Advancing Continuum of Care for Adults with Complex Hearing Needs

Bill Dickinson AuD

VP of Audiology - Phonak

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Disclosure in accordance with CEU Requirements

- Bill Dickinson AuD, VP of Audiology Phonak US

Bill Dickinson AuD is the VP of Audiology for Phonak. He joined Phonak in 2013 after nearly a decade serving as Assistant Professor in the Department of Hearing and Speech Sciences, Audiology Division at the Vanderbilt Bill Wilkerson Center for Otolaryngology and Communication Sciences at Vanderbilt University Medical Center in Nashville, TN. In addition to his academic and clinical work, Bill dedicated a great deal of time conducting speaking engagements to educate the local community about hearing health as well as serving as a popular speaker at state, national and international audiological meetings and conventions. Additionally, Bill taught a number of clinical courses at Vanderbilt and directed multiple capstone clinical committees over the years. Bill has published numerous articles focused on the management of hearing loss in children, Bone Anchored Hearing Aids (Baha) and the consumer perspective of the amplification market. Bill received his Bachelor and Master degrees in Audiology from Michigan State University, and his Doctorate of Audiology from Central Michigan University.

- I have a financial relationship to disclose:
  - Employee of Phonak who receives a salary
- I have no nonfinancial relationship to disclose

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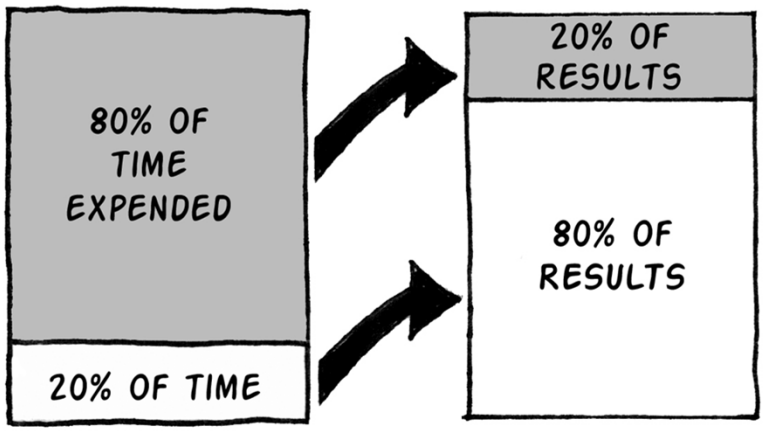
Balancing Act – The 80/20 Rule



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Agenda

1. Understanding Complex Hearing Needs
2. Subjective Needs Assessment
3. Objective Clinical Evaluation
4. Solutions to Outcomes

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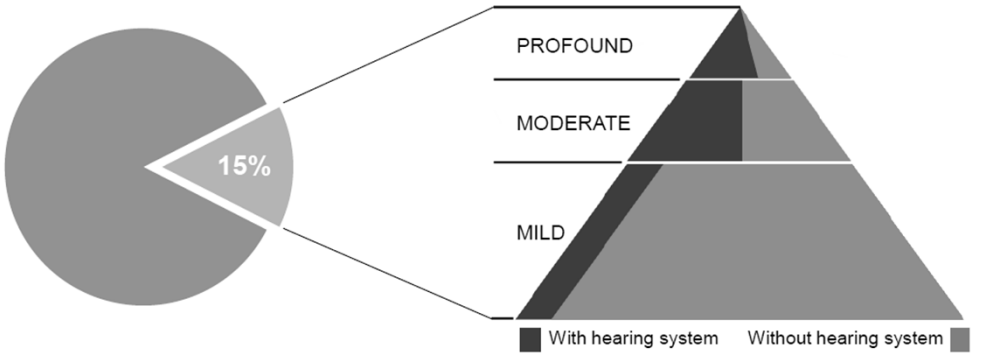
what makes them complex?

Incidence and adoption of technology



END-USER MARKET – PENETRATION*	
- Profound loss	70%
- Moderate loss	50%
- Mild loss	10%

* Source: Several industry statistics, Sonova estimates

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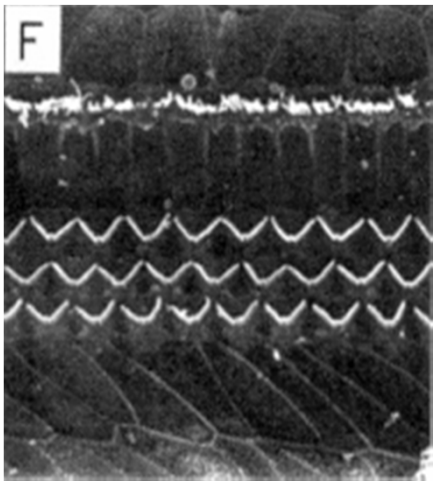
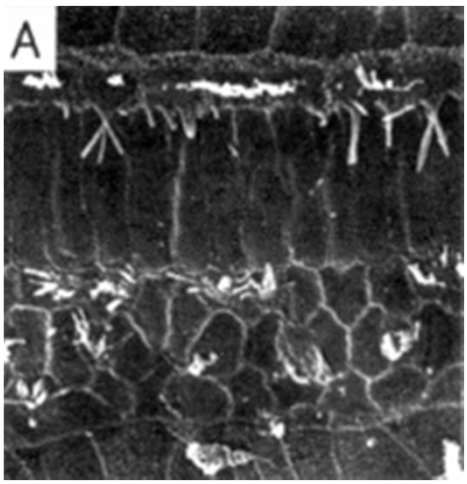
Peripheral?



healthy hair cells



damaged hair cells

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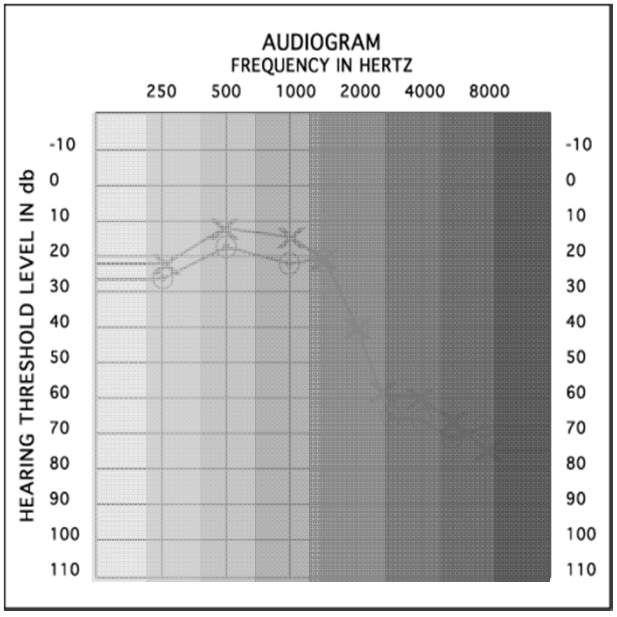
Audiogram complexity

