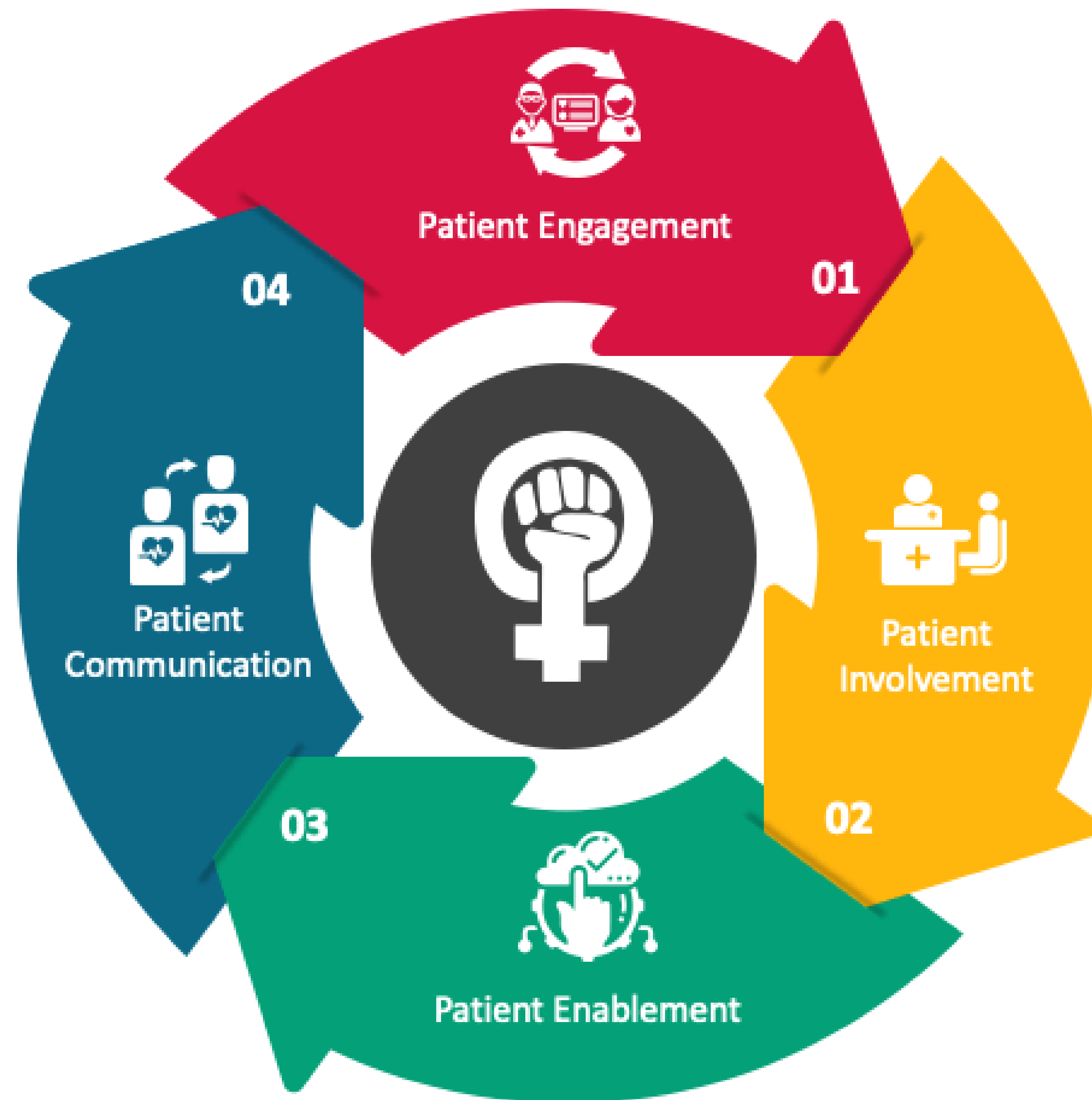
HLOC and hearing aid use

- A patient's locus of control is related to their self-efficacy. This is the belief that you can produce the result you want in a specific area—how much control you feel like you have over a situation.
- People with high self-efficacy for a task will most likely have an internal locus of control for success in that task. It's easy to see why this internal trait might be related to the adoption and use of hearing aids.
- In one study, Cueval et al (2019), surveyed a total of 114 persons who identified as hard-of-hearing. These authors found that a strong predictor of self-efficacy for this group was an internal locus of control, which should help to adjust to living better with their hearing loss (and presumably the use of hearing aids).
- HLOC also has been studied to some extent in research that sought to identify factors that are associated with the ability to successfully set up a pair of commercially available self-fitting hearing aids.

