

# How Hearing Aids Enhance Human Performance

Improving Health-related Outcomes with Hybrid Devices

# Disclosures

## **BRIAN TAYLOR, AuD**

Senior Director, Audiology, Signia

Editor, Audiology Practices (ADA)

Editor-at-Large, HHTM blog

Adjunct Instructor, University of Wisconsin

Contact: [brian.taylor@wsa.com](mailto:brian.taylor@wsa.com)





# Key Questions

- What are health-related quality of life outcomes?
- Can (and should) QoL be measured clinically?
- What are hybrid devices?
- How can hybrid devices be used in a clinical practice?
- Why should you ignore the audiogram?

# Notable Quote

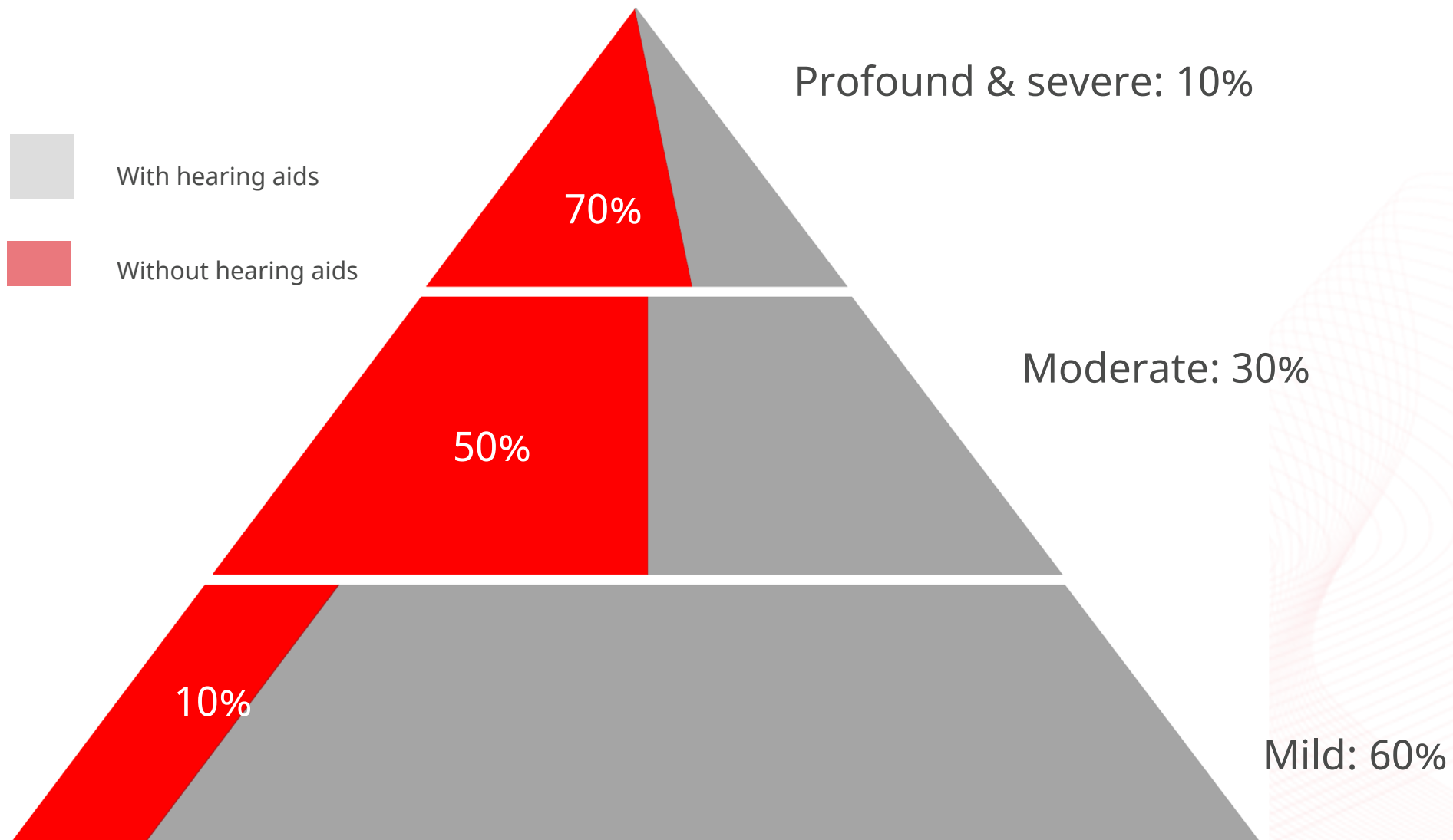
“The field of hearing aids is in rapid flux. Substantial changes in instrument design and performance are occurring. Our understanding of patient requirements and of the important criteria for instrument selection are becoming more definite. We may expect the confusion, which has clouded the field, to dissipate steadily.”



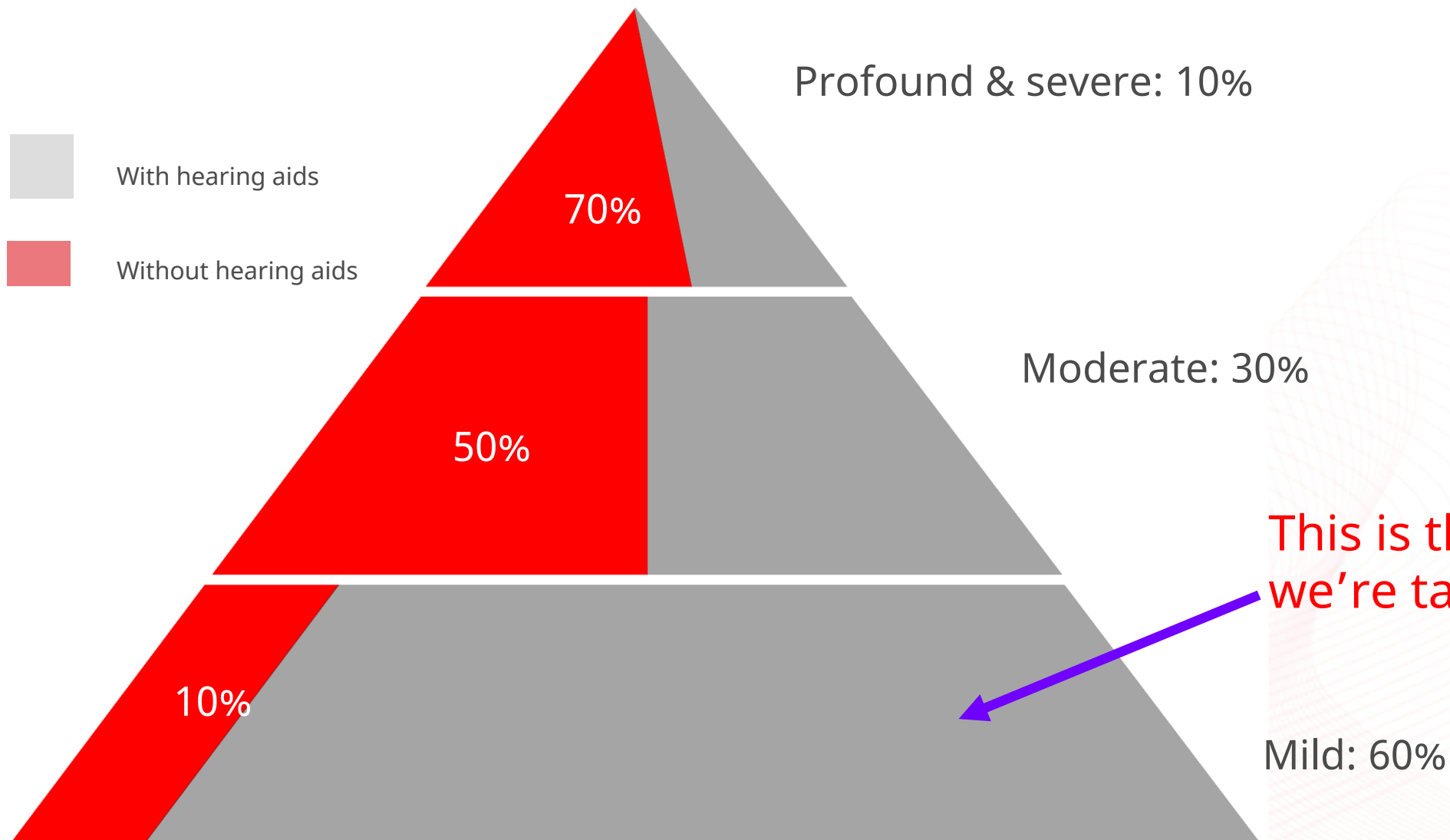
# Raymond Carhart, 1946



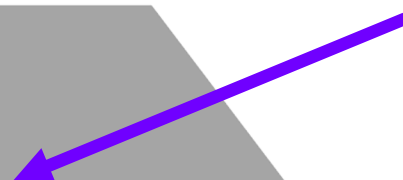
Stop me if you've seen this before.....







This is the group we're talking about today



# Uncovering New Patient Categories

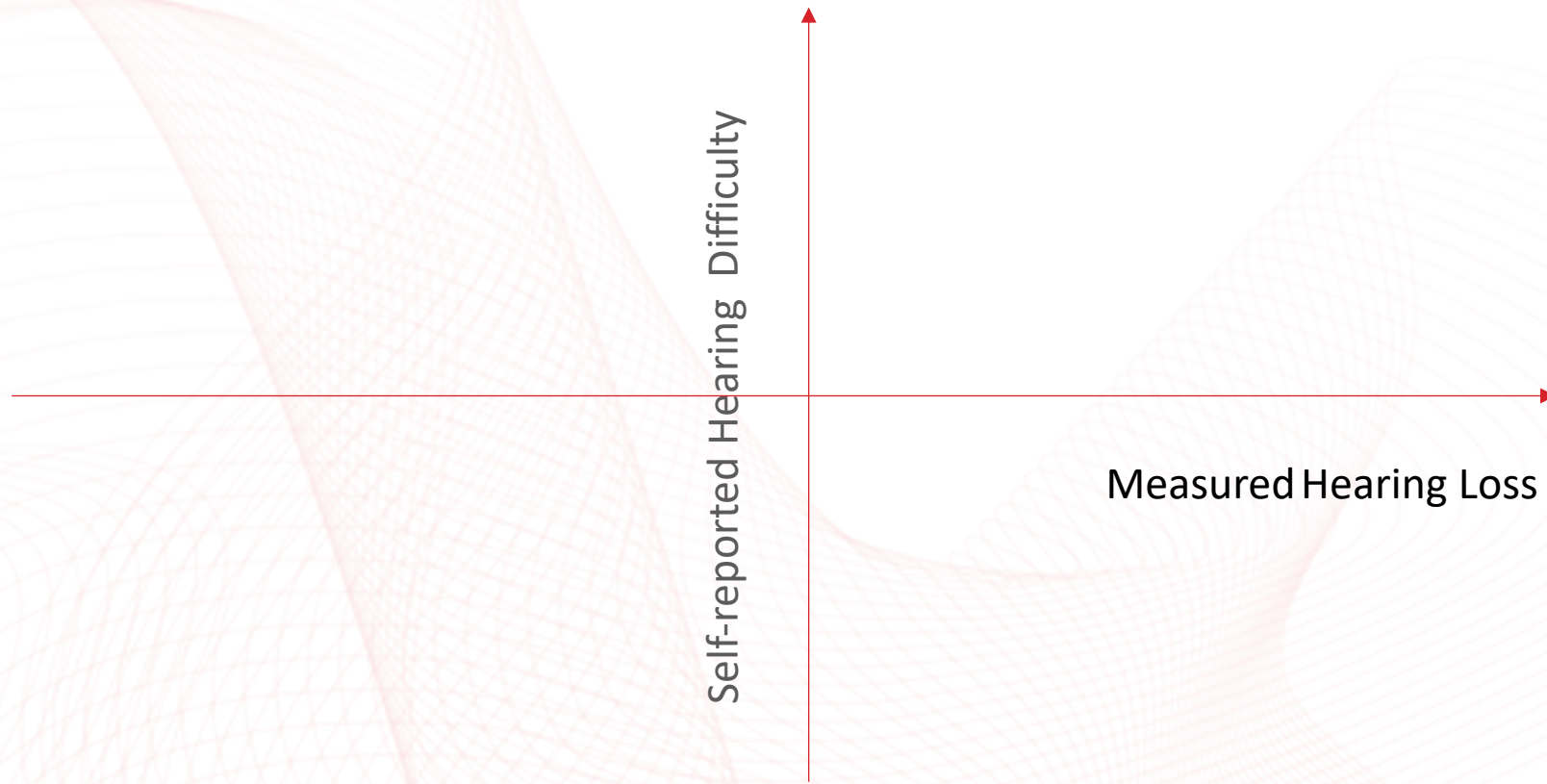


Self-reported Hearing Difficulty - “Normal Hearing”