- With modern multi-channel digitial hearing instruments, difficult to fit audiograms should be a thing of the past
- Yet, we still continue to see the patients who are “complex”



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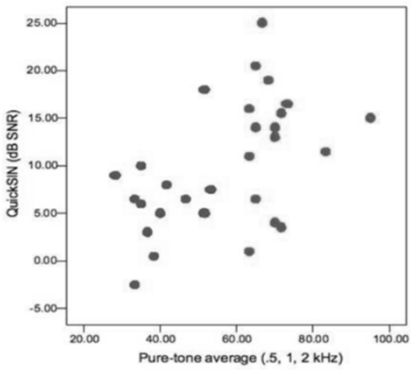
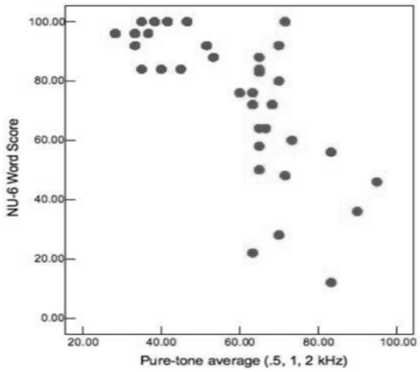
Significant variability in performance in noise and in quiet



Speech in noise (SNR) vs pure tone average



Speech in quiet (% correct) vs pure tone average

- Mild to Moderate
- Moderately Severe to Severe

Souza, P. (2009). Severe Hearing Loss Recommendations for Fitting Amplification. *Audiology Online*, *January 19*

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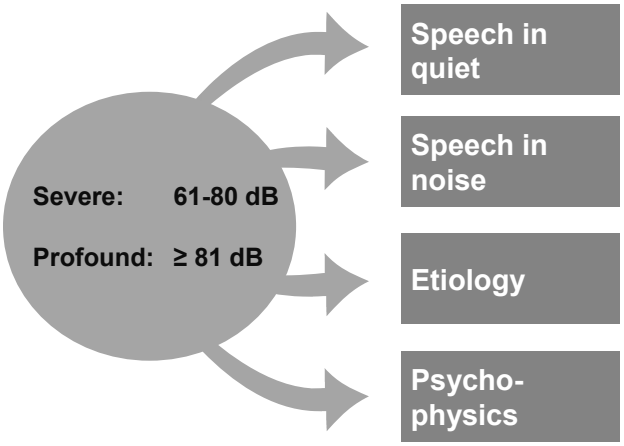
How are severe to profound clients different?



Speech in quiet	• Large variance, some do well, some do very poorly
Speech in noise	• Large variance, but most do very poorly
Etiology	• Congenital, progressive, sudden
Psycho-physics	• Poor frequency resolution, poor temporal resolution and/or poor loudness discrimination; 38% have tinnitus

Souza, P. (2009). Severe Hearing Loss Recommendations for Fitting Amplification. *Audiology Online*, *January 19;* Stuart Rosen (1990).The Psychoacoustics of Profound Hearing Impairment. *Acta Otolaryngol (Stockh),* Suppl. 469: 16 -22; Per-Inge Carlsson et al. (2014). Severe to profound hearing impairment: quality of life, psychosocial consequences, and audiological rehabilitation. Disability and Rehabilitation. Early Online; 1- 8

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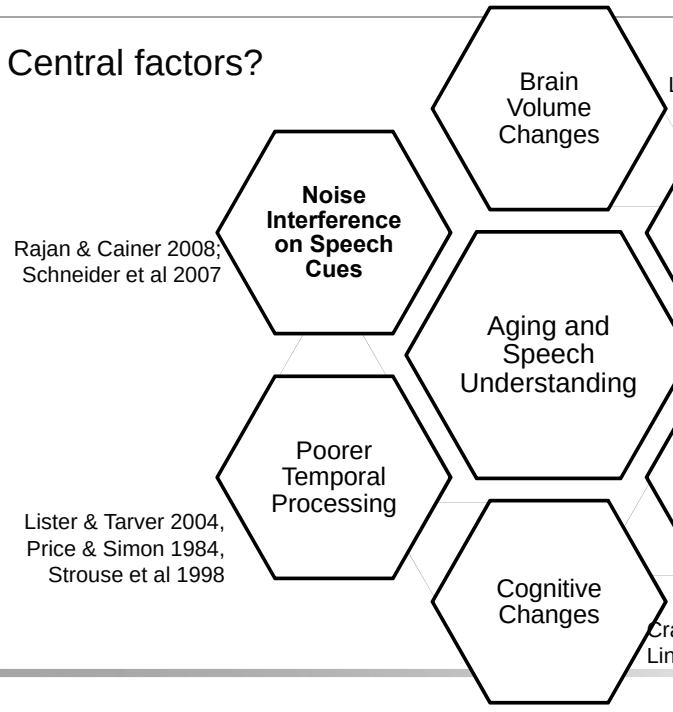
Multifactorial Central factors?



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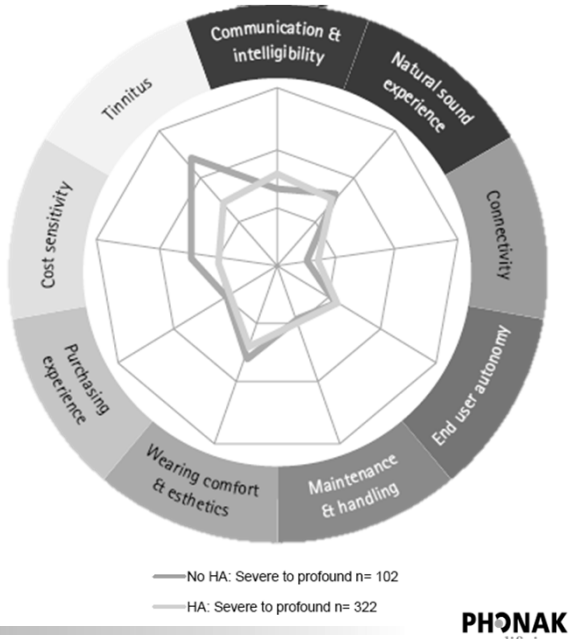
Patient perception?