Six important domains relative to hearing adoption, that you probably haven't thought much about:

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PATIENT EMPOWERMENT



Why empowerment is important

- Defined as: *"an individuals' capacity to make decisions about their health (behavior) and to have, or take control over aspects of their lives that relate to health."*
- Patients can be empowered by their healthcare providers through education, counseling, and patient-centered care.
- Patients can empower themselves through self-education and help-seeking.
- Research shows that empowered patients have a greater understanding of how to navigate the healthcare system, experience improved health outcomes, and are more satisfied with the healthcare they receive (Bennett et al, 2024).

Five-item empowerment scale

(From Bennett et al, 2024)

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	Not applicable
1. I know how to get help if I have any problems with my hearing	☐	☐	☐	☐	☐
2. I use tactics to help me communicate in challenging situations (e.g. move to a quieter location)	☐	☐	☐	☐	☐
3. My hearing loss doesn't stop me from taking part in social activities	☐	☐	☐	☐	☐
4. I can control how I respond to the challenges I experience resulting from my hearing loss	☐	☐	☐	☐	☐
5. I am confident about my ability to manage problems caused by my hearing loss	☐	☐	☐	☐	☐

- The five question EmpAQ-5 evaluates five separate domains of empowerment: knowledge, skills, participation, control, and self-efficacy.
- It can be a valuable tool, used clinically to gauge just how empowered a patient might (or might not) be on the day of their appointment.
- Provides valuable insights on exactly what “areas of concern” the HCP should address before hearing aids are fitted, or even months or years post-fitting.

Six important domains relative to hearing adoption, that you probably haven't thought much about:

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About Self-Esteem

We previously talked about self-efficacy. While seeming similar to self-efficacy, self-esteem refers to your respect for your own value and worth, whereas self-efficacy refers to how you feel about your ability to succeed in different situations.

A person could have low self-esteem, but yet have high self-efficacy for some aspect of their life.

In general, high self-esteem is associated with good coping skills and persistence—two factors that would seem to relate to the use of hearing aids, and indeed, this has been studied.



Yes, we do have a self-esteem scale (from Rosenberg, which has been used since 1965)

		Strongly Disagree	Disagree	Agree	Strongly Agree
1.	On the whole, I am satisfied with myself.	0	1	2	3
2.	* At times, I think I am no good at all.	0	1	2	3
3.	I feel that I have a number of good qualities.	0	1	2	3
4.	I am able to do things as well as most other people.	0	1	2	3
5.	* I feel I do not have much to be proud of.	0	1	2	3
6.	* I certainly feel useless at times.	0	1	2	3
7.	I feel that I'm a person of worth, at least on an equal plane with others.	0	1	2	3
8.	* I wish I could have more respect for myself.	0	1	2	3
9.	* All in all, I am inclined to feel that I am a failure.	0	1	2	3
10.	I take a positive attitude toward myself.	0	1	2	3

Self-esteem and hearing aid satisfaction

- Ceyhan and Ture (2023) conducted testing with 86 hearing aid users, which included a measure of self-esteem (the scale you just saw). Hearing aid satisfaction was assessed using the IOI-HA outcome measure.
- There was a significant positive relationship between the level of satisfaction with hearing aids (IOI-HA score) and the Rosenberg Self-Esteem Scale Score.
- Self-esteem explained 26.2% of the variation in satisfaction. The authors conclude that the self-esteem of hearing aid users is a prominent factor in satisfaction with hearing aids, and important for enriching audiologic rehabilitation.

A final topic for this section: Why post-fitting instruction and counseling matters!



Does counseling matter regarding the use of one versus two hearing aids?

- Over a three-month period, consecutive patients who audiometrically were candidates, were fitted bilaterally with ITE/ITC products, all from the same manufacturer (hearing aids provided free-of-charge).
- Hearing aids were programmed to a best-fit to NAL-R prescriptive targets, verified with probe-microphone measures.
- Prior to the fitting of hearing aids, all participants completed a short questionnaire, where one of the questions asked if they desired to be fitted with one or two hearing aids—they were all fitted with two regardless of their answer to this question; 46% selected one, 54% selected two.
- The hearing aids were fitted by three different clinical (civilian) audiologists, and then, following the fitting and basic orientation, all participants received 10-minutes of final guidance from a different audiologist, a senior ranking active-duty officer.