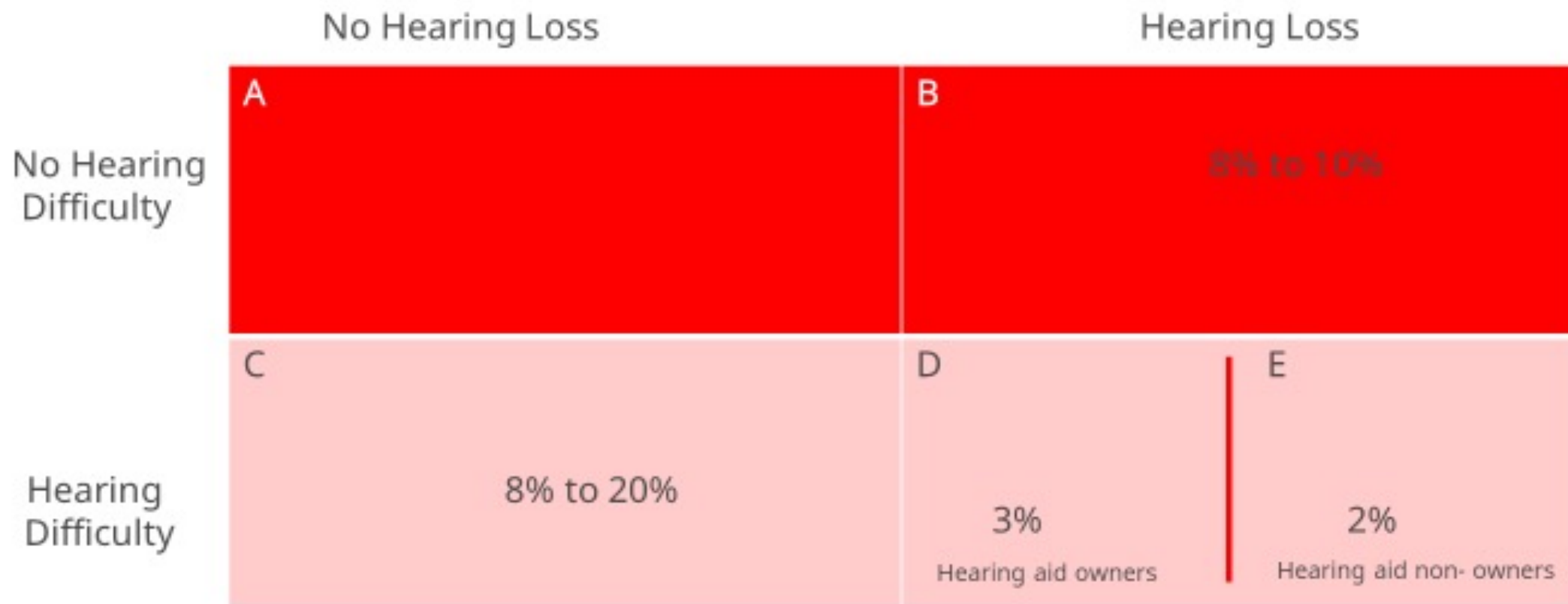
Measured Hearing Loss

# Unmet Needs of the Population





# Consumer Segments



% = total US population

Edwards, 2020



Imagine, it's Monday morning in your clinic





# Two patients of similar ages

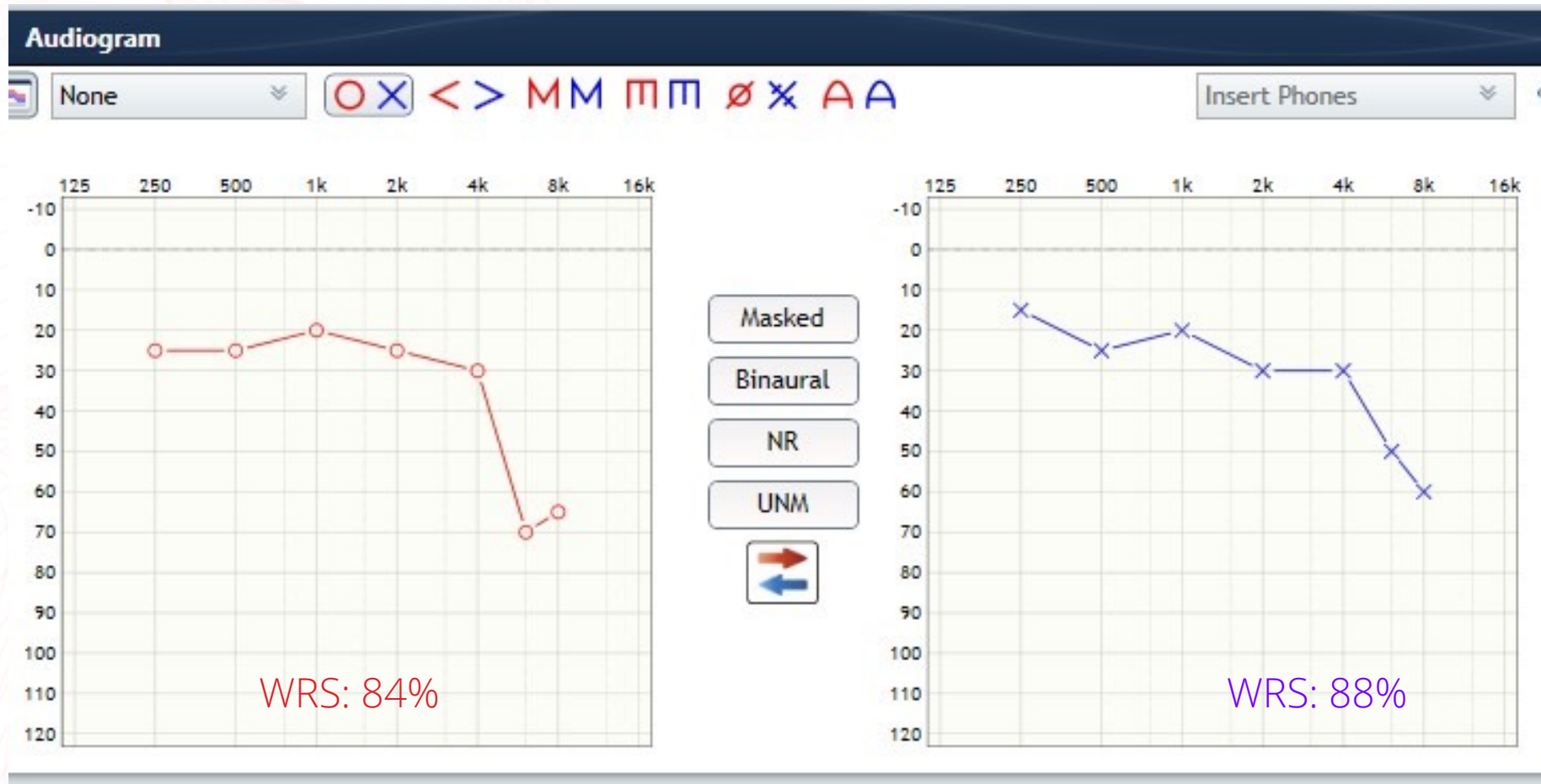
---

- Mary with her husband, Al
- Debra





# Similar Test Results



How would you describe their conditions?

# How would you describe their conditions?

- Mild loss?
- Normal hearing?







# Different Functional Status

- **Mary:** reports difficulty in social situations but able to maintain high activity levels. *"Hearing trouble doesn't slow me down."*
- **Debra:** reports occasional problems hearing in noise. *"I am starting to avoid situations. I'm embarrassed that I miss so many words – Sometimes I just don't feel part of the group."*



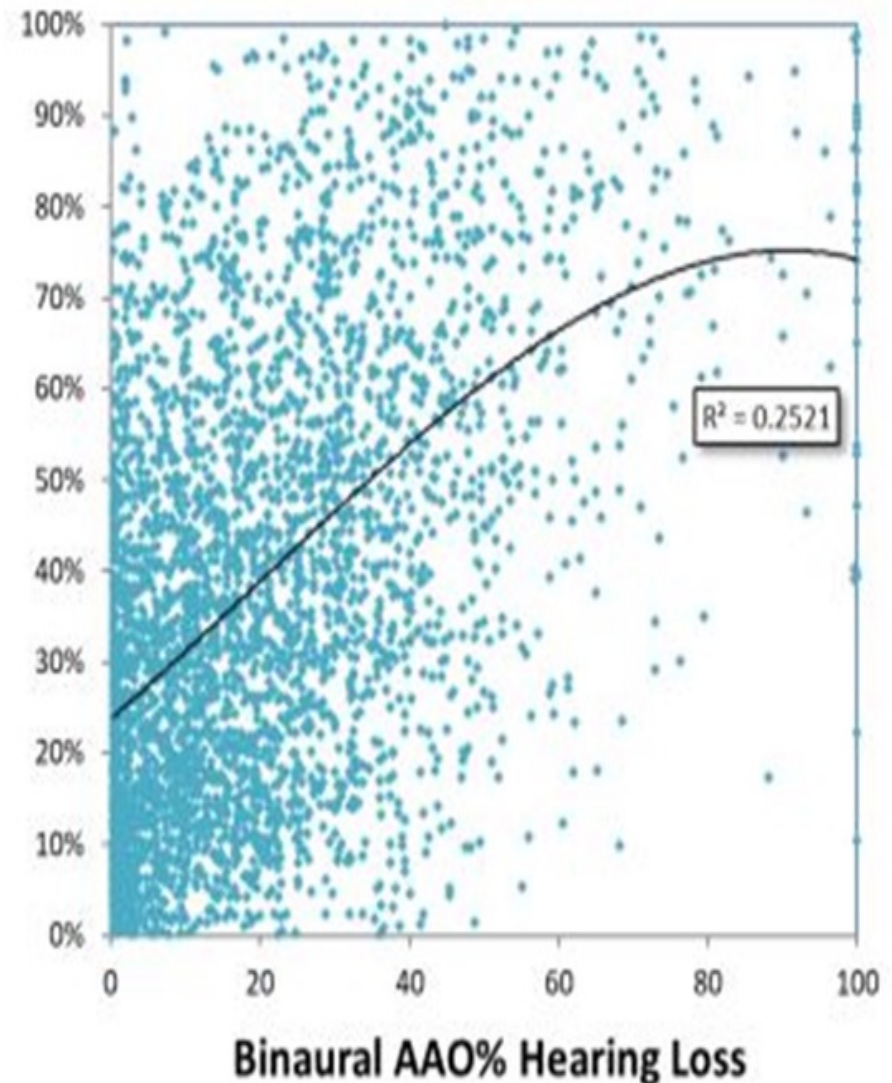
HHIA scores from 5333 patients with age or noise related hearing loss.

The higher the HHIA score, the greater the self perceived hearing difficulty.

Notice the variation in HHIA scores in individuals with 0% AAO Hearing Impairment.

Sometimes hearing difficulties can occur with little or no hearing loss.

**HHIA**



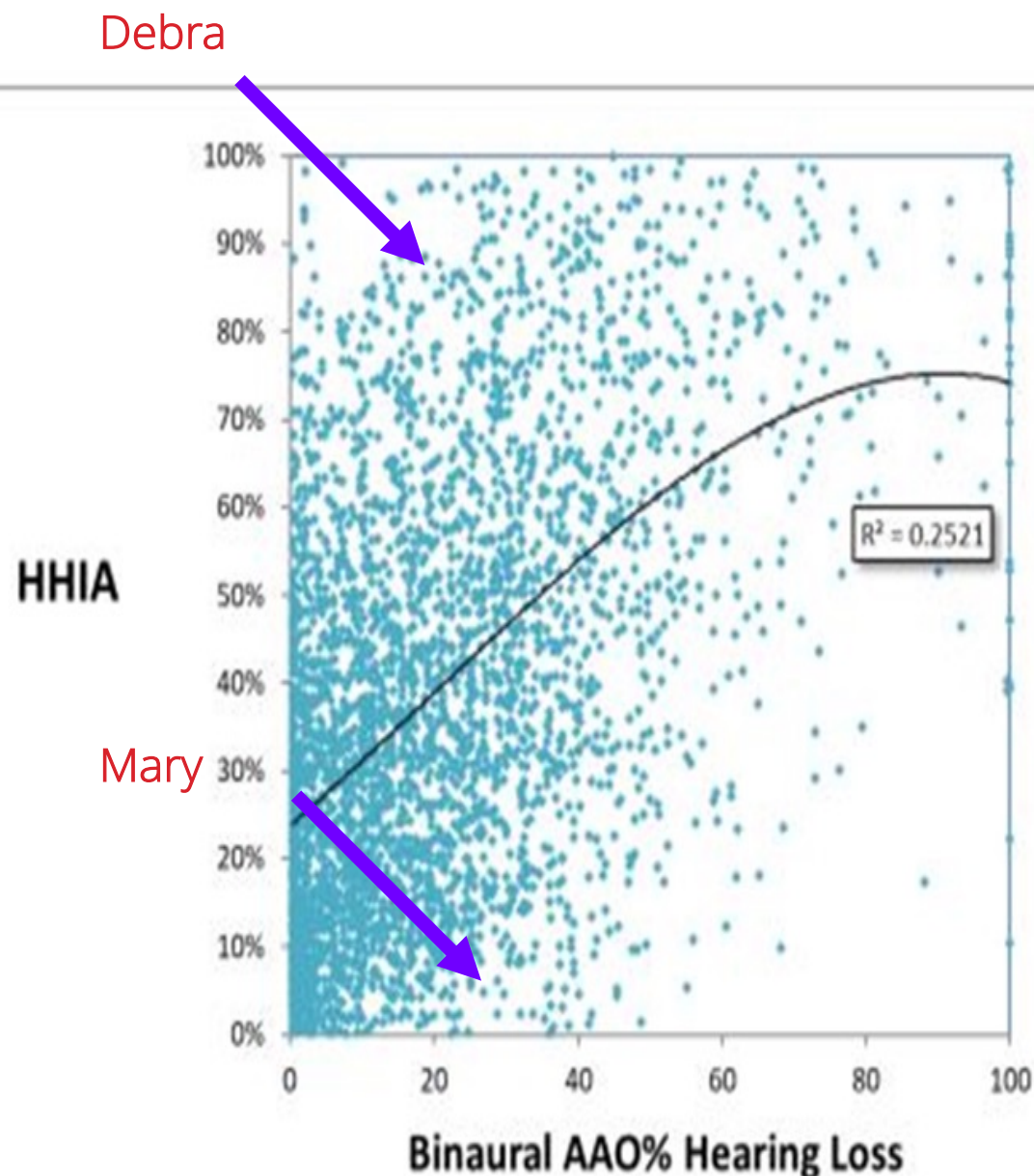


HHIA scores from 5333 patients with age or noise related hearing loss.

The higher the HHIA score, the greater the self perceived hearing difficulty.

Notice the variation in HHIA scores in individuals with 0% AAO Hearing Impairment.

Sometimes hearing difficulties can occur with little or no hearing loss.





# Functional Status

1. Ability to participate in daily activities
2. Health-related quality of life



# What is Health- Related Quality of Life?

signia | Audiology





“Age-related hearing impairment is emerging as a potential risk factor for a broad range of poor health-related quality of life outcomes in older adults.”

*Does Hearing Impairment Affect Physical Function? Current Evidence, Potential Mechanisms, and Future Research Directions for Healthy Aging*

Brenowitz & Wallhagen

*JAMA Network Open*. 2021;4(6):e2114782. doi:10.1001/jamanetworkopen.2021.14782 ,) June 25, 2021



# Quality of Life has many names

- Health-related quality of life
- Wellness or wellbeing
- Perceived health
- Functional health status
- Auditory wellness



# Quality of Life

- “Multidimensional Construct Involving Physical, Mental, Emotional, And Social Function”
  - US Dept of Health and Human Services
- The *Ultimate Outcome* -- it captures well-being and independence



A man with dark hair and a light beard is shown from the chest up, looking upwards and to the right with a thoughtful expression. His right hand is resting on his chin. The background is a collage of handwritten text and drawings in black ink on a white surface. Visible text includes "EXCUSE ME", "WHAT!", "NO WAY!", "ow?", "What ME", "here", "NO WAY!", "who", "he", "ow?", "WHAT!", "No way", "WHO", "YUP.", "What ME", "here", "NO WAY!", "who", "he". There are also some scribbles and a large question mark. The overall theme is one of confusion or deep thought.





## OLDEST PLAYERS TO THROW TD PASS

NFL POSTSEASON HISTORY

**TOM  
BRADY**

**43 YEARS, 159 DAYS**

► TONIGHT

**GEORGE  
BLANDA**

**43 YEARS, 108 DAYS**

► 1970 AFC CHAMPIONSHIP GAME



# 1980s vs. 2021 Senior Living

1981

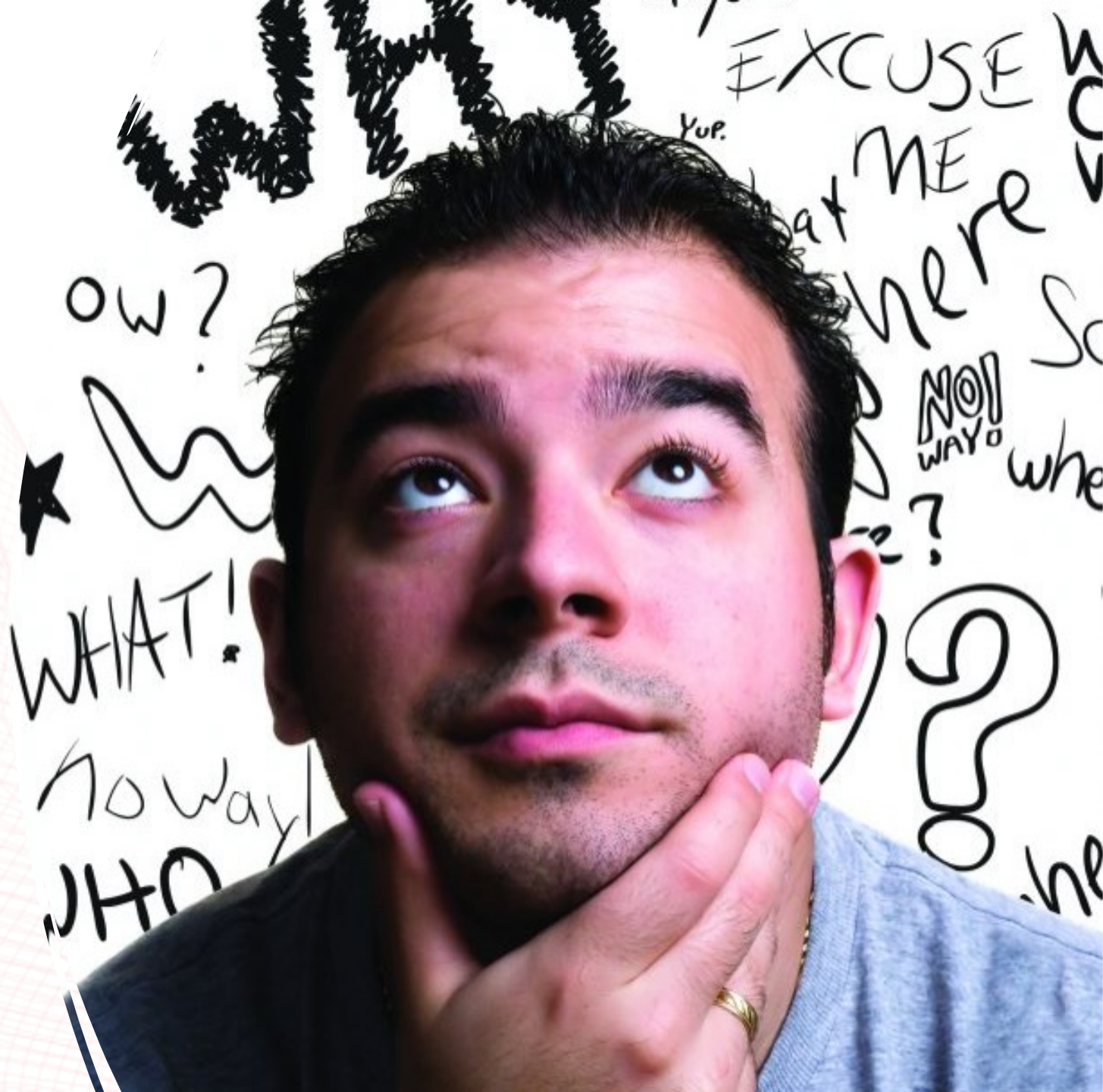


2021



Maybe have heard that 80 is the new 50!