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Understanding Needs

IMPACT

Proven and Demonstrated benefits of Phonak product based on consumer needs

Support and Focus on your clinical services and practice

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Differentiation

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Lifetime value of treating patients with complex needs

AVERAGE VALUE OF A SALE X NUMBER OF REPEAT TRANSACTIONS X AVERAGE RETENTION TIME

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Appeal to a person's reason and they're yours for a **DAY**

Appeal to a person's emotions and they're yours for a **LIFETIME**

(address their needs)

Marshall et al (2015) The Happiness Halo

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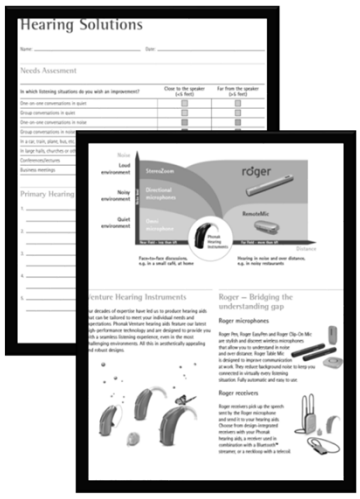
Subjective Needs Assessment | Objective evaluation | Solution and Outcomes



OUTCOMES

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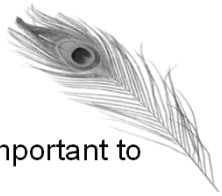
Seeing the whole patient



A holistic approach:

1. Hearing and listening needs assessment, including the situations most important to the patient
2. Complete audiological assessment
3. Recommend a complete solution that aims to meet the listening and communication needs of the patient and their communication partners

A complete solution often includes elements beyond the hearing aids. A solution that not only solves face to face communication but helps patients navigate hearing at home, at work, with family and in their social life.

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Universal Hearing Needs

Near or Far? In Quiet or in Noise?

Kochkin, S. (2010). Compton-Conley, C. (2014), Atcherson (2015)

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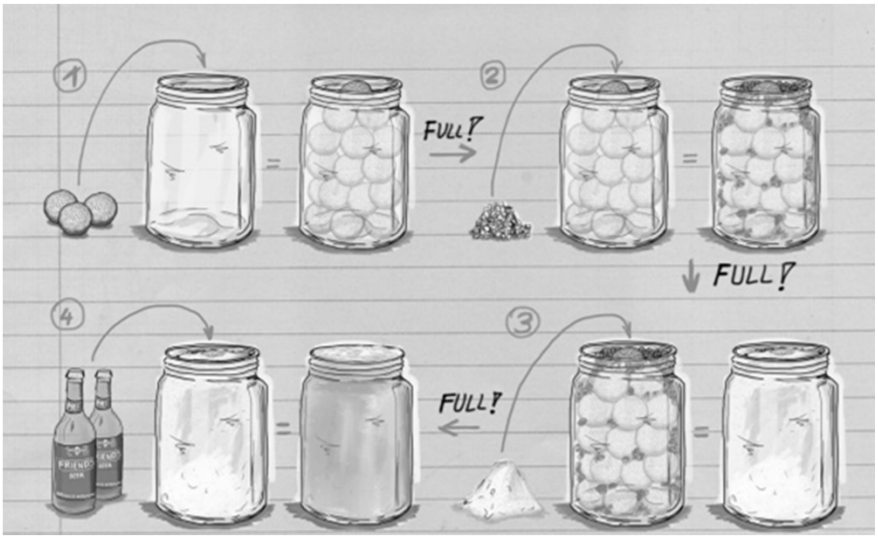
Fulfill the needs that matter most



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Social	
Visited family or **relatives**	82.6
Visited friends or **neighbors**	84.3
Telephone conversation with friends/relatives	93.1
Church-related **activities**	47.0
Organized or informal multi-age social recreation groups	18.0
Formal or informal social **groups** for aged	24.2
Service, fraternal, or legion organizations	12.1
Mass **activities** (e.g., bingo, community club)	16.2
Travel	37.0
Sports or games	34.1
Solitary	
Collecting hobbies	30.9
Handiwork hobbies	45.9
Music, art, theatre	34.4
Reading or writing	89.9
Productive	
Work	8.4
Volunteer work	22.9
Light housework or gardening	95.3
Heavy housework or yard work	63.2

Engagement in Everyday Activities

74% in 6-11 activities

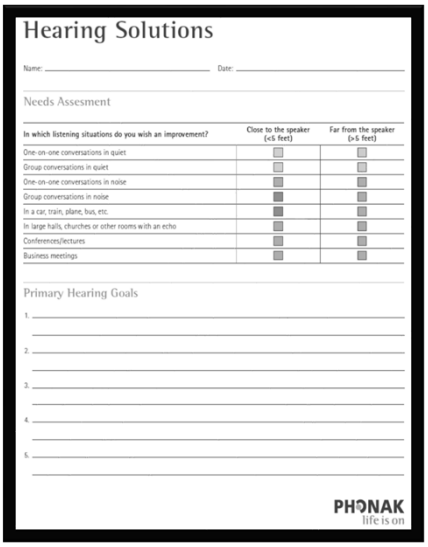
Menec et.al (2002) Journals of Gerontology

Journals of Gerontology (2002): Everyday Activities and Successful Aging

- Greater **overall activity** level was related to greater happiness (well being, satisfaction), better function (cognitive and physical abilities), and reduced mortality
  - 6 year longitudinal, epidemiologic study
  - 60% female; mean age 75 years; 60% live with others; community dwellers
  - Generally: **social and productive activities** were positively related to happiness, function, and mortality, whereas more **solitary activities** (e.g., handiwork hobbies) were related only to happiness

Menec et.al (2002) Journals of Gerontology

Subjective Needs Assessments



Hearing Solutions

Name: _____ Date: _____

Needs Assesment

In which listening situations do you wish an improvement?	Close to the speaker (<5 feet)	Far from the speaker (>5 feet)
One-on-one conversations in quiet	☐	☐
Group conversations in quiet	☐	☐
One-on-one conversations in noise	☐	☐
Group conversations in noise	☐	☐
In a car, train, plane, bus, etc.	☐	☐
In large halls, churches or other rooms with an echo	☐	☐
Conferences/lectures	☐	☐
Business meetings	☐	☐

Primary Hearing Goals

1. _____
2. _____
3. _____
4. _____
5. _____

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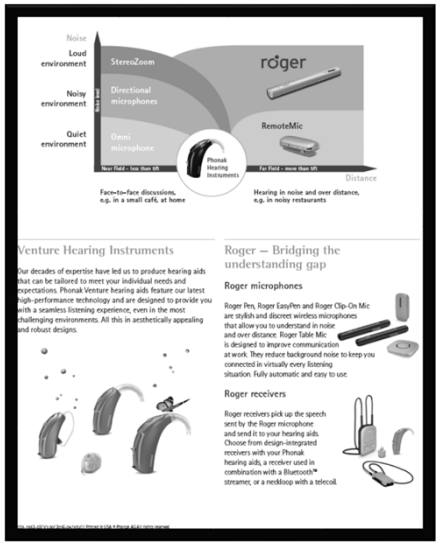