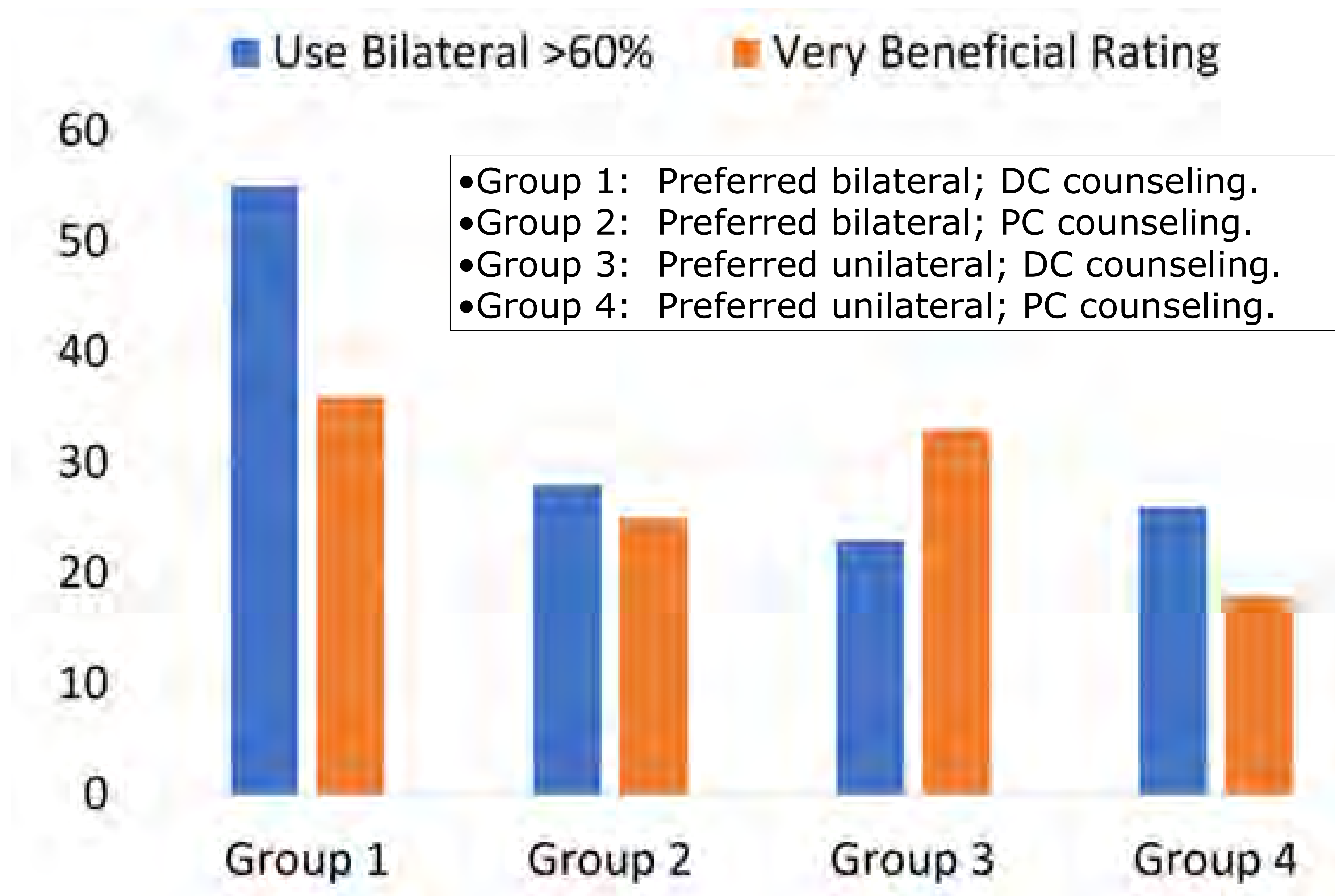
Does counseling matter regarding the use of one versus two hearing aids?

- The participants were randomly assigned to receive one of two different types of counseling:
Approach #1: "Doctor-Centered (DC)." The patients were informed of the research showing that bilateral use was best for them, and all the benefits were emphasized. They further were informed that they would be foolish not to embrace using two hearing aids.
Approach #2: "Patient-Centered (PC)." The patients were told that some people preferred using two hearing aids, others preferred only using one. It was up to them to try it out, and see what they liked.

The use of the different counseling then separated the participants into four groups:

- Group 1: Preferred bilateral; DC counseling.
- Group 2: Preferred bilateral; PC counseling.
- Group 3: Preferred unilateral; DC counseling.
- Group 4: Preferred unilateral; PC counseling.