# How is hearing loss related to Quality of Life?





# Hearing Loss and Quality of Life: The Big Picture





# Three population-based studies

## 1. 2003 study from the Beaver Dam group:

- Greater levels of hearing loss were equated with poorer overall QoL

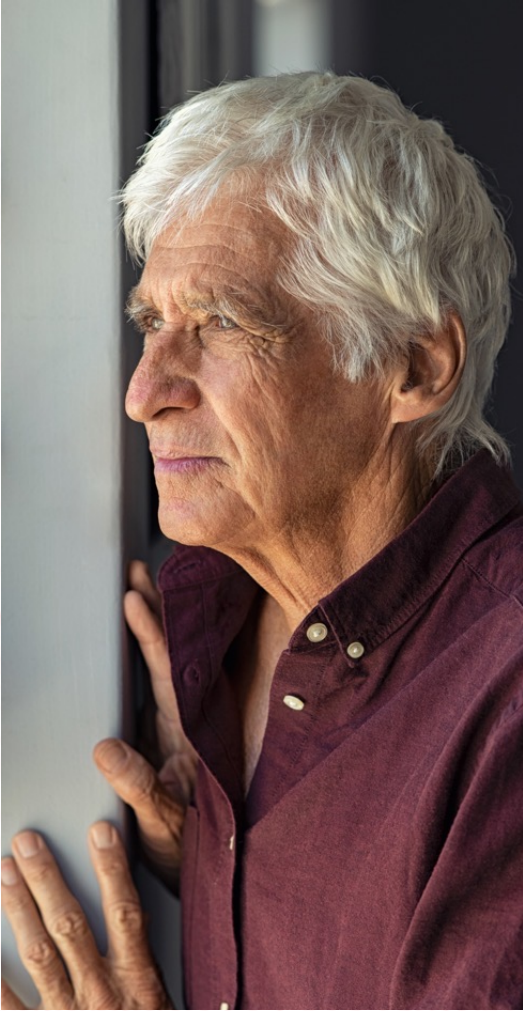
## 2. 2007 study from the Blue Mountains group showed similar findings:

- The greater the hearing loss, the poorer the overall QoL scores.

## 3. 2012 Italian study indicated:

- One-third of people with HL report fair to poor health, compared to just 9% with normal hearing reporting fair to poor health.

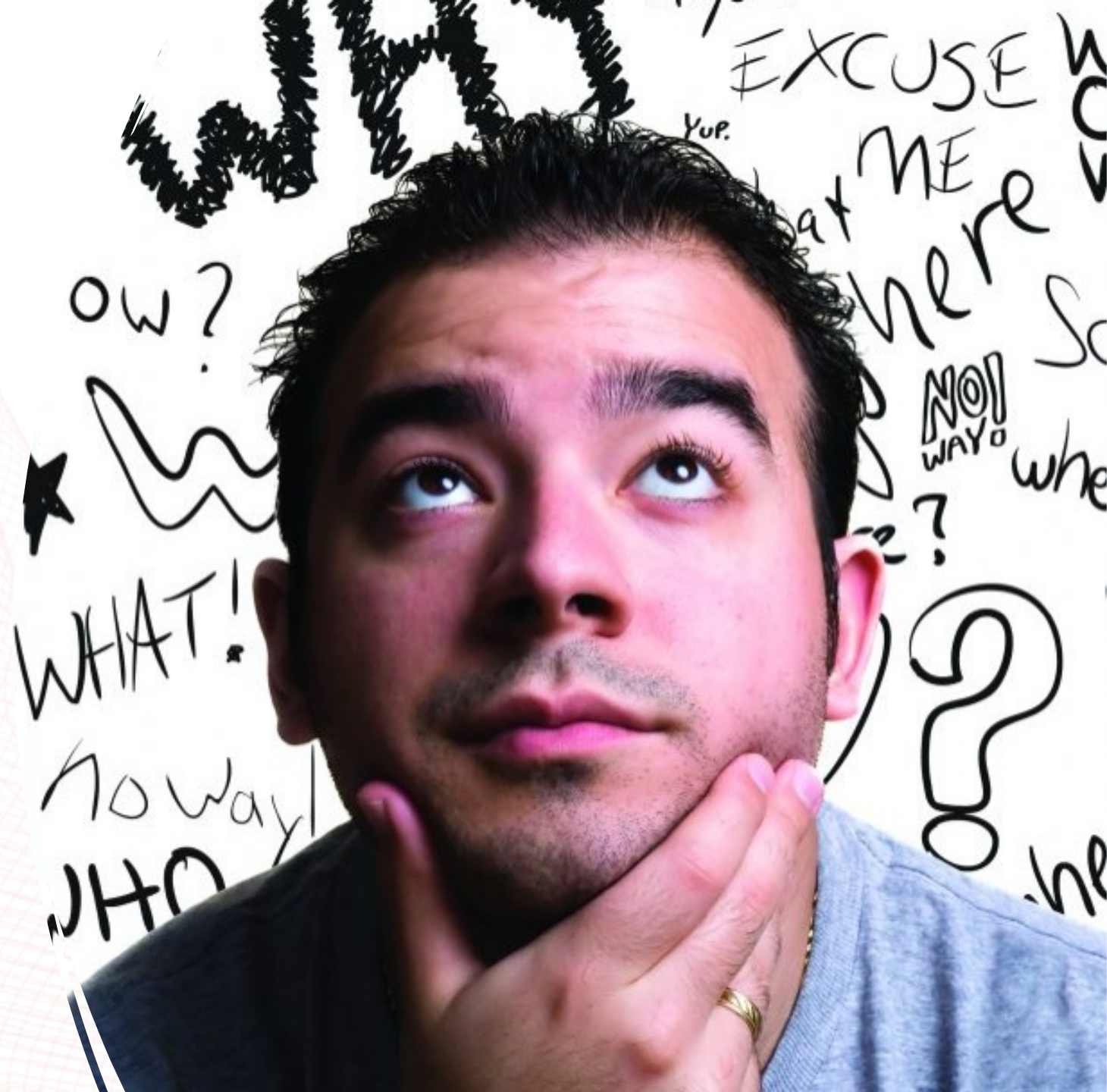
# Clinical limitations of those studies



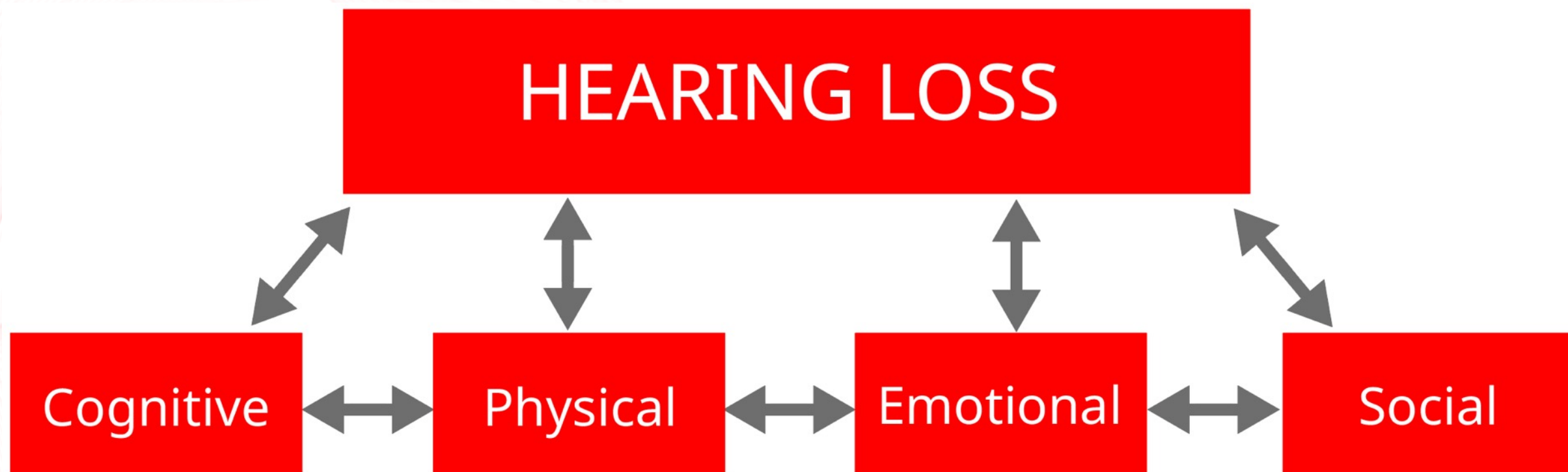
- Used large sample sizes
- Conducted dozens of tests and self-reports



How can I  
think about  
Quality of  
Life in the  
clinic?

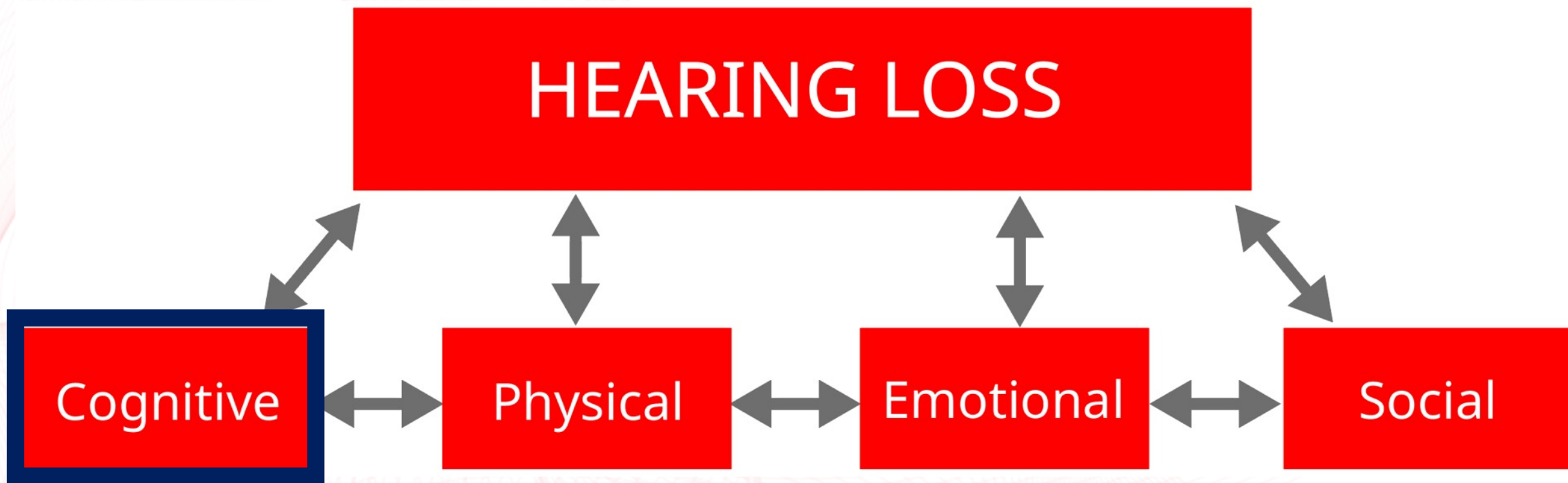


# Four Quality of Life Factors





# Let's Take a Closer Look....





# Hearing loss and cognitive ability

Landmark 2011 study:

- Mild losses: 2-fold or 100% increased risk of dementia.
- Moderate losses: three-fold or 200% increased risk of dementia.
- Severe losses: five-fold or 400% increased risk of dementia.

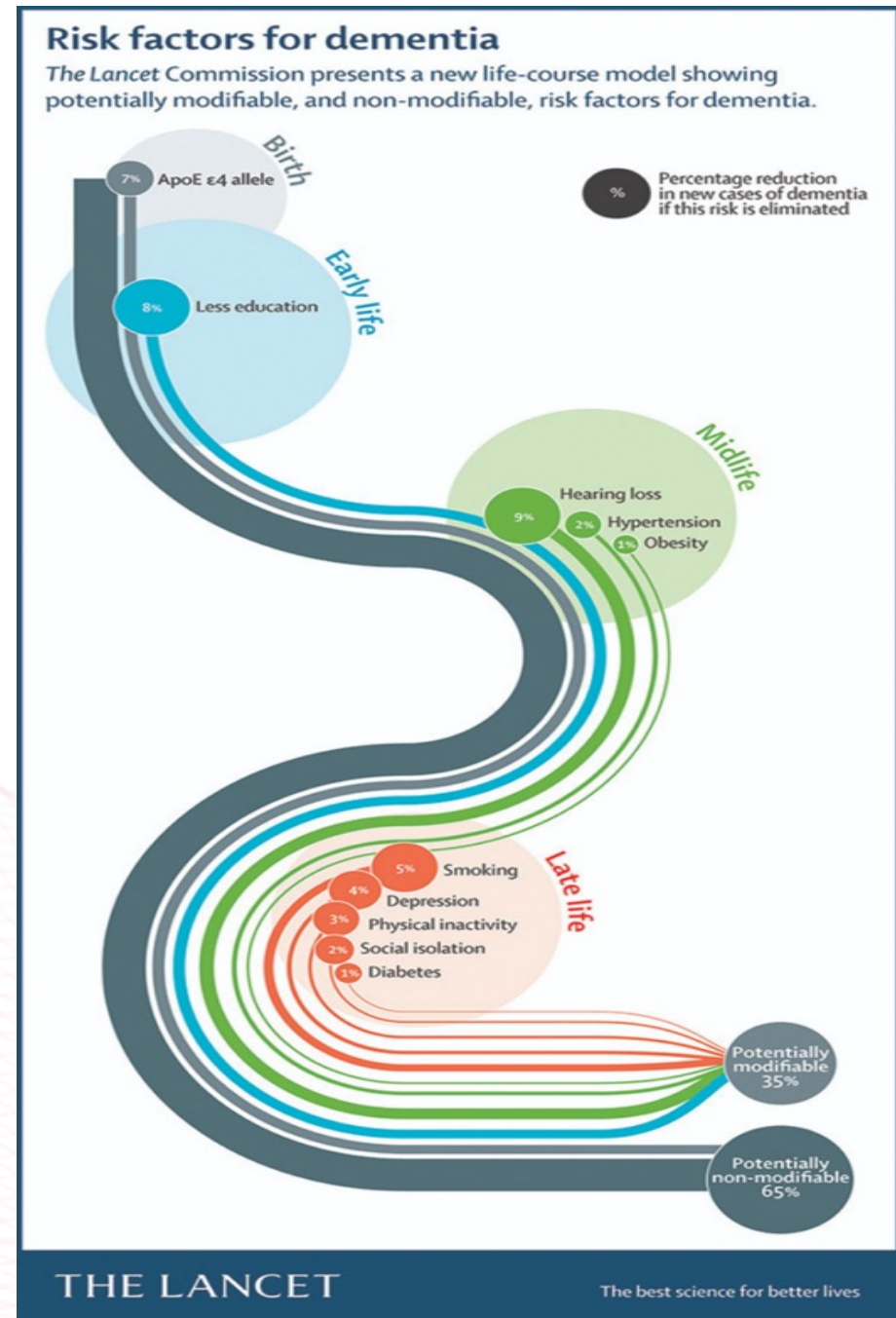
# Why the link?

- 3 theories
- 1 consideration



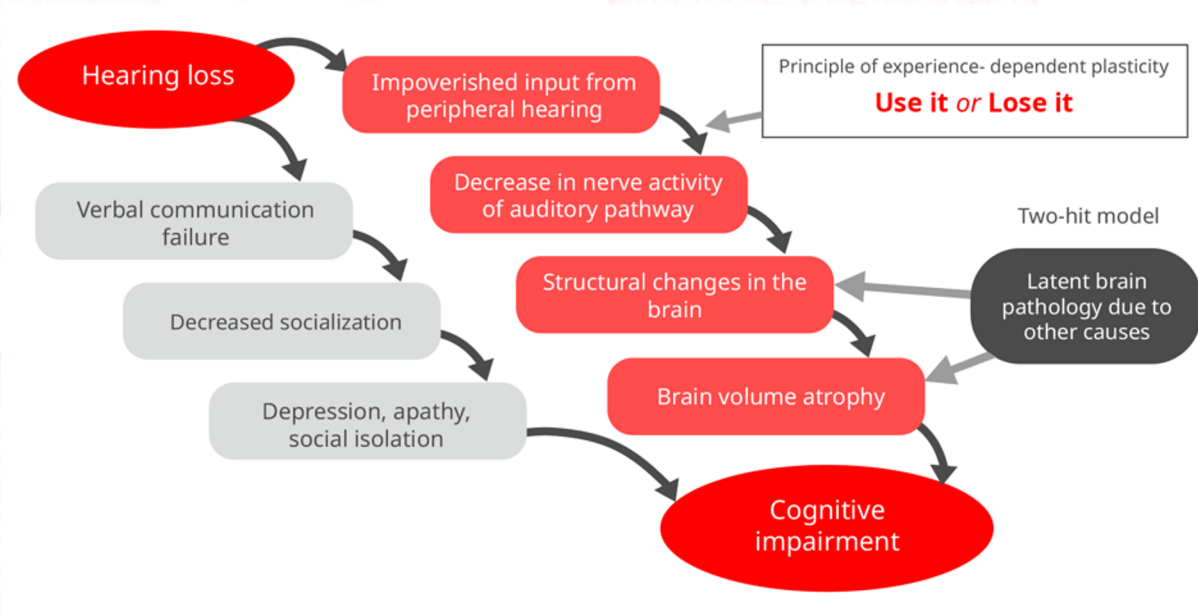
# One Consideration

- Sense-Cog Group, Lancet 2019
- 35% of the causes of dementia are modifiable based on 10 different factors
- Hearing loss in mid-life is the highest, accounting for 9%, or 25% of all modifiable factors.