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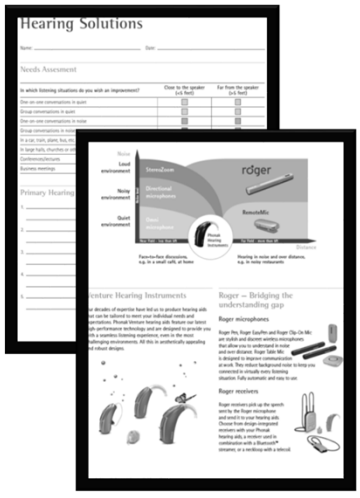
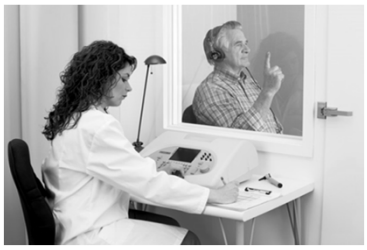
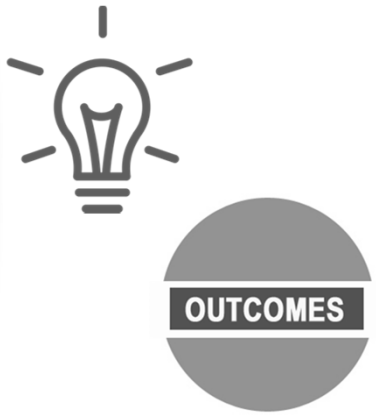
Subjective Needs Assessment | **Objective evaluation** | **Solution and Outcomes**







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What comprises a complete objective evaluation?

- Air Conduction
- Bone Conduction
- Speech in Quiet testing
- Speech in Noise testing
- Loudness Discomfort Levels (LDL)
- Acceptable Noise Level (ANL)
- Listening in Spatialized Noise – Sentence Test with Prescribed Gain Amplifier (LISN-S PGA)

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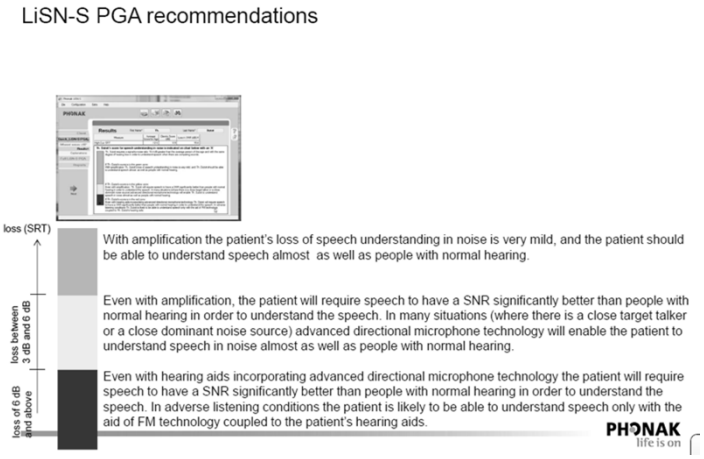
LiSN-S PGA

- Developed by Sharon Cameron at the National Acoustic Laboratories (NAL) and distributed exclusively by Phonak.
- Assesses the ability of listeners with hearing loss to understand speech when noise is arriving from different directions.
- **Benefits**
  - Gain patient trust
  - Quick insights
  - Clear recommendations



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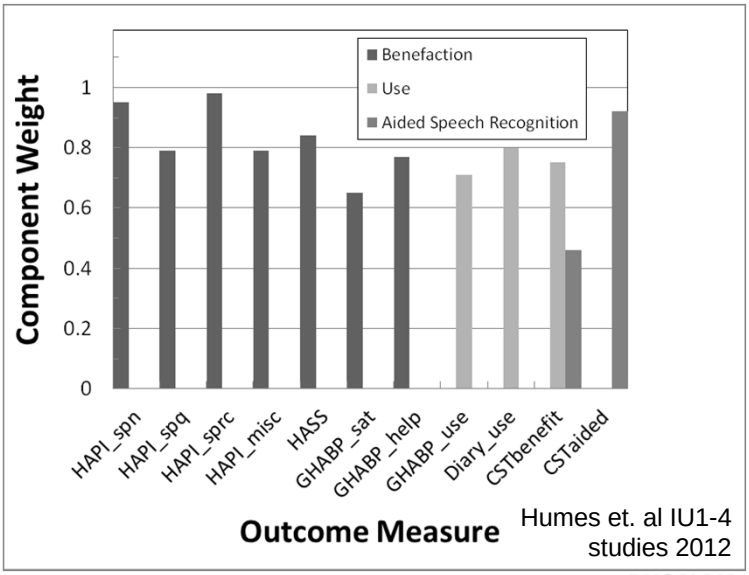
Dimensions of Hearing Aid Outcomes

- Humes et.al. performed a large scale study (n = 368) in which they collected multiple outcome measures
- Factor Analysis performed to determine which dimensions of hearing aid outcome are indicators for overall patient benefit



Humes et. al IU1-4 studies 2012

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Measures of unaided threshold sensitivity are not good predictors of success with hearing aids/treatment:

Research in this area (Gatehouse, Humes, Cox, Walden, Abrams, etc.) have indicated that traditional audiologic measures: pure tones, word rec in quiet, etc., do not predict success...

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Gatehouse, Humes, Cox, etc., suggest these are the strongest determinants of tx success:

- patient attitudes
- emotions
- personality
- cognitive ability
- types of support systems
- daily listening conditions

Less success with hearing aids as a treatment option associated with:

- Negative attitude toward wearing hearing aid
- Depression
- Denial of the problem

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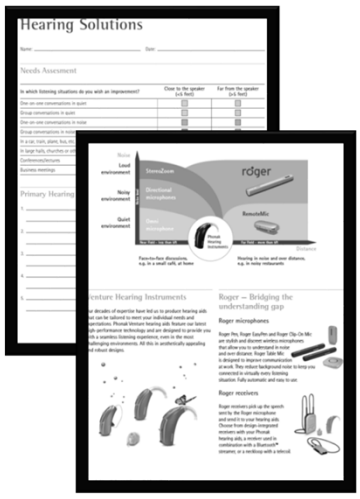
Subjective Needs Assessment | Objective evaluation | Solution and Outcomes