Hearing aid use, benefit and satisfaction data was collected for all participants (~100) 9-12 months following the fitting (via telephone interviews).



Other research examples when instructions and/or counseling mattered:

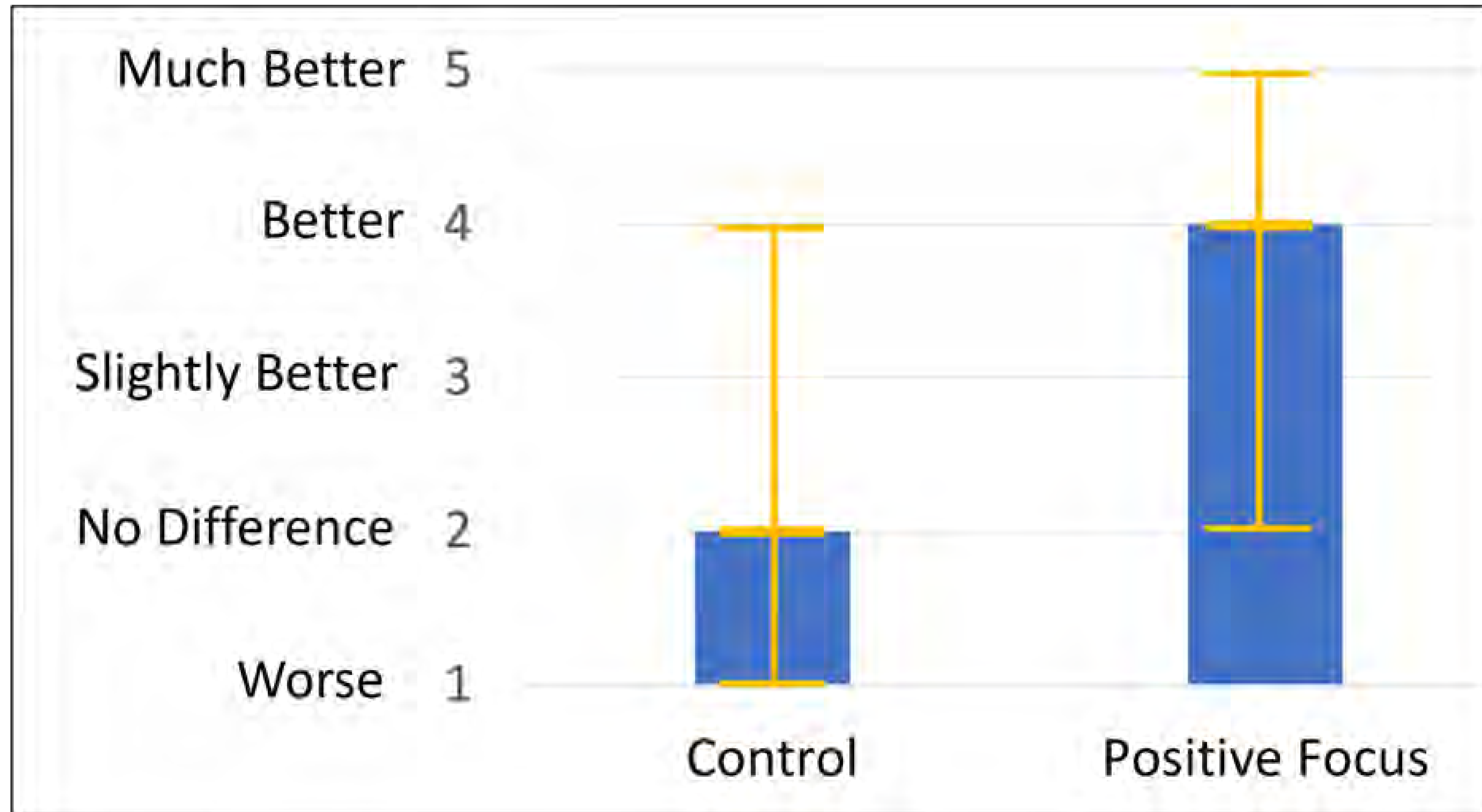
From Bentler et al (2003): For one month, participants wore hearing aids labeled “state-of-the-art digital;” the other month they wore hearing aids labeled “conventional,” although in reality they were wearing the same hearing aids. When the hearing aids were labeled “digital,” the self-report subscales of the APHAB were rated significantly higher. When asked to state a preference for continued use, 33 (83%) of the 40 participants expressed a preference for the fitting that had been labeled “digital.”