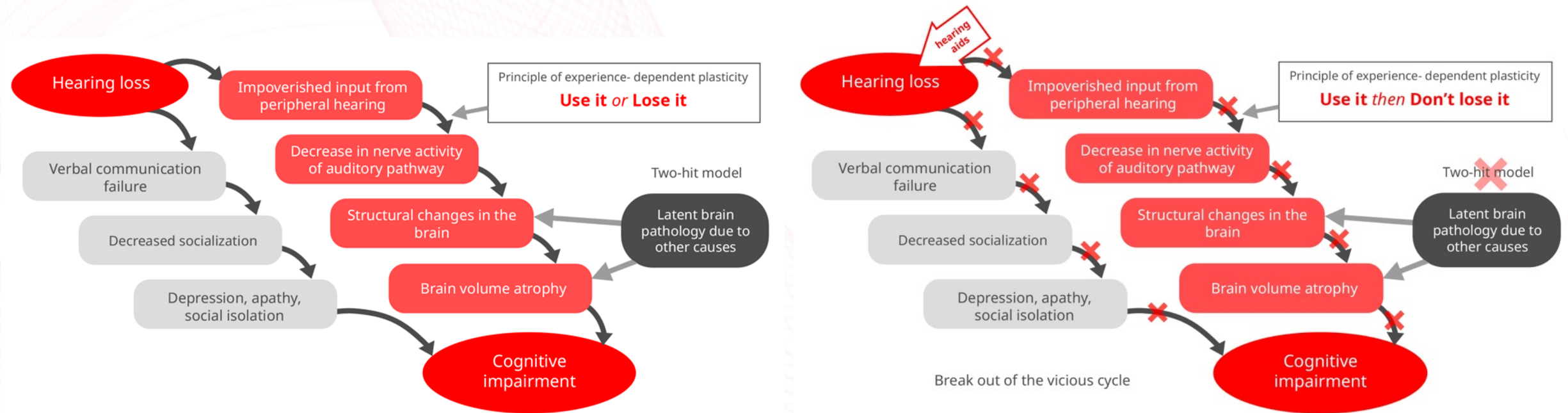
# Cascade Theory

The harm related to hearing loss can cascade directly or indirectly, leading to cognitive impairment.

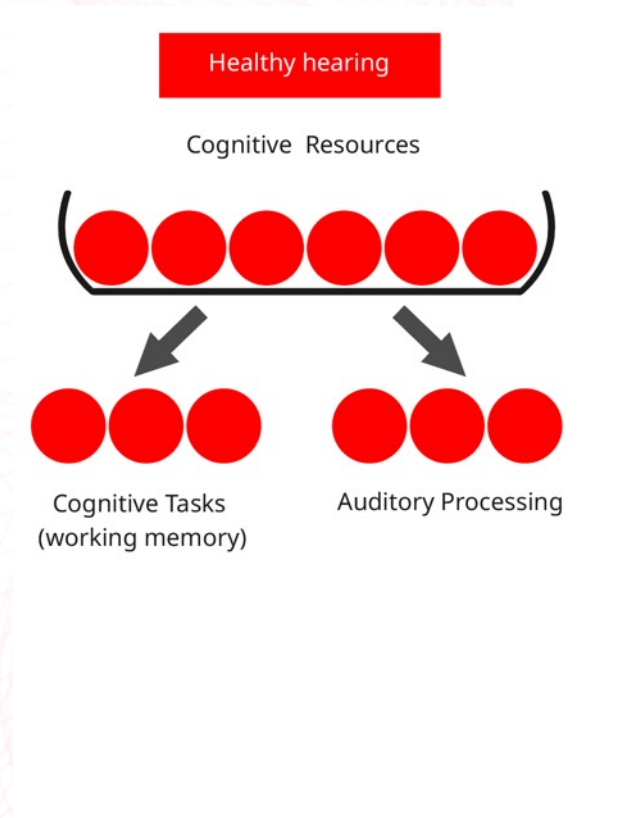




# Cascade Theory + Hearing Aids

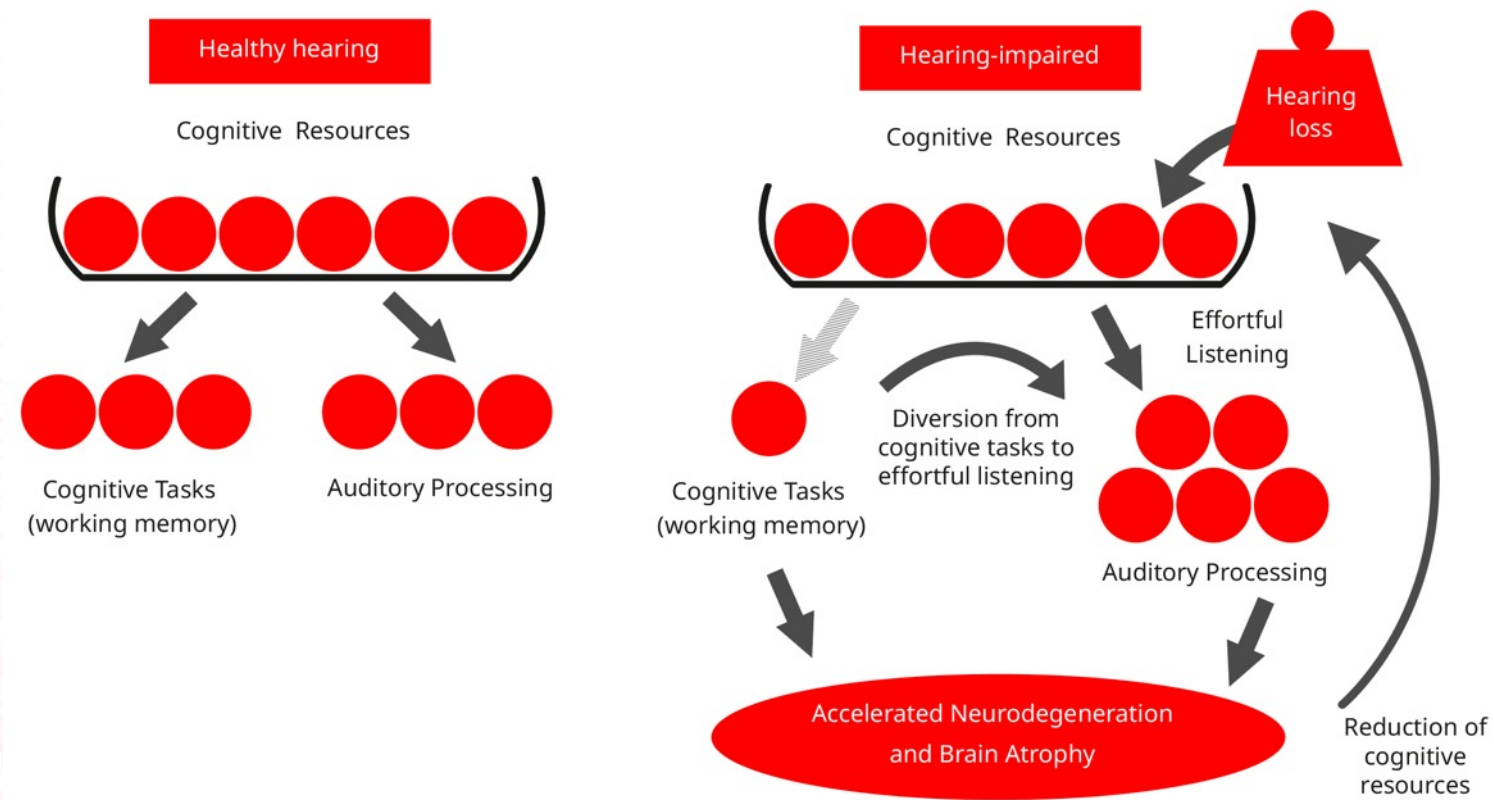


# Cognitive Load Theory

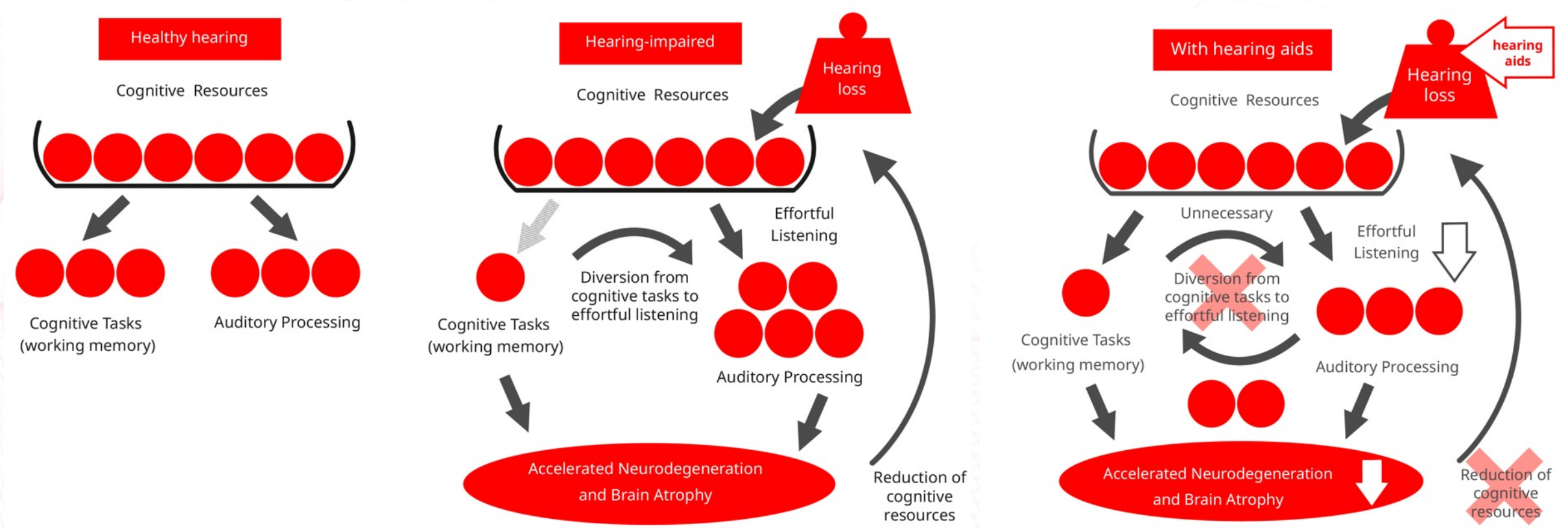




# Cognitive Load Theory



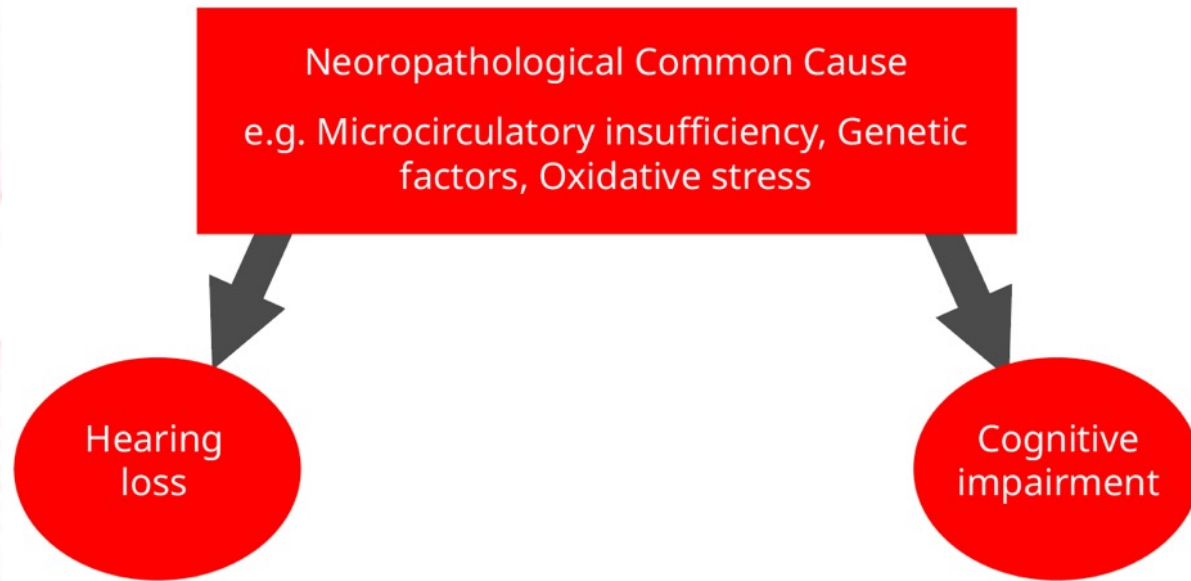
# Cognitive Load + Hearing Aids



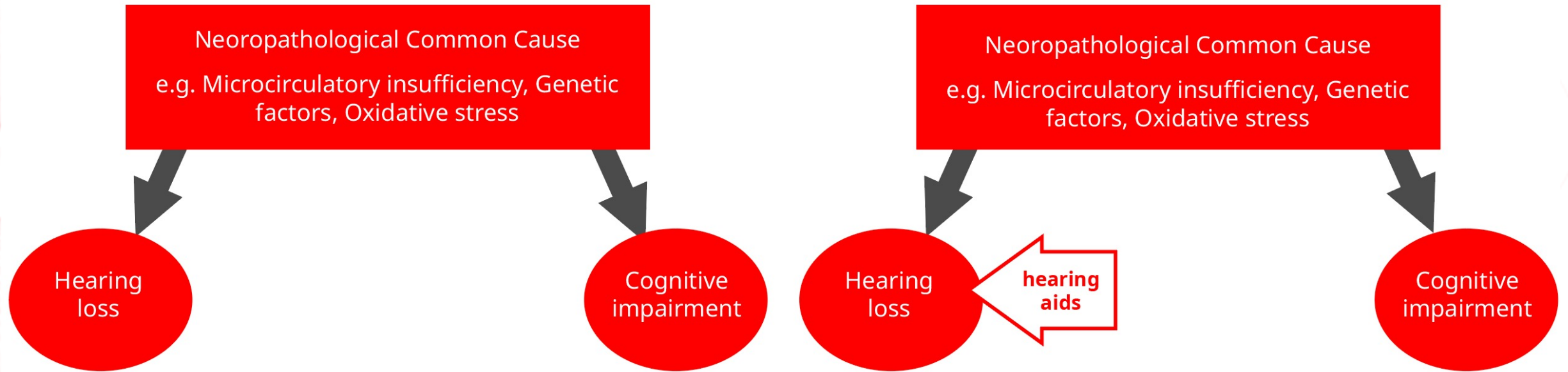


# Common Cause Theory

Both hearing loss and cognitive impairment are the result of a common neurodegenerative process in the ageing brain. In this mechanism, one does not cause the other.