OUTCOMES

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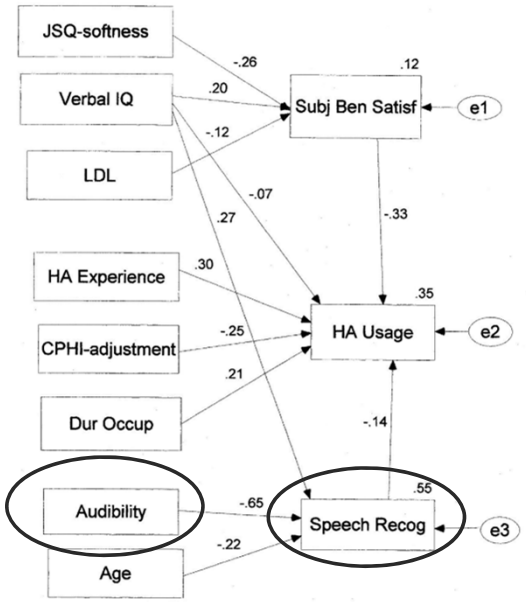
Indicators for Aided Speech Recognition



Humes et. al IU1 (2003)

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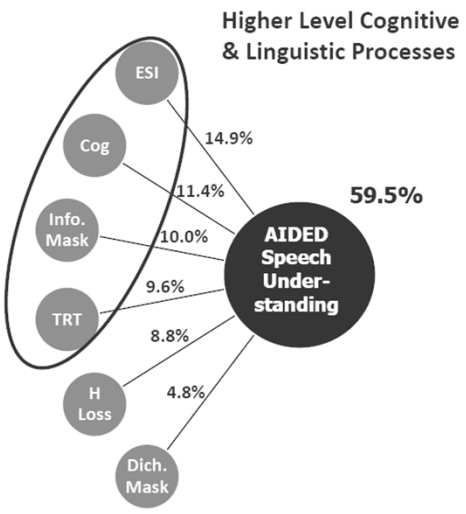
Individual Differences in Aided Speech Understanding

- Factor analysis of individual differences found that higher level cognition and linguistic differences were the strongest predictors of aided speech understanding after audibility has been confirmed.
- Researchers within VA and others are looking at the potential to include working memory tasks into clinical protocols as a predictor of aided speech understanding and benefaction.



Variables NOT Entering:
- Mod Detection
- Stream Segregation
- Age

Humes et. al Complex (2015)

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Audibility does not guarantee understanding...

but the lack of it ensures that little to nothing will be **understood**

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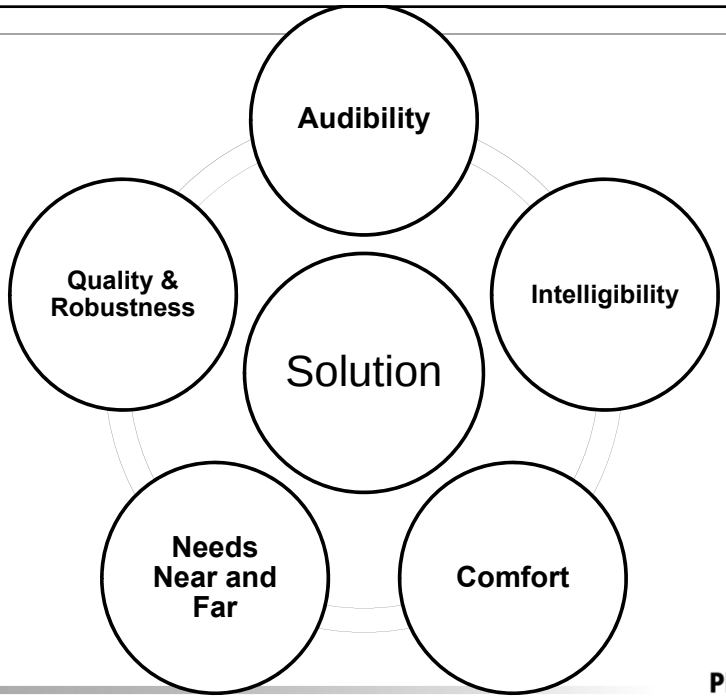
Building a solution



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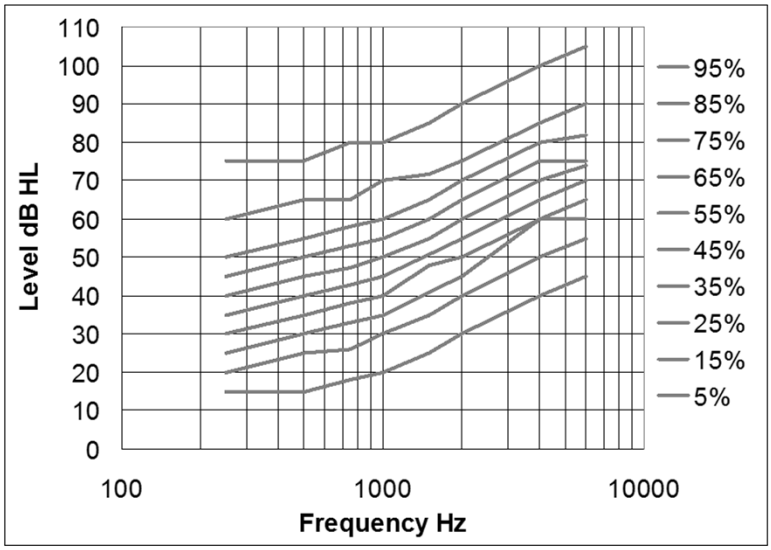
Audibility loss by frequency



Hearing loss is more prominent with high frequencies

Level percentiles of 8249 audiograms; Cuper 2012

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The importance of high frequency information

- **High frequency amplification:**
  - supports language development in children
  - enables clear speech for both children and adults
  - contributes to speech understanding
- **The contribution of /s/**
  - 3rd or 4th most frequently occurring consonant in English
  - Multiple linguistic uses
    - Plurality of nouns (cat; cats)
    - Third person present tense (I eat; she eats)
    - Tense (She put it on; She puts it on)
    - To show possession (That is Mike's)
    - Possessive pronouns (Is that Beth? Is that Beth's?)