From Dawes et al (2013): Participants compared two devices that were acoustically identical, except one was described as “new” and the other as “conventional”. When using the “new” hearing aids, participants had significantly better mean speech-in-noise performance (70.9% versus 66.8%) and sound quality ratings (8.1 versus 7.4); 75% expressed an overall preference for the “new” hearing aids.

Focusing on “positive listening experiences”

- Lelic et al (2023) divided 21 participants into two groups: a control group and a positive focus group. All participants were fitted bilaterally with the same model premier hearing aids, using the proprietary algorithm of that manufacturer.
- The participants then experienced a three-week field trial. During the field trial, the positive focus group actively reported, via a smartphone app, each time they had a positive listening experience. The average number of reports/participant was ~1.5-2.5/day; slightly higher for the last week of the trial.
- At the conclusion of the field trial, several outcome measures were administered, including the IOI-HA and the COSI.

Outcome results for the COSI





- Consider implementing some of the questionnaires that we have presented in this section. Research has shown that this extra information about the patient can assist in hearing aid adoption, increase benefit and satisfaction.
- Don't underestimate the importance of patient counseling at the time of the fitting—data reveals that it can alter hearing aid use and benefit.



RESEARCH QUICKTAKES

Volume 8.4: During the appointment--
Assessment tools beyond routine
audiometrics.

Brian Taylor & Gus Mueller





Audiology



RESEARCH QUICKTAKES

Volume 8.5: After the appointment—
Promoting consistent hearing aid use.

Brian Taylor & Gus Mueller

Some findings from systematic review regarding “after the fitting” (from Oosthuizen et al, 2022)

The Negative

- Acclimatization was the most often reported in owners’ experiences of getting used to.
- Issues with smartphone-connections also was commonly reported.

The Positive

- Owners describe information counseling, advice and training, and managing their expectations as prerequisites for positive early experiences.
- The concepts of acceptance of hearing loss, consistent use, patient attitude.
- Support from significant others (i.e., family and friends).
- Good relationship with the hearing care professional.

The issue of auditory acclimatization

- This is something that we need to emphasize in our counseling—the patient must realize that auditory acclimatization will most likely happen, at least to some degree, but that it takes time.
- Auditory acclimatization often is referred to as “perceptual learning.” That is, the brain must adapt to the new sounds, that in many cases, haven’t been audible for 10 or more years. All these new sounds are novel, and therefore impact conscious attention, and as a result, are annoying and often act as maskers of speech understanding.
- Our role is pretty simple: provide appropriate gain, especially for the high frequencies and for soft inputs, which, just happen to be the two main things that patients, particularly new users, are not fond of.