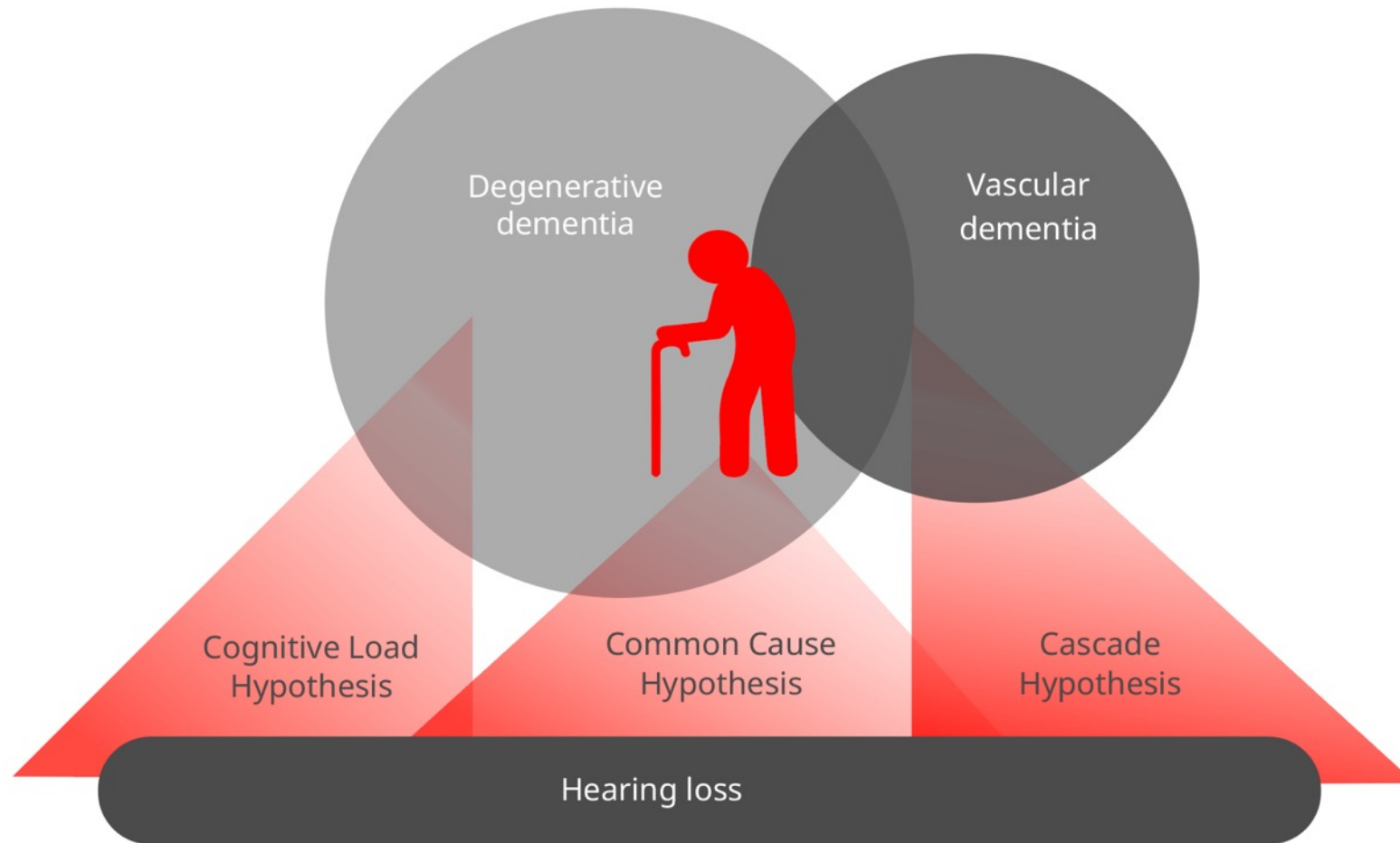


# Common Cause + Hearing Aids

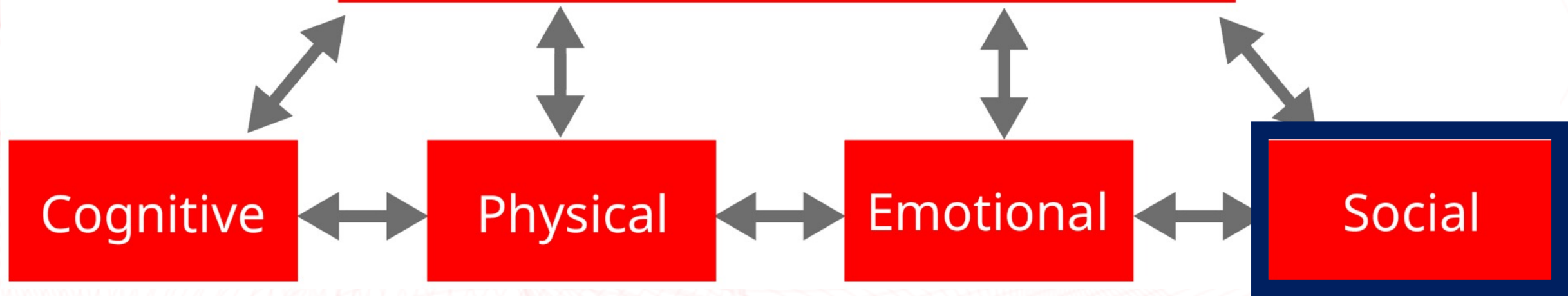




# Hearing Loss & Cognitive Decline: Big Picture



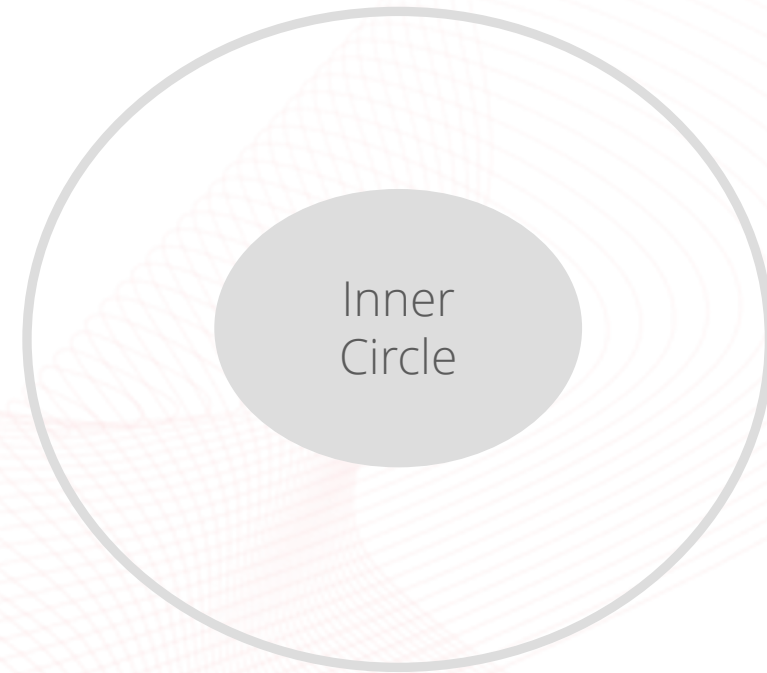
# HEARING LOSS





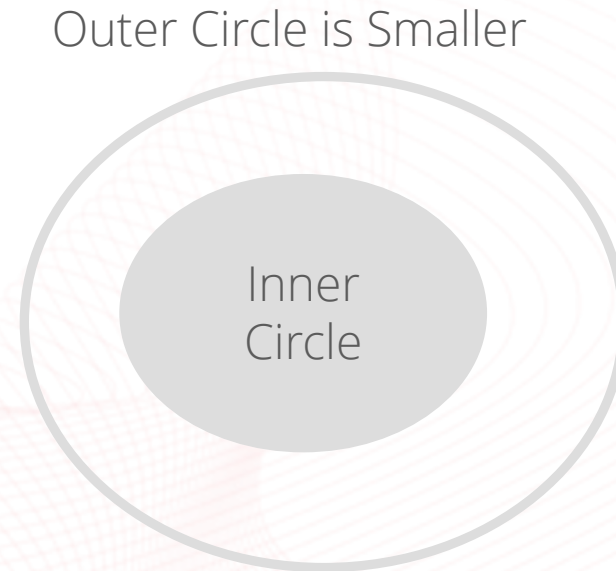
# Convoy Theory

- Everyone has an inner circle of friends and family they carry with them through life
- And an outer circle of friends, colleagues, acquaintances that are part of your life for periods of time (come and go)



# Convoy Theory

- People with hearing loss tend to have a smaller outer circle

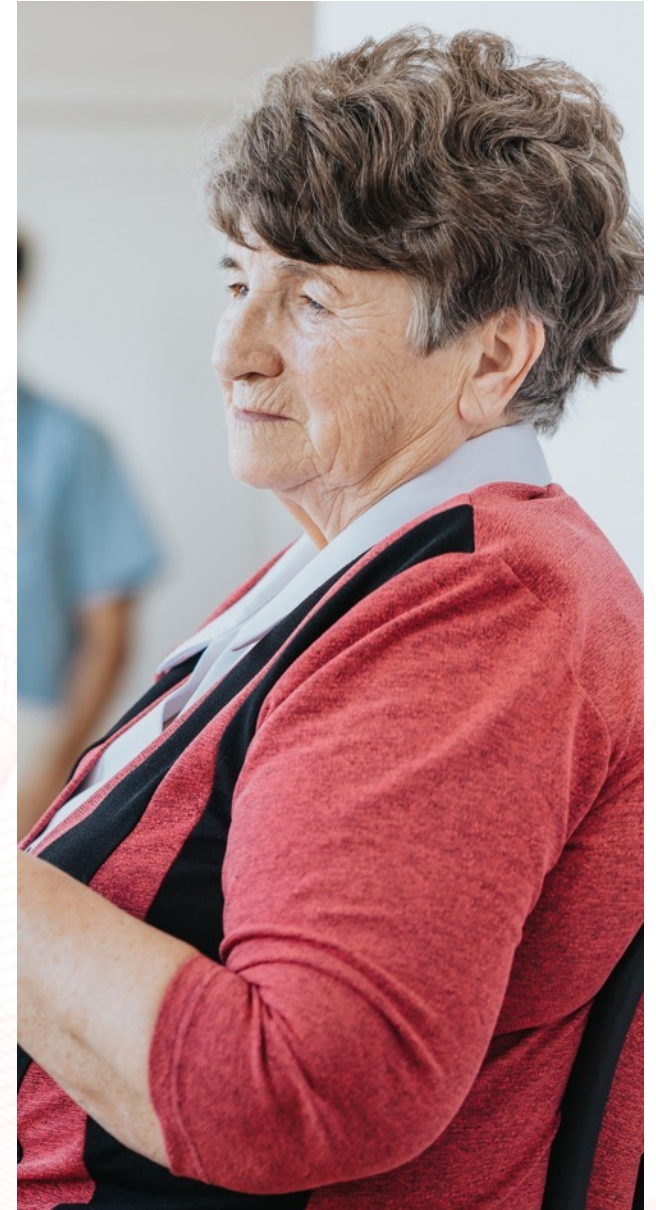




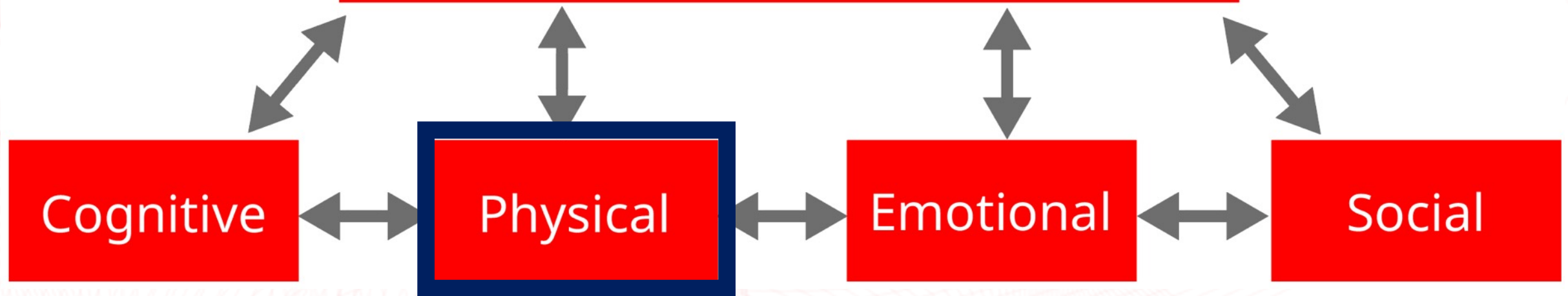
# Social Health And Hearing Loss

Several studies show that persons with hearing loss are prone to:

1. Social isolation
2. Express greater levels of loneliness (the emotional consequence of being socially isolated).



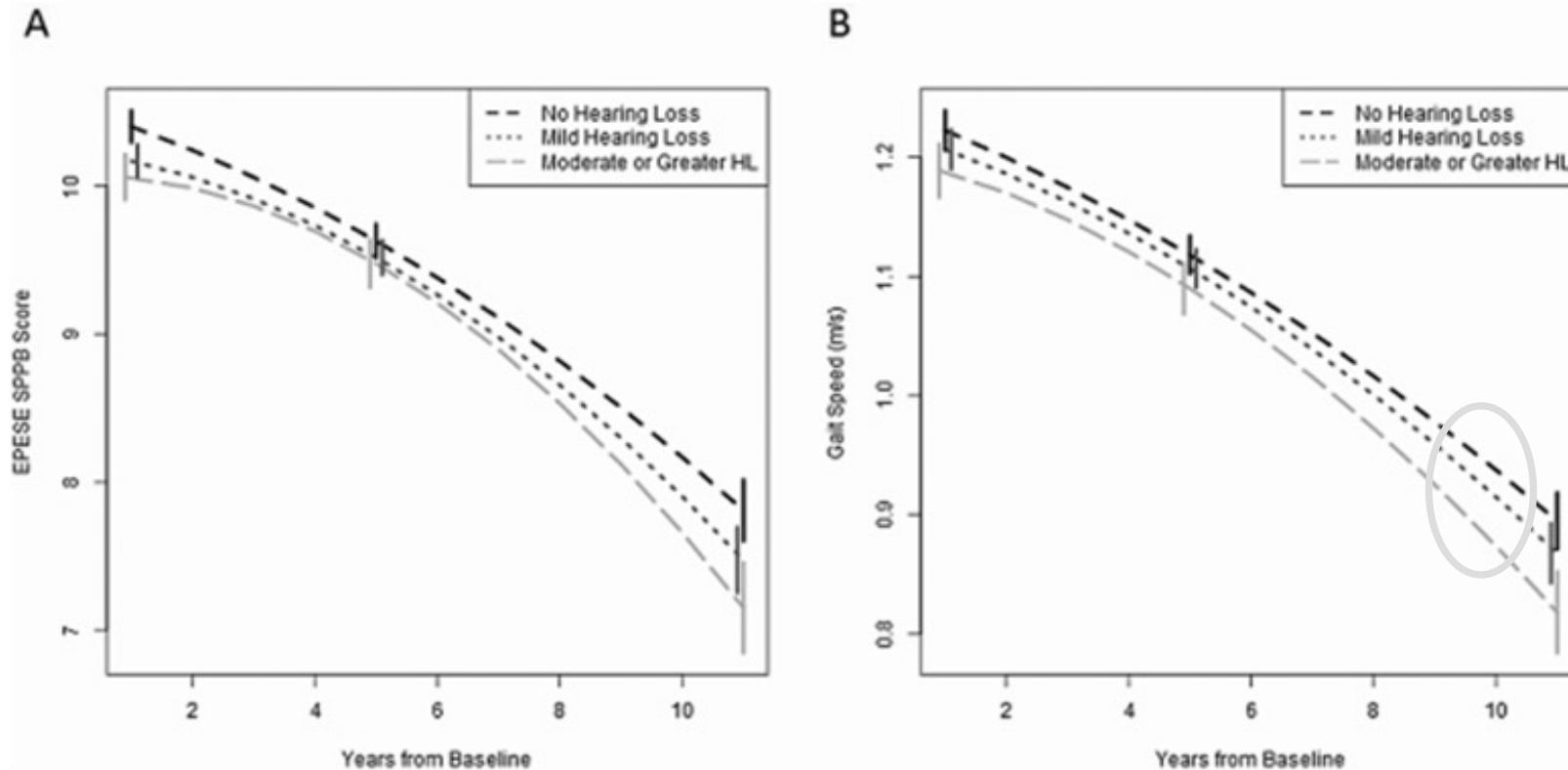
# HEARING LOSS





# Physical Health And Hearing Loss

# Physical Health and Hearing Loss

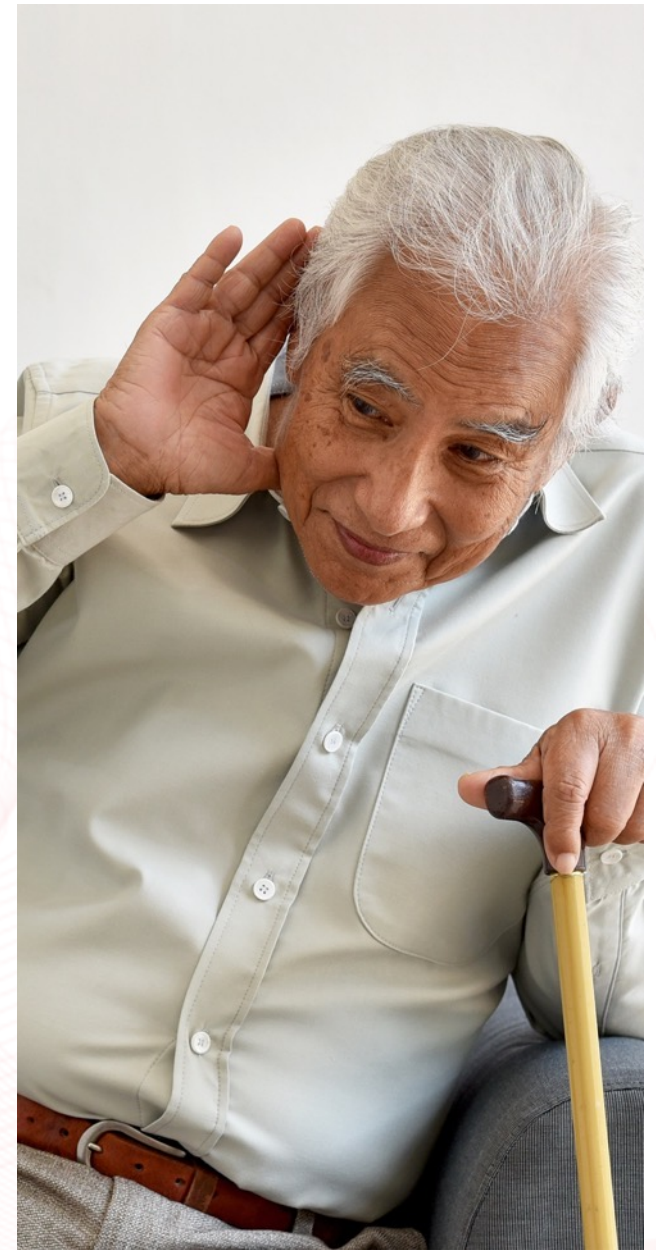


**Figure 1.** Trajectories of decline in (a) SPPB summary score and (b) gait speed according to hearing status.

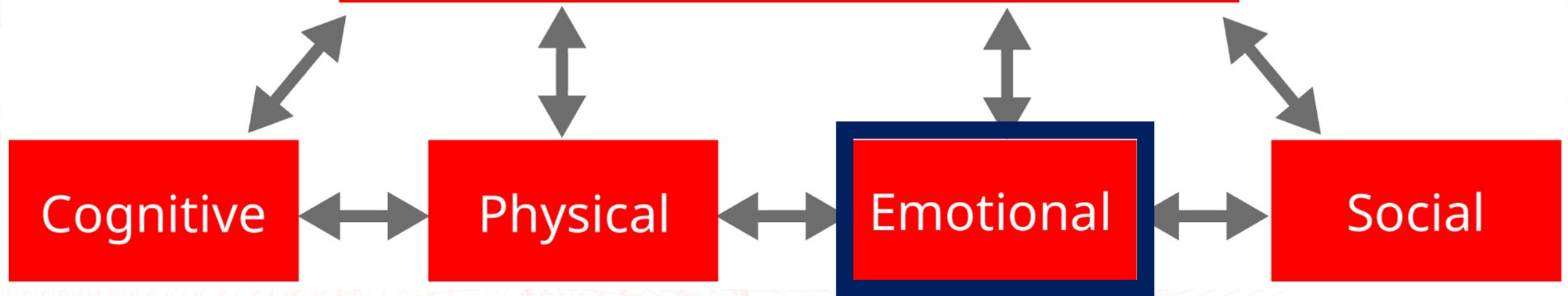


# Physical Health And Hearing Loss

- Overall physical mobility and gait speed decline with age
- Occurs at a faster rate for those with hearing loss
- Dosage effect – decline is greater for those with moderate HL



# HEARING LOSS

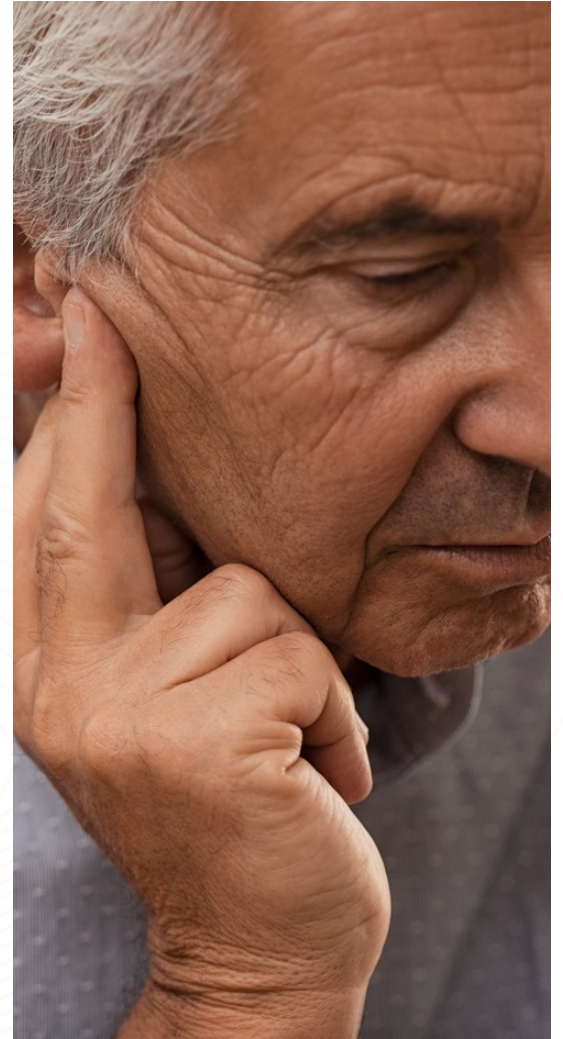




# Emotional Health And Hearing Loss

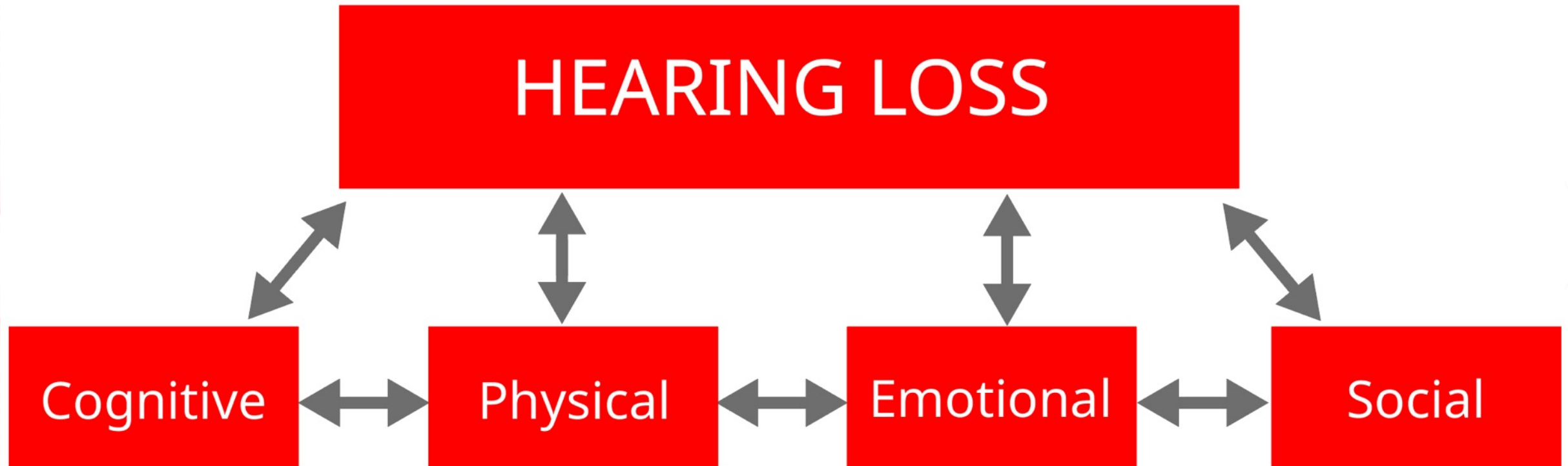
Numerous studies:

- Depressive symptoms
- Anxious
- Internalized shame
- Lower self-efficacy
- Greater psychological inflexibility



Latest research: Whicker, et al (2020) The Relationship Between Psychological Processes and Indices of Well-Being Among Adults With Hearing Loss. AJA. 29(4):728-737

All four QoL components can be assessed by the audiologist

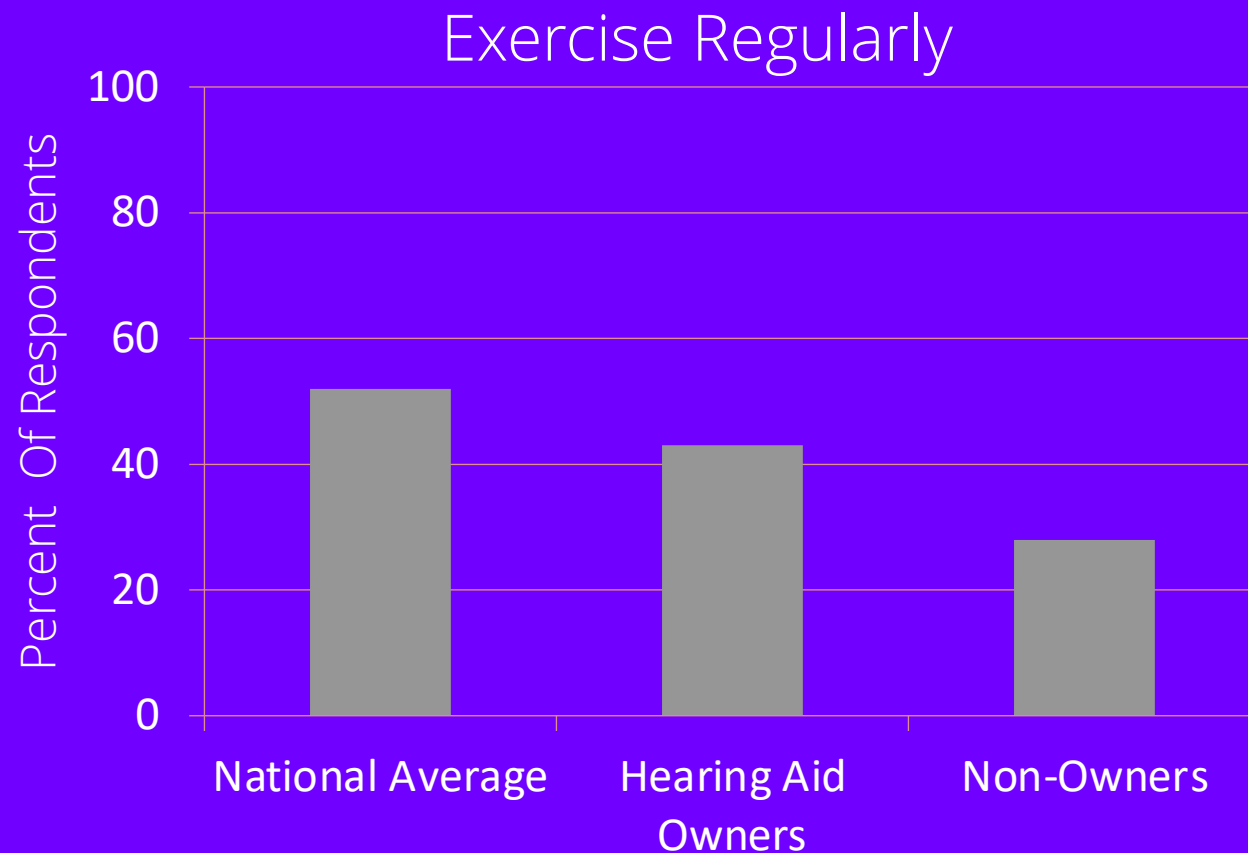




How might  
hearing  
devices  
improve  
Quality of  
Life?