Stelmachowicz, et.al JAAA 2004

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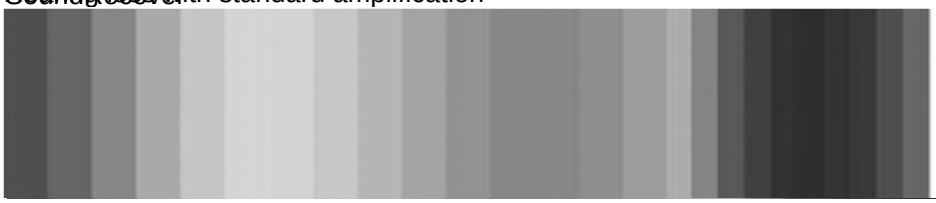
Frequency lowering

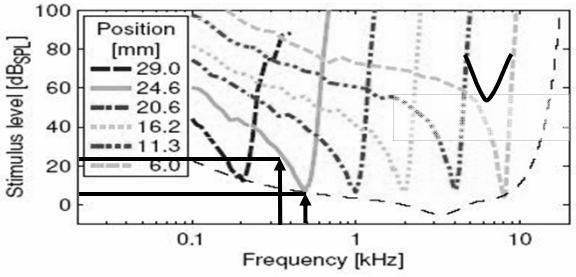
Hearing Loss with standard amplification

Sound Recover



Extensive data have found:

- Improved audibility of high frequency sounds and better speech understanding
- Significant improvement in intonation and overall voice production
- Overcome high frequency receiver limitations



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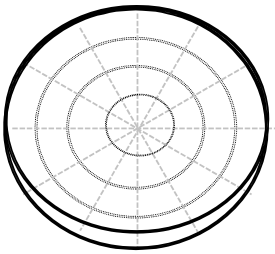
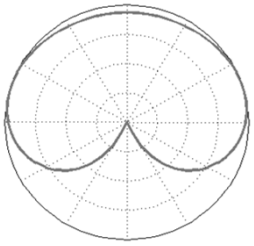
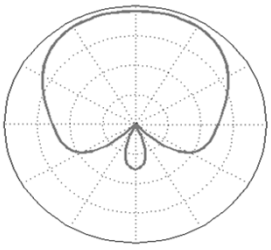
Intelligibility - beamforming



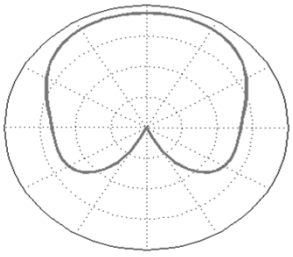
Real ear sound



Automatic Adaptive Beamformer



Binaural Automatic Beamformer



Binaural Automatic Adaptive Beamformer

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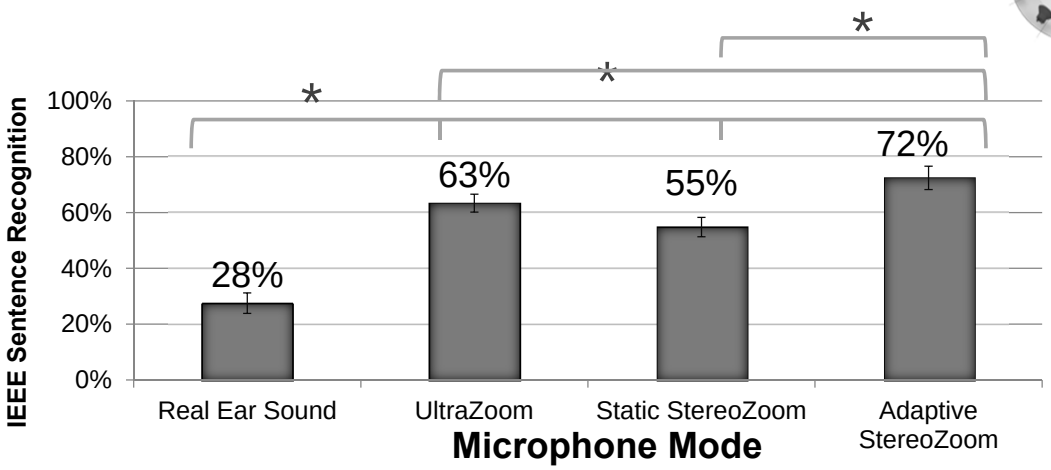
Microphone mode effect



*One way analysis of variance (ANOVA) revealed significant effect

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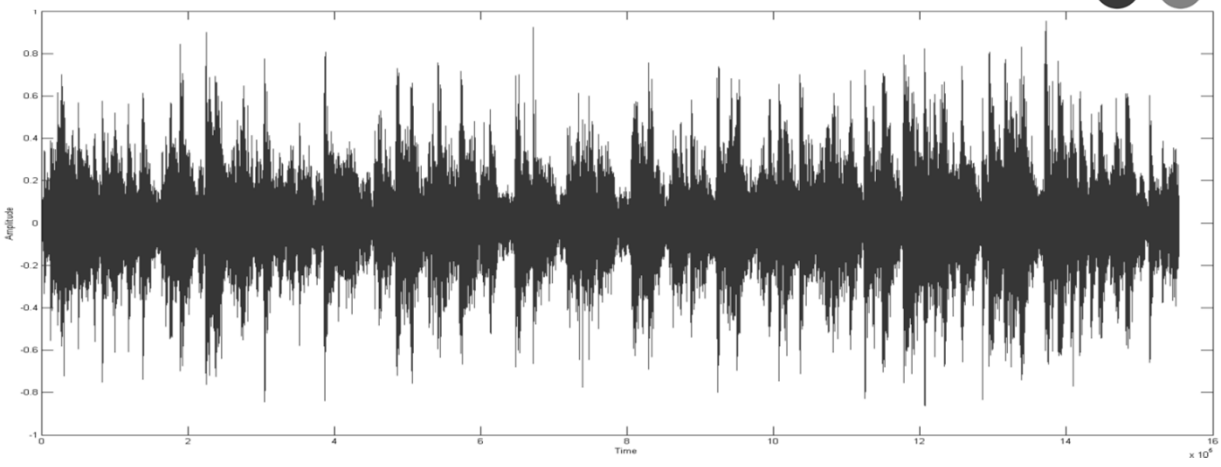
Comfort - Reverberation

EchoBlockreducesechoandprovideslisteningcomfortforpatientsinreverberantsituations.



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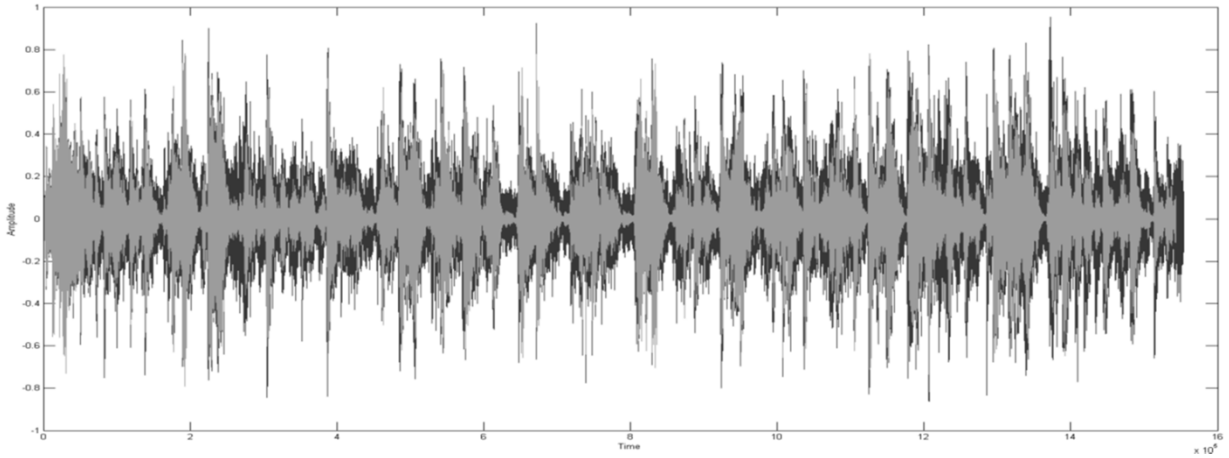
Comfort - Reverberation

EchoBlocklooksreducesechoandprovideslisteningcomfortforpatientsinreverberantsituations.