Mead Killion

An historical perspective

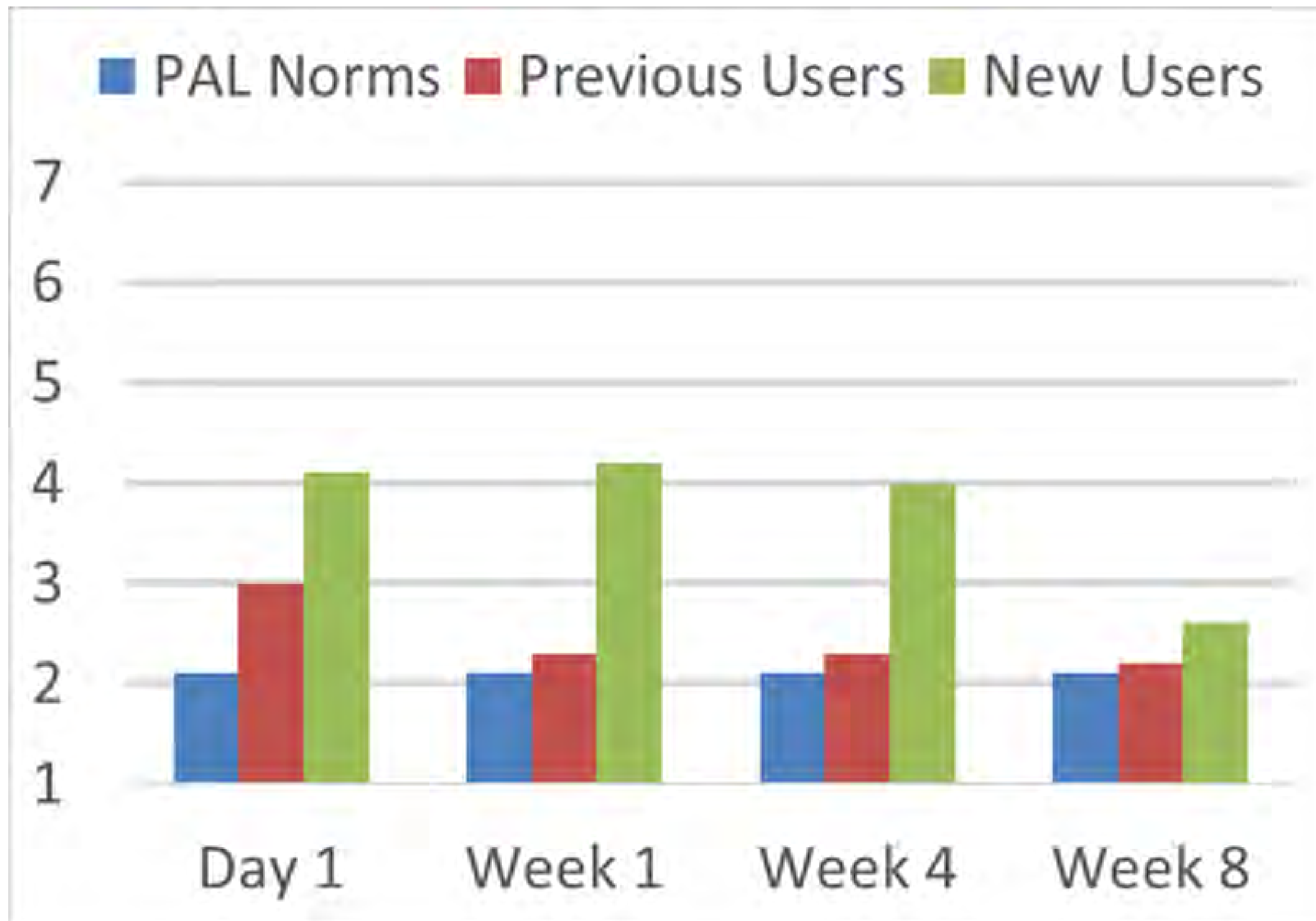
In 1989, Mead Killion introduced the K-AMP. This was the first wide-spread application of signal processing that used an input compression circuit with a very low kneepoint (soon known as wide dynamic range compression, or WDRC). With WDRC there was considerable more gain for soft inputs, which most patients didn't like.

- Audiologists had never experienced this counseling dilemma before—the easy fix was to turn down gain, but only for soft, which was not easy to do with the K-Amp product.
- In an effort to help audiologists with the counseling, Killion came up with the acronym ABONSO; Automatic Brain-Operated Noise-Suppressor Option. His point was: just give the brain a chance, and over time, it will help reduce what is now unwanted noise.
- A few years later, Mead teamed up with Stuart Gatehouse to publish an article on acclimatization, with an associated acronym: HABRAT—Hearing Aid Brain Rewiring Accommodation Time

Do ABONSO and HABRAT really happen?

Before we get to the study: The Profile of Aided Loudness (PAL) is a 12-item questionnaire that can be used to have patients rate their loudness perceptions for different environmental sounds on a 7-point scale (4 items for soft, 4 for average, and 4 for loud, based on norms from individuals with normal hearing).

- In one of these studies related to our discussion here, hearing aids were fitted to both new and experienced users according to the NAL prescriptive method.
- Of particular interest was the patient's PAL ratings for soft inputs; based on normative data, the PAL ratings for soft should be #2.
- The participants were followed for eight weeks, with PAL ratings obtained at Day 1, Week 1, Week 4 and Week 8.



What about acclimatization for speech understanding?

- Research addressing this was conducted by Dawes and Munro (2017). New adult hearing aid users ($n = 35$) completed a test of aided speech recognition in noise (SIN) and a test of the auditory distraction caused by amplified background sounds.
- Testing was conducted on the day of fitting and one, seven, 14 and 30 days following the fitting. A control group of experienced hearing aid users ($n = 20$) completed the tests over a similar time frame.
- The findings were that a subset of new users with moderate hearing loss who wore their hearing aids at least 12 hours a day had significantly improved SIN scores (~ 3 -dB SNR) compared to the control group.
- The improvements in SIN were associated with more consistent hearing aid use. Improvements in SIN also were associated with self-report of background sound being less distracting and greater self-reported hearing aid benefit.