# Encouraging findings from MarkeTrak10



Owners: n=656

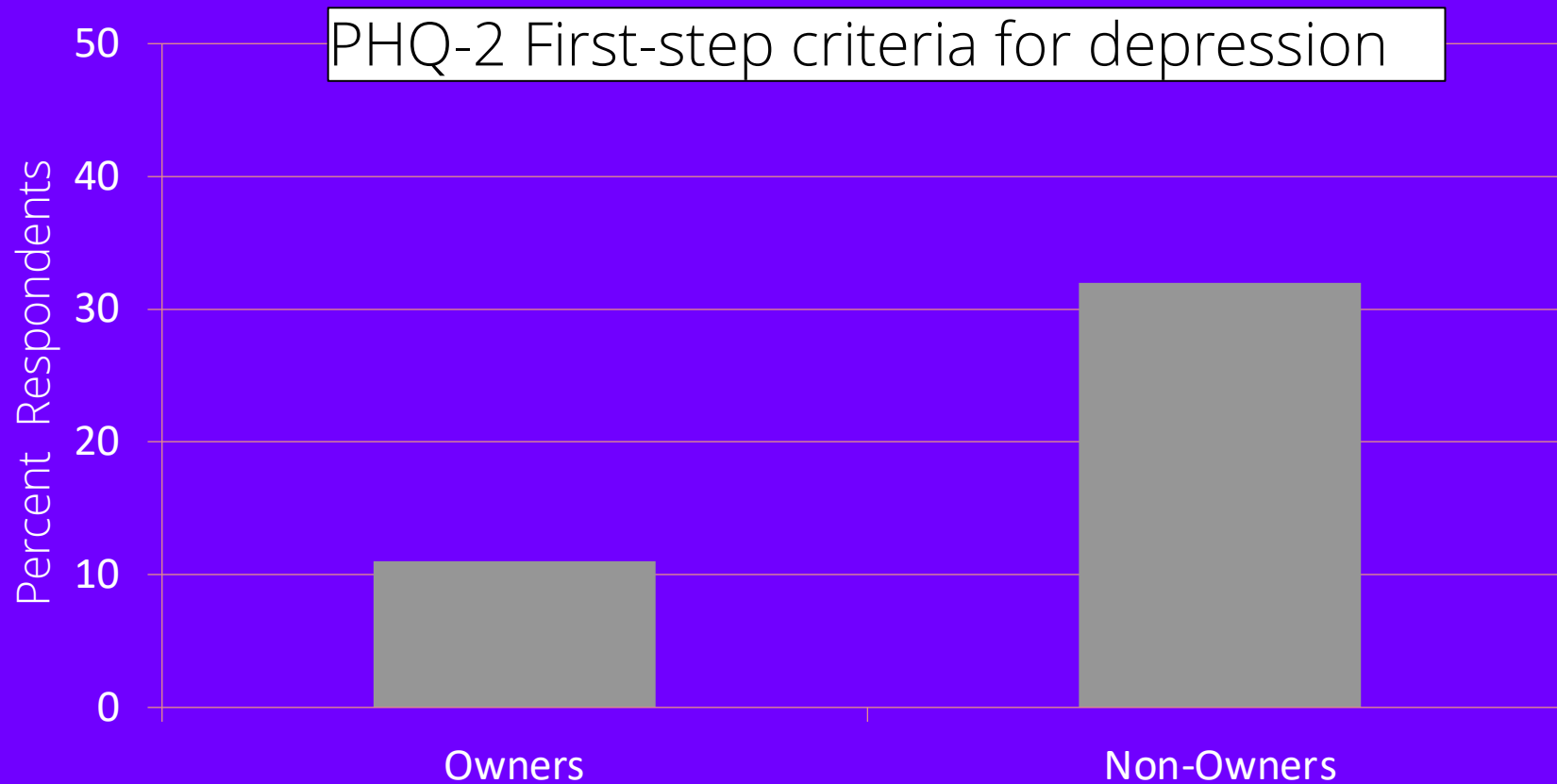
Non-Owners: n=513

Note: Non-Owners have self-reported hearing loss

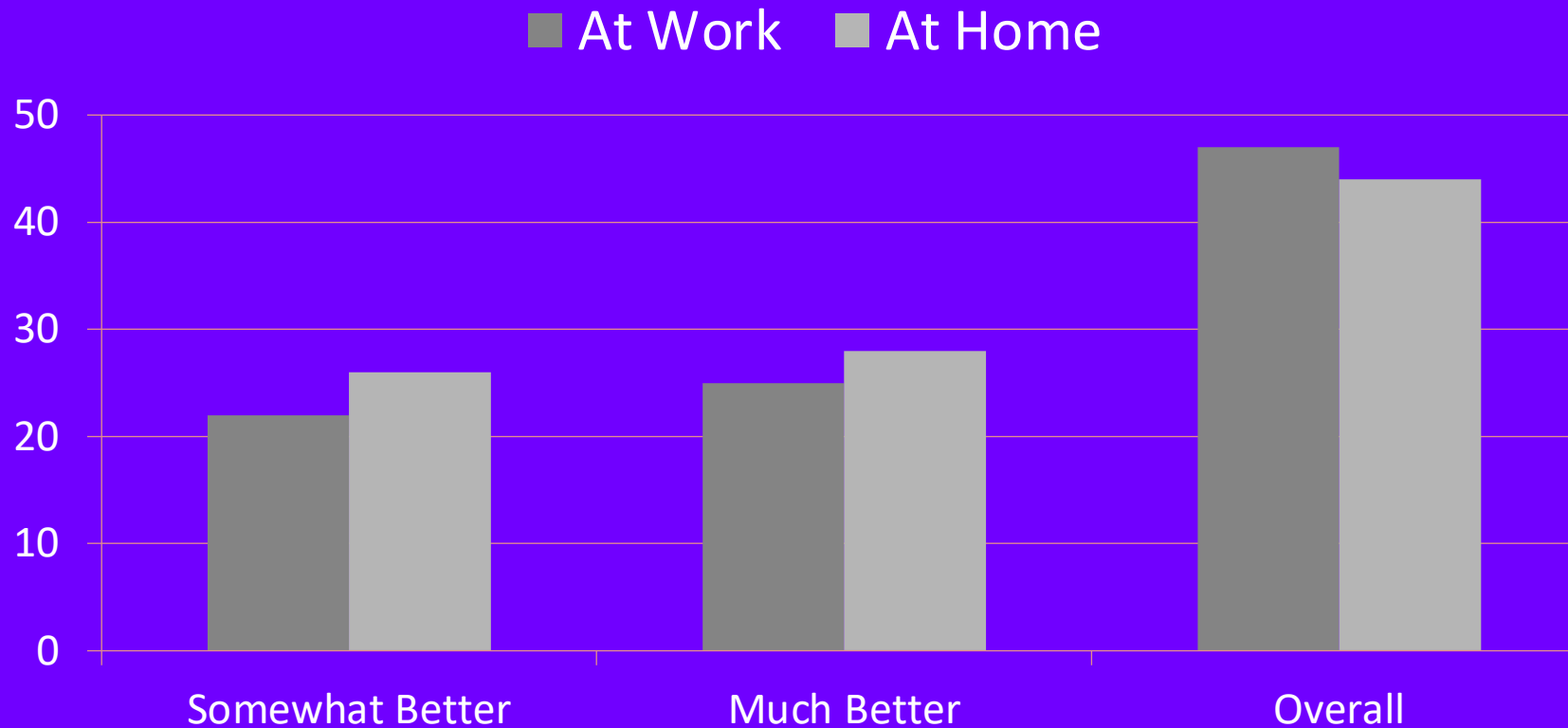




# Encouraging findings from MarkeTrak10



# Encouraging findings from MarkeTrak10

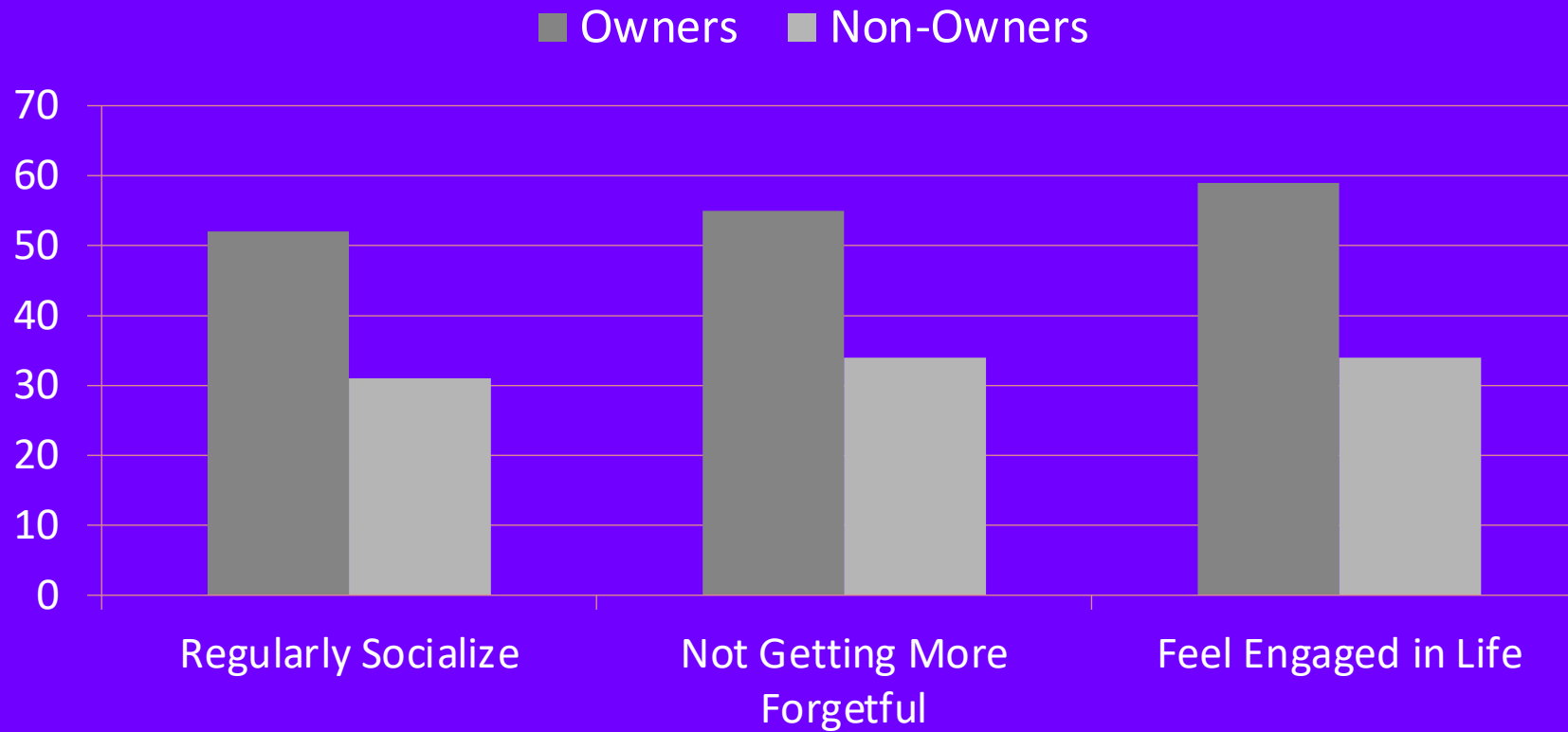


Report “improved relationships” after using hearing aids





# Encouraging findings from MarkeTrak10





# Two patients of similar ages

- **Mary with her husband, Al**
- **Debra**







## Two patients of similar ages

- Mary with her husband, Al
- Debra



Do they consider themselves hearing aid candidates?

Will they wear hearing aids, if you recommend it?



# A Common Scenario



“Your  
hearing  
is  
basically  
normal”

# Good News, Bad News

- A normal test result
- Unable to identify the problem





# A Common Occurrence

- A recent survey of 209 audiologists around the country found:
  - 45% see 1 to 3 individuals per month with normal or near-normal PTAs who had communication difficulties
  - 23% see more than 4 patients per month who have communication difficulties despite having normal or near-normal PTAs.



# Subclinical Hearing Loss

- “Normal Hearing” -- pure tone average is 20/25 dB HL or better
- It is prevalent:
  - Adults who self-report hearing difficulties with normal audiograms:
    - 12% (Tremblay, et al 2015)
    - 15% (Spankovich, et al 2018)
- Not a benign condition:
  - The link between hearing and cognition may be present earlier in hearing loss than previously understood (Golub, et al 2020)
  - Older adults with subclinical hearing loss were more likely to have depressive symptoms (Golub, et al 2020)

# A new tool

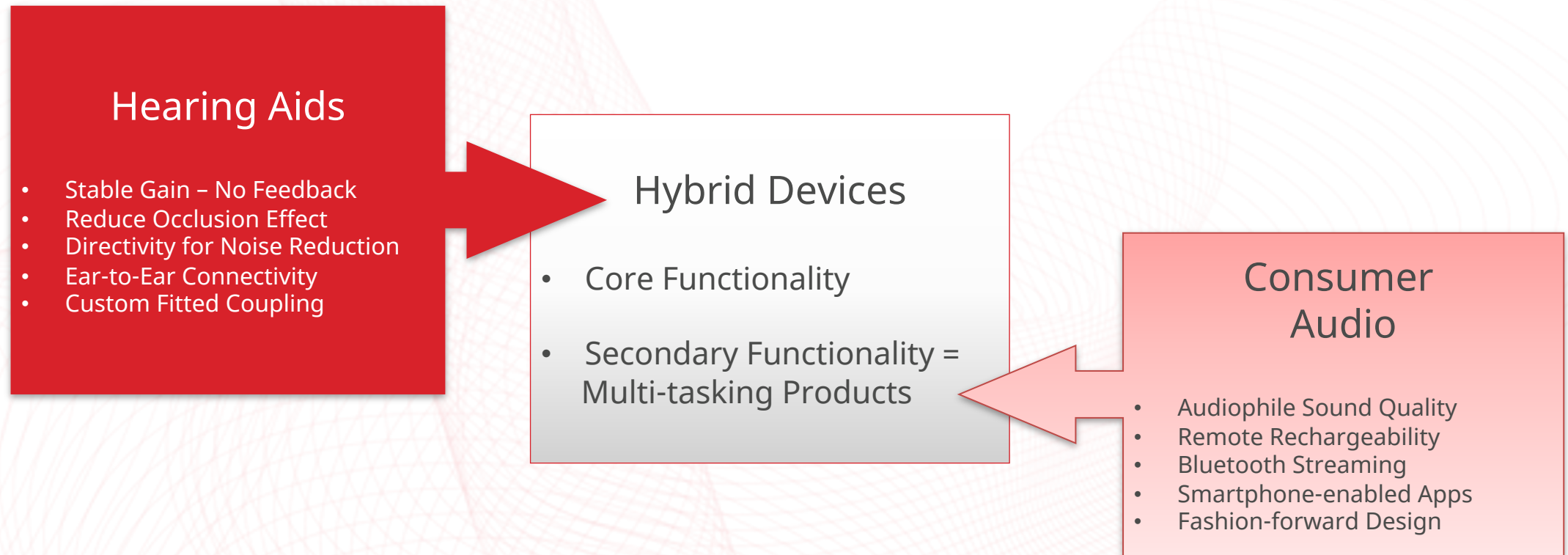




# Hybrid Devices

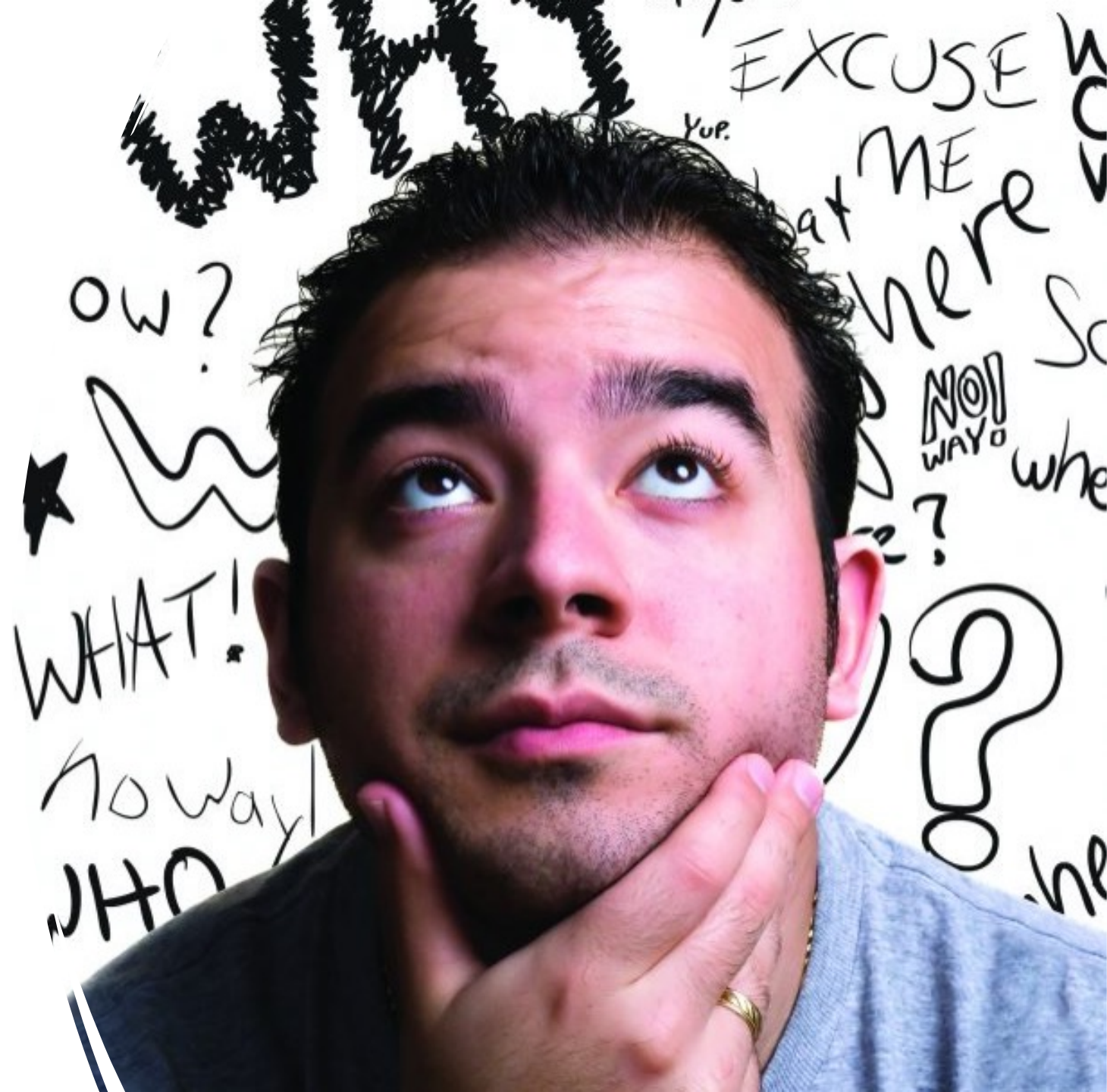


# Convergence of Technology is Critical to Addressing Needs





5 things you  
can do in the  
clinic to  
assess  
Quality of  
Life and offer  
hybrid  
devices





# Two patients of similar ages



- **Mary with her husband, Al**
- **Debra**





# Thing 1: Target Functional Communication Goals

# Patient Expectations Worksheet

Goal	Hardly Ever	Occasionally	Half the Time	Most of the time	Almost Always
To enjoy my visits with family at dinners		C			E
To become more actively involved in my church group meetings	C				E



# Thing 2: Assess Self-reported Difficulties

## Hearing Handicap Inventory Screening Questionnaire for Adults

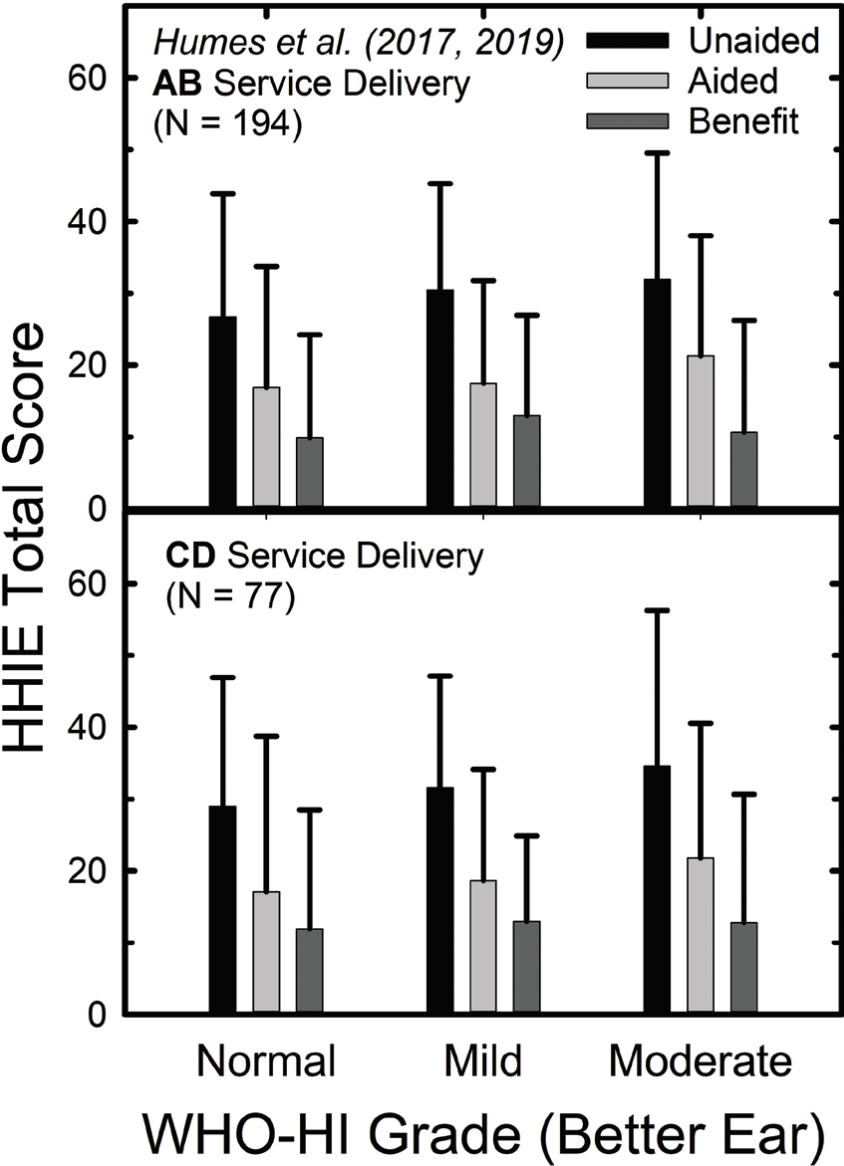
1) Answer **No**, **Sometimes** or **Yes** for each question.