EchoBlock reduces echo and provides listening comfort for patients in reverberant situations.



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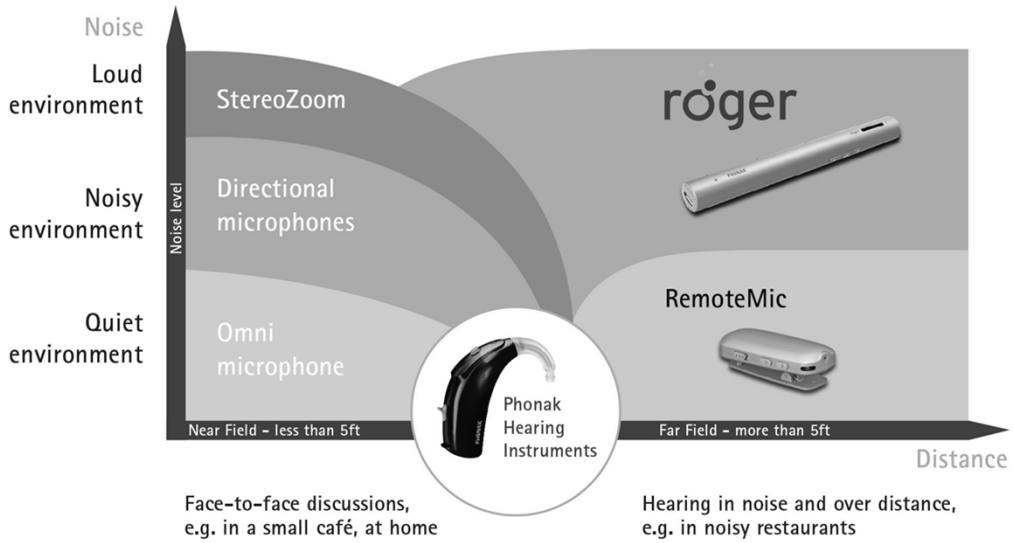
Solutions for Near and Far…in Quiet and Noise



Face-to-face discussions, e.g. in a small café, at home

Hearing in noise and over distance, e.g. in noisy restaurants

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Roger Receivers

Roger Design Integrated

Roger X

Roger MyLink

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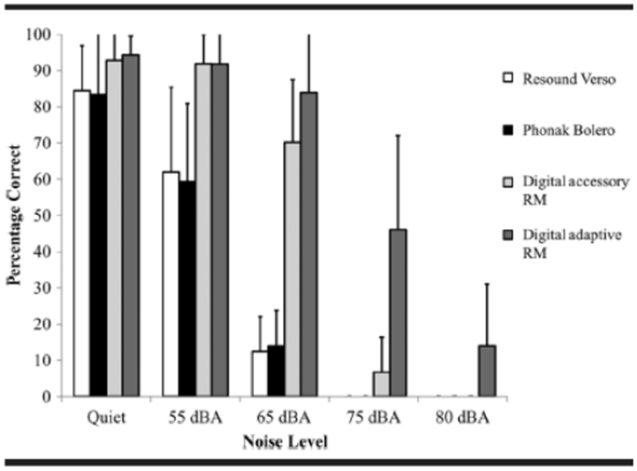
Evaluation of performance

Figure 3. Average performance across the four device conditions and five signal levels. Vertical bars represent 1 *SD*. RM = remote microphone.



Evaluation of Performance With an Adaptive Digital Remote Microphone System and a Digital Remote Microphone Audio-Streaming Accessory System

Jace Wolfe, Mila Morais Duke, Erin Schafer, Christine Jones, Hans E. Mülder, Andrew John, and Mary Hudson

+ Author Affiliations & Notes

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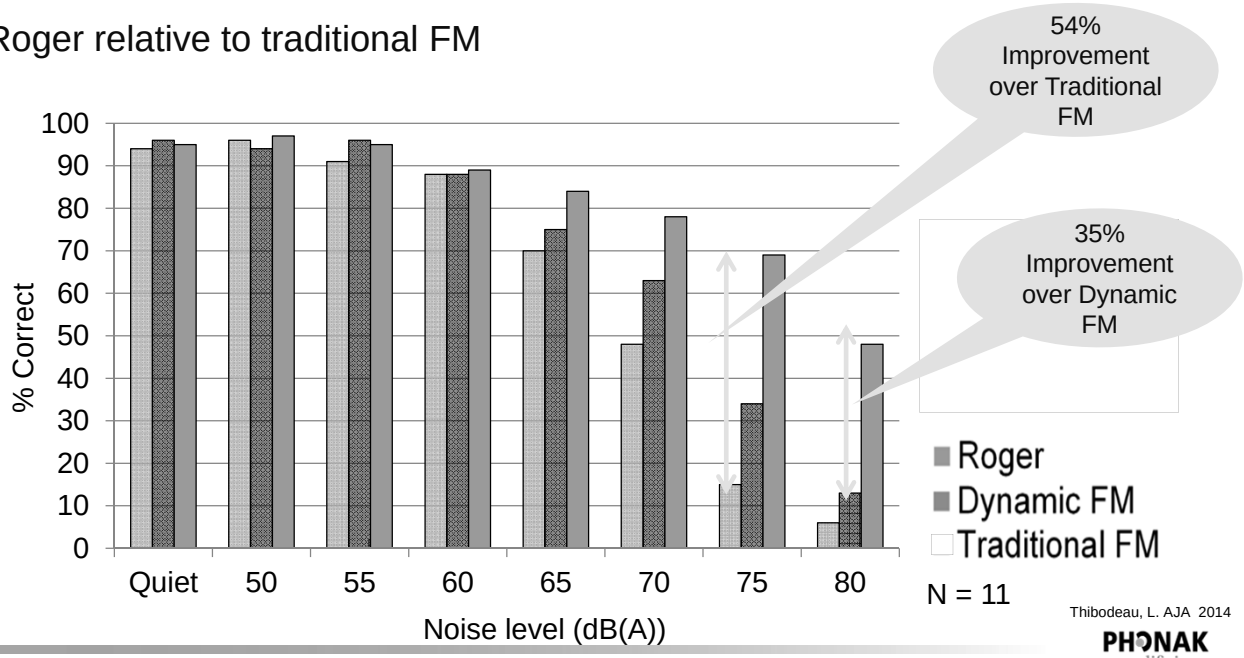
Roger relative to traditional FM