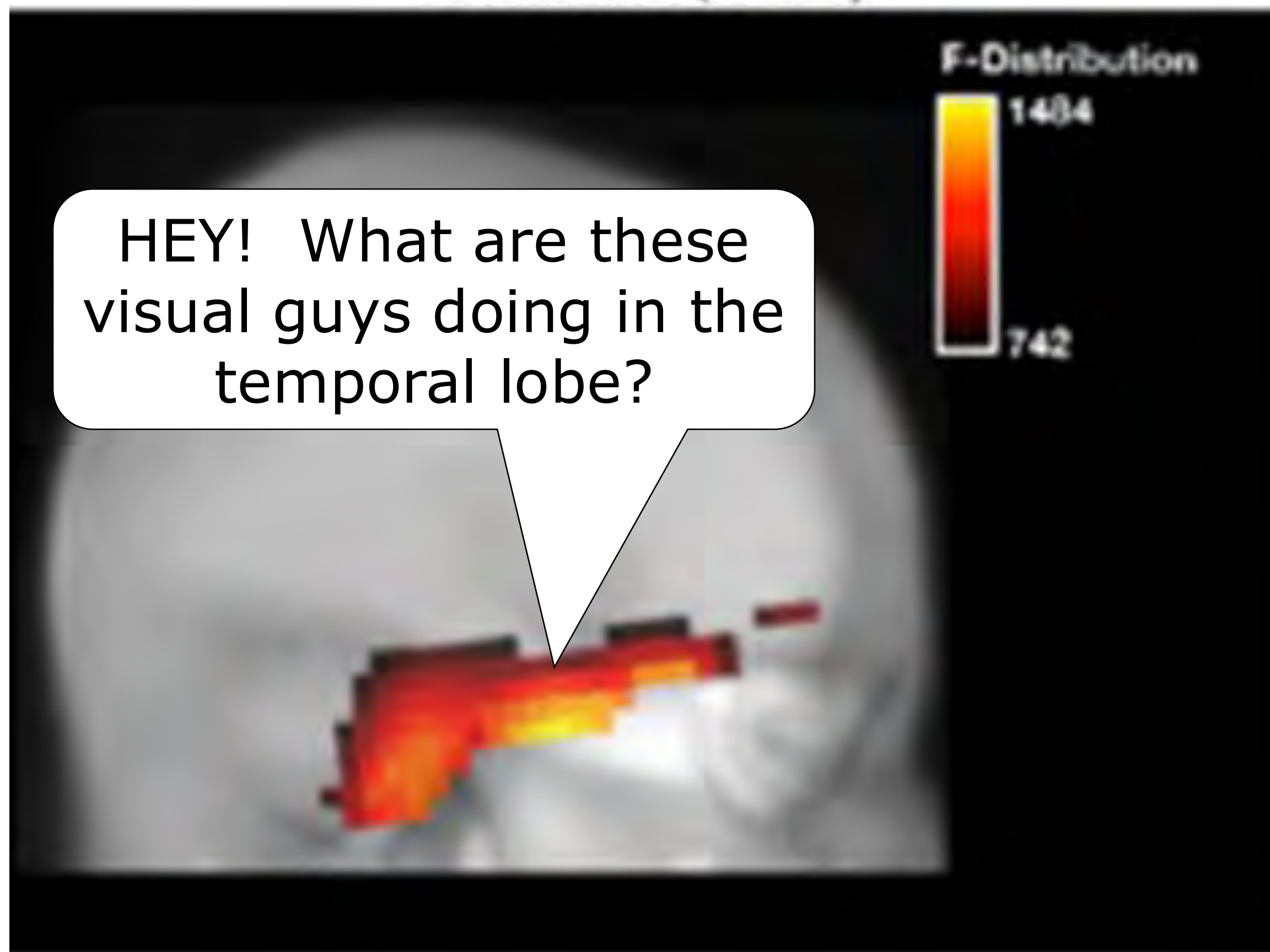
3 dB SNR improvement
is a big deal!

Is there electrophysiologic data to support auditory acclimatization?

- Glick and Sharma (2020) examined changes in a group of 28 older adults with early-stage, mild-moderate age-related hearing loss—all participants were fitted bilaterally to NAL-NL2 targets—none of the participants had worn hearing aids prior to the study.
- Following the fitting, the participants used the hearing aids in their everyday life for six months. A minimum use of 5 hours/day was required.
- At the time of the fitting, and at the end of the six-month field trial, cortical visual evoked potentials (CVEPs) were conducted. A cognitive test battery also was administered pre-and post-hearing aid use.
- Prior to the use of hearing aids, the group showed the expected occipital lobe brain activation for the CVEPs, but also, there was additional activation of the auditory regions of the brain, suggestive of cross-modal re-organization. Moreover, participants showed recruitment of the frontal cortex during this task, which is believed to reflect increased effort or cognitive load.