2) Do not skip a question if you avoid a situation because of a hearing problem.

3) If you use a hearing aid, please answer according to the way you hear with the aid.

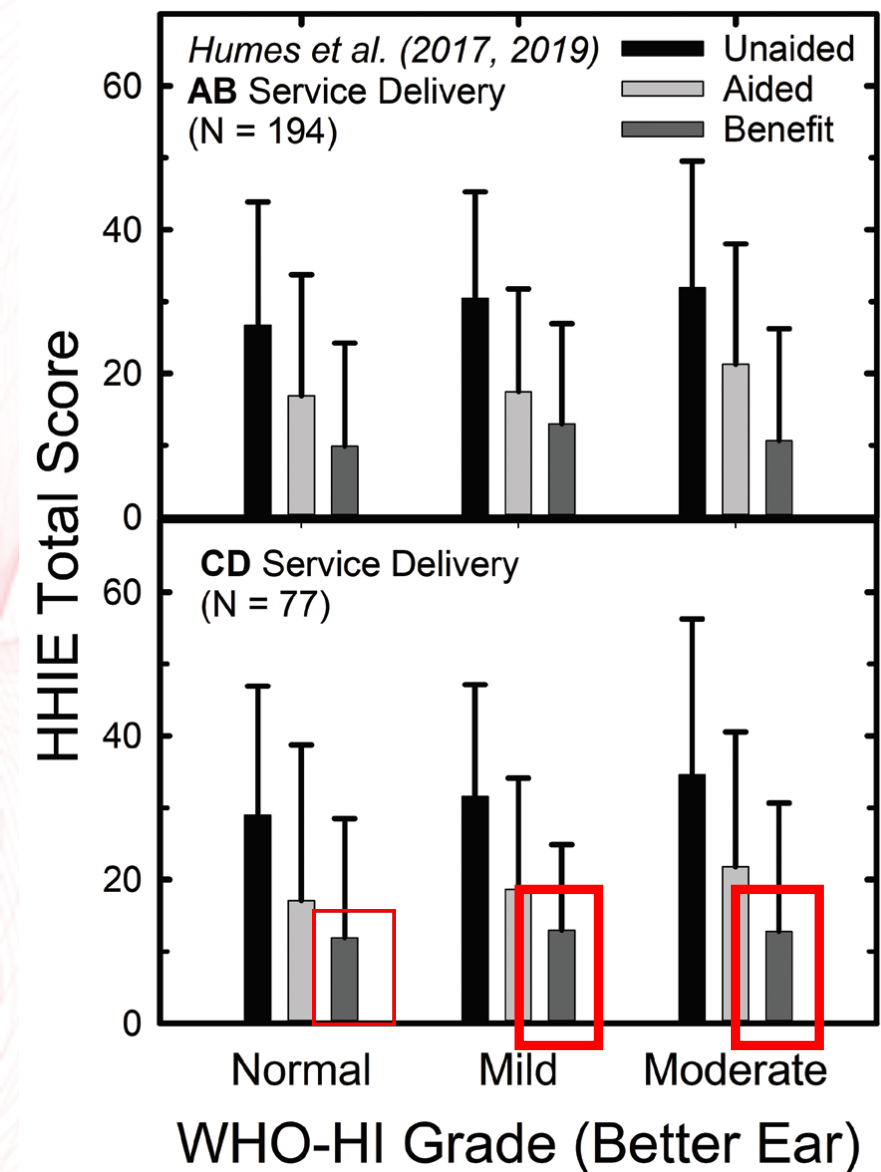
	No	Sometimes	Yes	
1. Does a hearing problem cause you to feel embarrassed when you meet new people?	0	2	4	
2. Does a hearing problem cause you to feel frustrated when talking to members of your family?	0	2	4	
3. Do you have difficulty hearing / understanding co-workers, clients or customers?	0	2	4	
4. Do you feel handicapped by a hearing problem?	0	2	4	
5. Does a hearing problem cause you difficulty when visiting friends, relatives or neighbors?	0	2	4	
6. Does a hearing problem cause you difficulty in the movies or in the theater?	0	2	4	
7. Does a hearing problem cause you to have arguments with family members?	0	2	4	
8. Does a hearing problem cause you difficulty when listening to TV or radio?	0	2	4	
9. Do you feel that any difficulty with your hearing limits or hampers your personal or social life?	0	2	4	
10. Does a hearing problem cause you difficulty when in a restaurant with relatives or friends?	0	2	4	
<b>Totals:</b>				
* Adapted from: Ventry, I., Weinstein, B. "Identification of elderly people with hearing problems" American Speech-Language-Hearing Association. 1983, 25, 37-42. *				

# 2020 Data from IU



- N = 271, 20% had normal audiograms





- People with normal audiograms and self-reported communication difficulties experience a similar level of benefit compared to those with mild and moderate hearing loss

# Thing 3: Assess Overall Health (broadly)

Under each heading, please tick the ONE box that best describes your health TODAY.

**MOBILITY**

I have no problems in walking about ☒

I have some problems in walking about ☐

I am confined to bed ☐

**SELF-CARE**

I have no problems with self-care ☒

I have some problems washing or dressing myself ☐

I am unable to wash or dress myself ☐

**USUAL ACTIVITIES** (e.g. work, study, housework, family or leisure activities)

I have no problems with performing my usual activities ☐

I have some problems with performing my usual activities ☒

I am unable to perform my usual activities ☐

**PAIN/DISCOMFORT**

I have no pain or discomfort ☐

I have moderate pain or discomfort ☐

I have extreme pain or discomfort ☒

**ANXIETY/DEPRESSION**

I am not anxious or depressed ☐

I am moderately anxious or depressed ☒

I am extremely anxious or depressed ☐

EQ-5 self-report of overall health

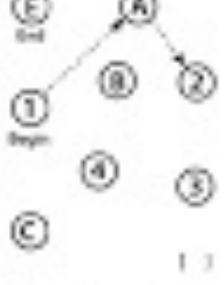


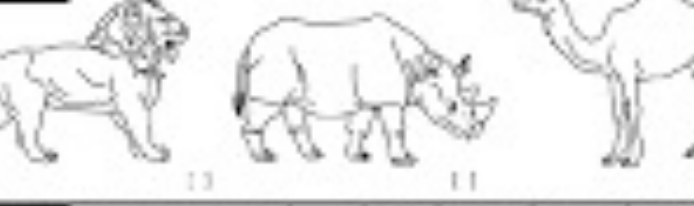
Determine obstacles and facilitators



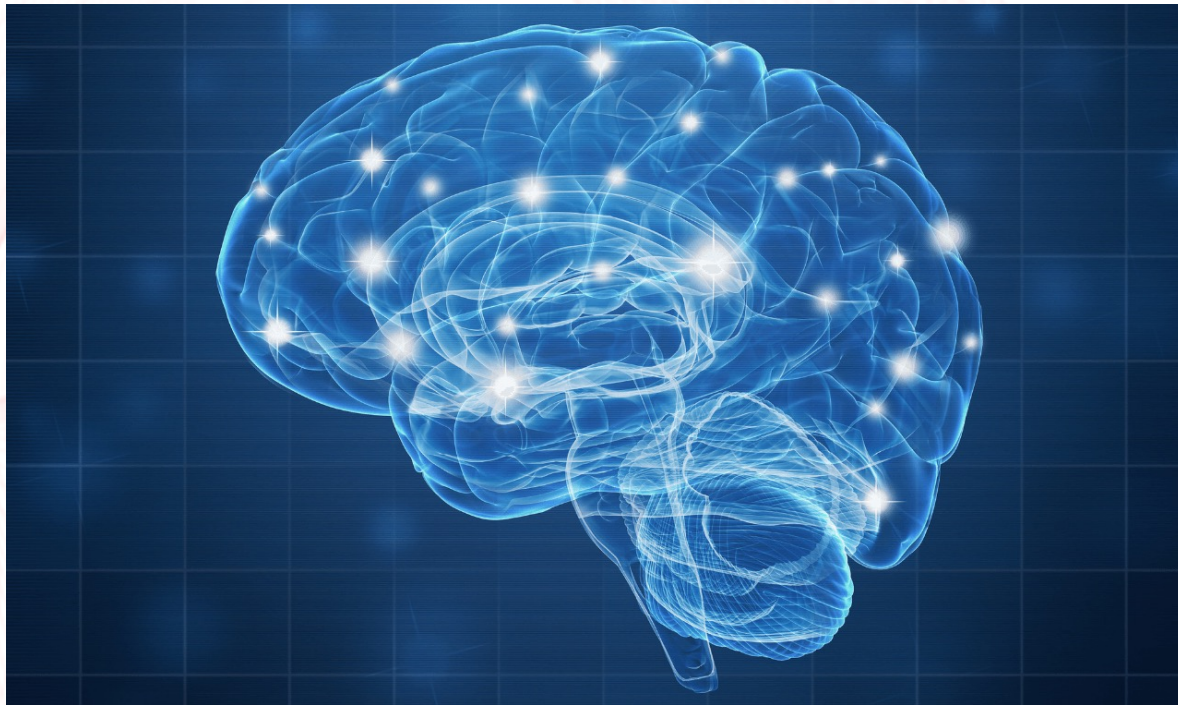
## Thing 4: Assess Cognitive Ability

Consider the MoCA:

1. Recent review indicates it is a validate screening tool (Humes, 2020)
2. Several versions of MoCA available for people with severe hearing loss.
3. MoCA certification is encouraged – allows HCPs to better administer, score, and interpret tests

MONTREAL COGNITIVE ASSESSMENT (MOCA) version 7.5 (original version)		NAME: _____ Education: _____ Sex: _____	Date of birth: _____ DATE: _____	SCORE: _____
<b>SPATIAL / EXECUTIVE</b> 		Copy cube 	Draw a cube (first part done) 	_____/5
<b>NAMING</b> 		_____/3	_____/3	_____/3
<b>MEMORY</b> Read list of words; subject must repeat them in exactly the same order as written above.		FIRST 1st trial 2nd trial	VERBAL CHURCH DAILY NOSE	NO POINTS
<b>ATTENTION</b> Read list of digits; subject must repeat them in the backward order.		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2
<b>LANGUAGE</b> Repeat: I only know that French is the one I help today. I... Repeat: I only know that French is the one I help today. I...		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2
<b>ABSTRACTION</b> Identify between e.g. female - orange - hair		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2
<b>DELUSION RECALL</b> Read list of words; subject must repeat them in the same order.		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2
<b>Optional</b> Complete the sentence:		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2
<b>Observation</b> Read list of words; subject must repeat them in the same order.		1st trial 2nd trial	1 2 3 4 5 6 6 5 4 3 2 1	_____/2

# Consider Cognivue



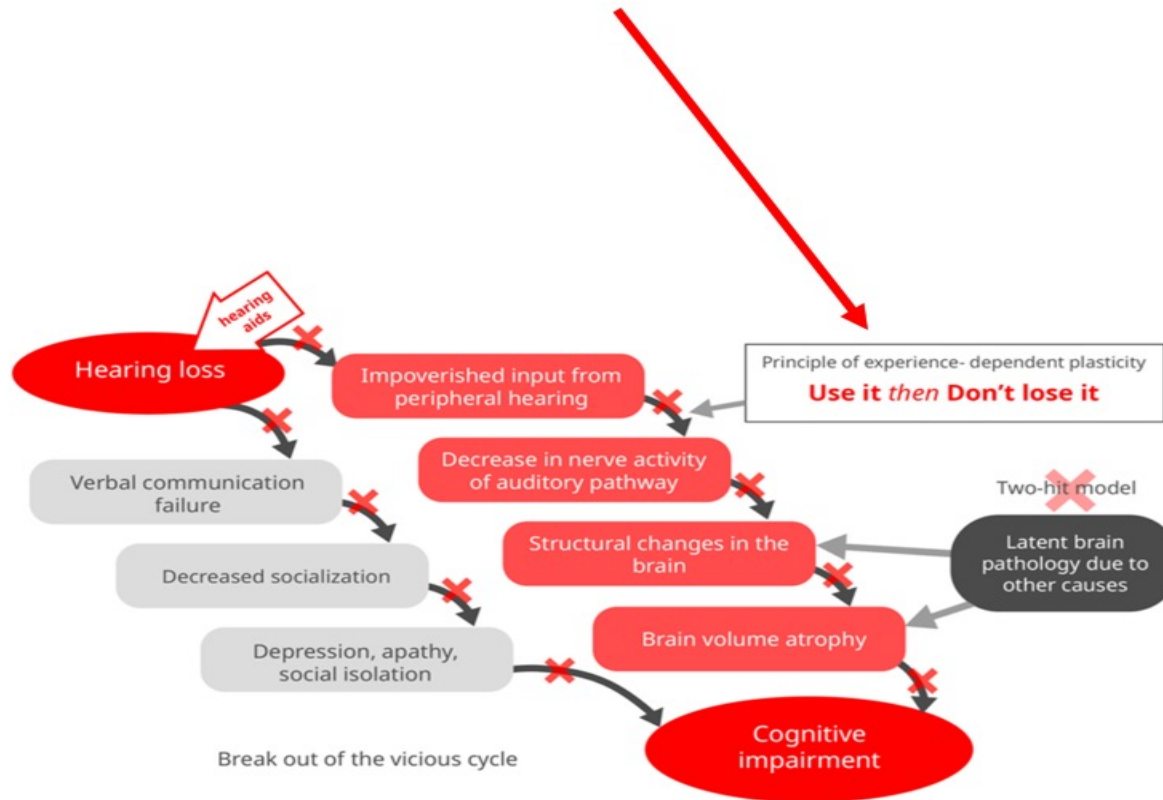


## Thing 5: Assess SNR Loss

## “Use it and Improve It”



- June 2021 20Q with Anu Sharma
- A case for earlier intervention with properly fitted hearing aids:
  - Adults with mild hearing loss show signs of brain reorganization (cross-modal neuroplasticity)
  - Poor Quick SIN scores in the clinic
  - Under-fitted hearing aids did not improve brain's ability to re-organize



# Summary

- Focus on the functional capabilities of the individual
- Add hybrid devices to your intervention toolbox



# Another notable quote

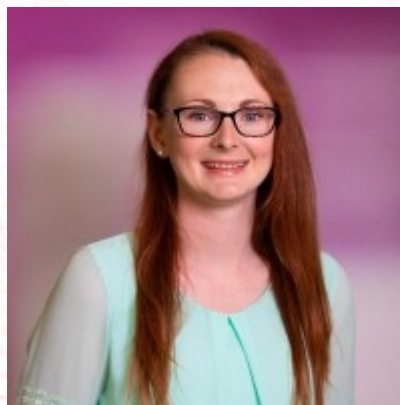
“The fact that our primary treatment for hearing loss, hearing aids, is tied to the audiogram has effectively narrowed the audiologist’s scope of practice. Only 7% of audiologists dispense personal sound amplification products, 20% provide tinnitus evaluations, 25% provide auditory training, and 29% routinely perform speech-in-noise testing. All of these services could potentially benefit the “normal-hearing” populations. Audiology must recognize our reliance on the audiogram now and aim to offer these services more routinely. An audiologist’s skills in these areas are only going to become more important in the future when patients are able to directly obtain assistance, including over-the-counter devices.”

2021

Viewpoint

# History and Lingering Impact of the Arbitrary 25-dB Cutoff for Normal Hearing

Andrea E. Gatlin<sup>a</sup> and Sumitrajit Dhar<sup>a,b</sup>



Andrea Gatlin



Sumit Dhar



**THANK YOU FOR WATCHING!**