Thibodeau, L. AJA 2014

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Robust

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Quality & Robustness

Quality

- Vital importance as especially those with severe to profound losses are dependent on their hearing aids to perform
- Consider special working considitions

Robustness

- Housing material choices
  - Pressure test validation found that 60% more pressure was needed to damage the housing of the instrument compared to its predecessor.
- IP rating ingress protection

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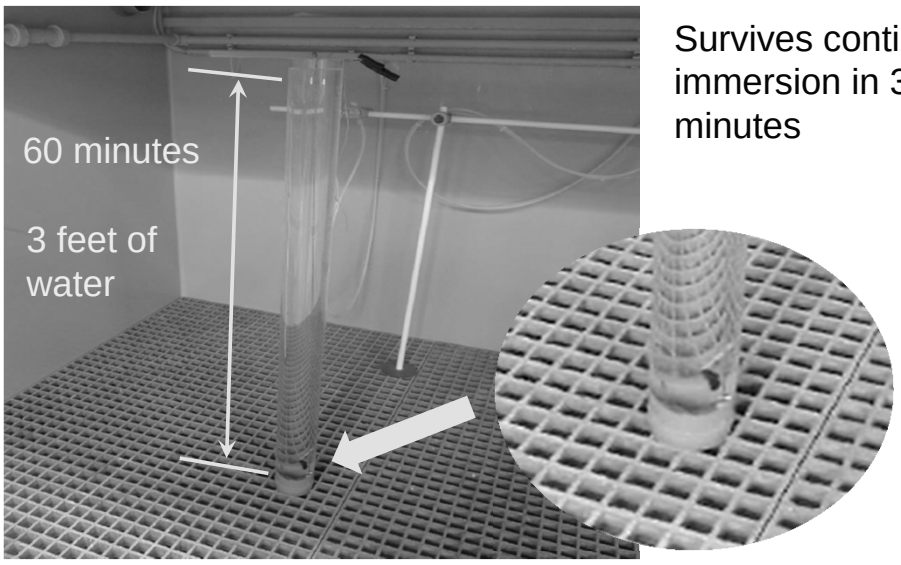
Ingress Protection rating (IP68)



Survives continuous immersion in 3 feet of water for 60 minutes

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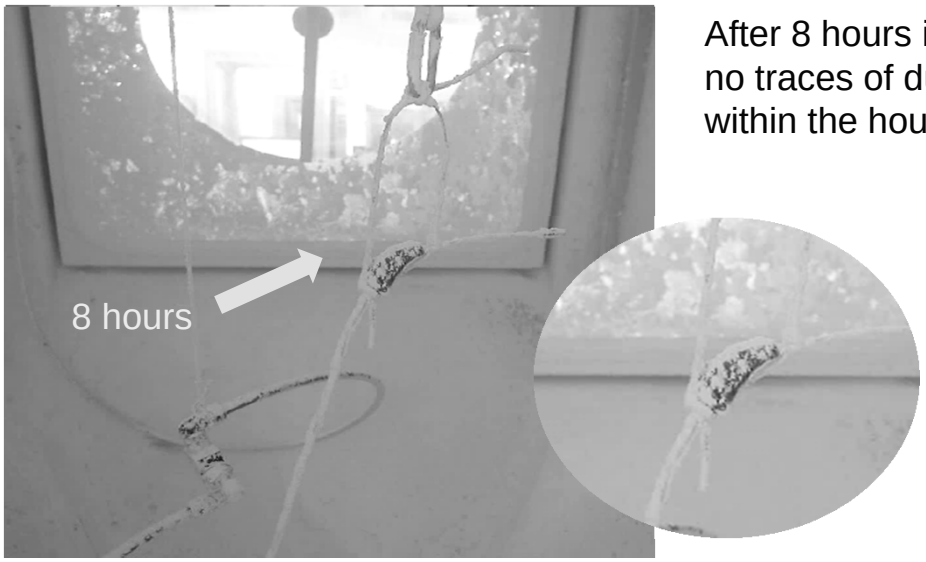
Naída V tested in the dust chamber (IP68)



After 8 hours in a dust chamber no traces of dust were evident within the housing

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A solutions approach

- A complete solution that is aimed to meet all the listening and communication needs.
- A single product solution is unlikely to meet all of their needs.
- Support encompasses *more* than just hearing aids and involves *more* than just the person with hearing loss.

Timing is everything: To drive adoption, the complete solution must be recommended at the same time.

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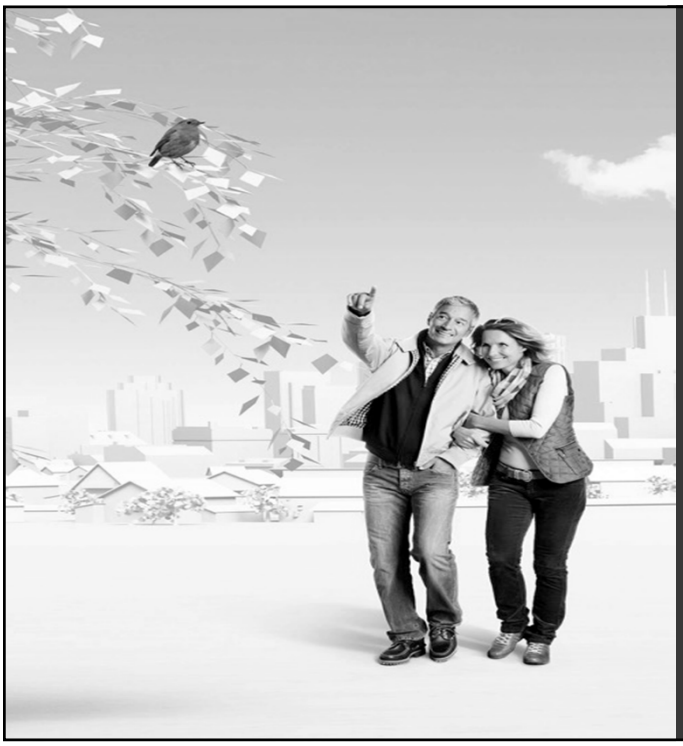

"In many ways patients with severe hearing loss are the most interesting we see, calling upon our skills as clinicians to develop assistive strategies, provide counseling, and think more creatively than the typical hearing aid fitting."

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