Current Density Source Reconstruction for the N1 Cortical Visual Evoked Potential (CVEP) Response

Baseline (n=21) 6 Months Post-HA (n=21)



And for those HCPs who do not believe in providing a verified fit to validated prescriptive targets . . .



Consider this statement from Anu Sharma

“. . . neuroimaging evidence from long-term hearing aid users who were “underfit” showed persistent cross-modal re-organization even after extended periods of hearing aid use. This suggests that correctly fitted hearing aids are important for providing the necessary gain to the auditory cortex to reverse cross-modal changes.”

Yes folks, you really do have the patient's brain in your hands!



And let's not forget the patient's mental health

- Overall mental health can be a significant component of hearing aid adoption and benefit. We know from several studies that adults with acquired hearing loss have greater social isolation and loneliness than their peers—factors that certainly could contribute to mental health issues.
- As reviewed by Bennett et al (2024) there are data showing that mental health is not addressed effectively by general practitioners—something that is often referred to as the “rule of diminishing halves.”
- Half the patients presenting with symptoms are recognized; half of those recognized are treated; and half of those treated are effectively treated—if our math is correct, that leaves us with 12.5%! All the more reason why this area should not be ignored by HCPs.

Implementation and evaluation of health behavior change

A structure that has been used over the years to evaluate the implementation of health behavior change is the **RE-AIM**, an acronym for: Reach, Effectiveness, Adoption, Implementation, and Maintenance (Glasgow et al, 1999; Bennett et al, 2024):

- Reach— Did the targeted population receive the intervention?
- Effectiveness—Was the intervention effective?
- Adoption—Was there support to deliver my intervention?
- Implementation—Was the intervention delivered properly?
- Maintenance—Has the intervention become a part of routine organizational practice?

Going from the
“RE-AIM”



To the
“AIMER”



From the RE-AIM to the AIMER



Related to the RE-AIM is the AIMER:

- Ask
- Inform
- Manage
- Encourage
- Refer

The AIMER program is a behavior change intervention that is specifically designed to increase the frequency with which HCPs ask about and provide information regarding mental wellbeing within adult audiology services (Bennett et al, 2024).

Research with the AIMER approach (Bennett et al, 2024)

Participants received training over a ~1.5 year period

Data were collected that included both quantitative and qualitative measures: observation reports, staff surveys, clinical file audits, and interviews

The AIMER intervention

- The HCP skills and confidence
- How often HCPs asked about mental wellbeing during patient visit.
- How often HCPs provided personalized information and support regarding mental wellbeing within and audiology appointment.
- How often HCPs used mental wellbeing terms within clinical case notes and general practitioner reports.

Implementation of the AIMER program in a real-world setting was feasible. HCPs enjoyed receiving AIMER training and felt that it benefitted them and their patients.

Research with the AIMER approach (Bennett et al, 2024)

Bennett et al (2024b) report the key findings of this study:

- The AIMER program was effective at changing clinician's behaviors related to provision of mental wellbeing support within routine audiologic appointments.
- Implementation of the AIMER program in a real-world setting was feasible.
- HCPs enjoyed receiving AIMER training and felt that it benefitted them and their patients.



- Post-fitting instructions and counseling, regarding expected post-fitting problems, can be as important as the fitting itself regarding long-term use and benefit from amplification.
- Consider the adoption of a model such as the AIMER to help ensure that the many patient-specific aspects related to hearing loss and hearing aid use are included in routine practice.

A final quick review of AIMER

A=Assessment

This initial phase involves gathering comprehensive information about the patient's background, current situation, and presenting issues. The aim is to develop a thorough understanding of the patient's needs, strengths, and challenges.

A final quick review of AIMER

I=Intervention

Based on the assessment, specific interventions are designed and implemented. These interventions are tailored to address the patient's unique needs and may include various therapeutic techniques and strategies.

A final quick review of AIMER

M=Monitoring

Continuous monitoring of the patient's progress is crucial. This involves tracking changes, both positive and negative, to ensure that the interventions are effective and to make adjustments as needed.

A final quick review of AIMER

E=Evaluation

Periodic evaluation is conducted to assess the effectiveness of the counseling interventions. This involves reviewing the patient's progress towards their goals and determining the overall impact of the treatment.

A final quick review of AIMER

R=Review

The final phase involves a comprehensive review of the entire counseling process. This includes reflecting on what worked well, what didn't, and any lessons learned. The review phase helps in refining future counseling strategies and ensuring continuous improvement.



Audiology



RESEARCH QUICKTAKES

Volume 8.5: After the appointment—
Promoting consistent hearing aid use.

Brian Taylor & Gus Mueller