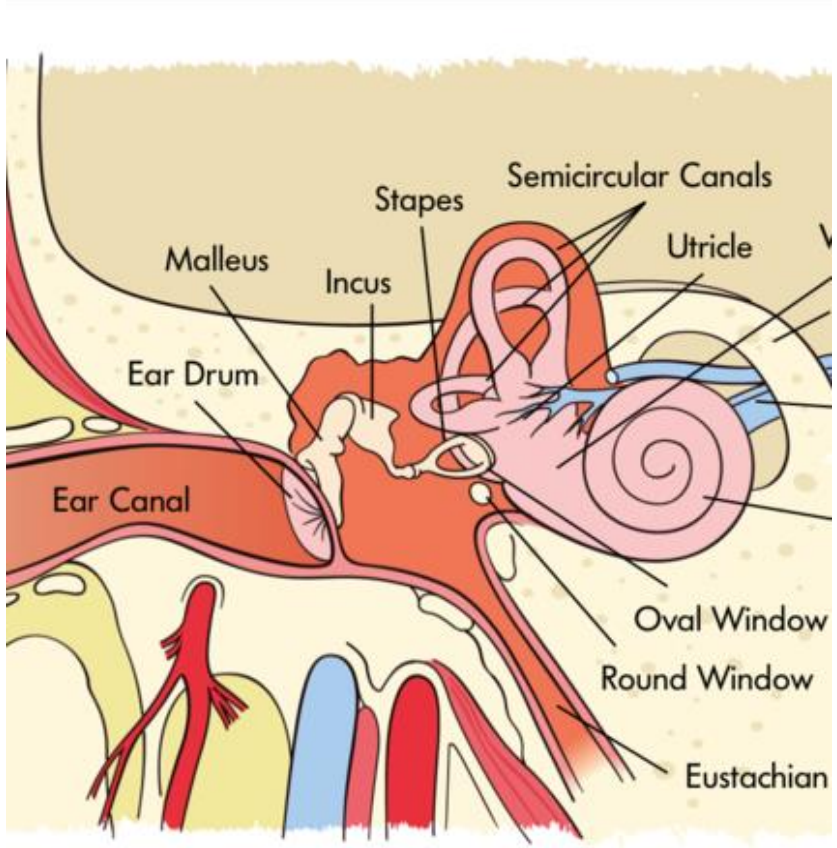
HEARING LOSS AND RISK FOR COGNITIVE IMPAIRMENT



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10/5/23

Objectives

- Review the scope of the problem of age-related hearing loss (ARHL)
- Understand the association between ARHL and cognitive impairment
- Appreciate that treatment of hearing loss may be helpful in reducing cognitive decline

Age-related Hearing Loss (ARHL)

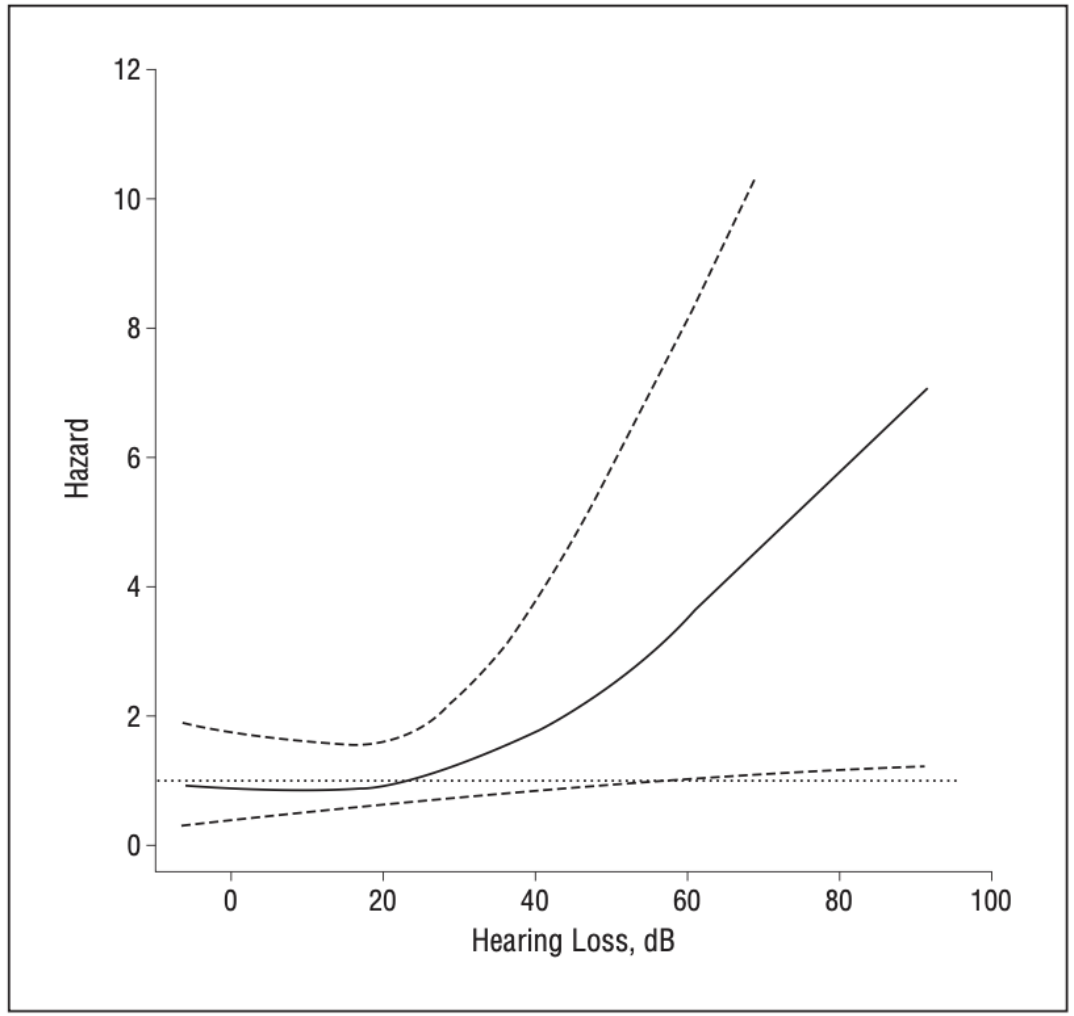
- Most prevalent health condition that affects older adults worldwide
- Affects 40% of people over 50 years old and ~**71% of people over 70 years**
- Incidence is higher among men
- Higher among people with cardiovascular disease
- Inversely associated with socioeconomic status
- <10% of individuals in low-income countries and **<20–30% in high-income countries with hearing loss use hearing aids**

Tarawneh, 2022; Slade 2020; Scholes, 2018; WHO 2021

Hearing Loss and Incident Dementia

Baltimore Longitudinal Study of Aging
639 individuals followed over 12 years
Controlled for: age, sex, race, education, DM and HTN.

Hazard Ratio for
Mild Hearing Loss: 1.89
Moderate Hearing Loss: 3
Severe Hearing Loss: 4.94

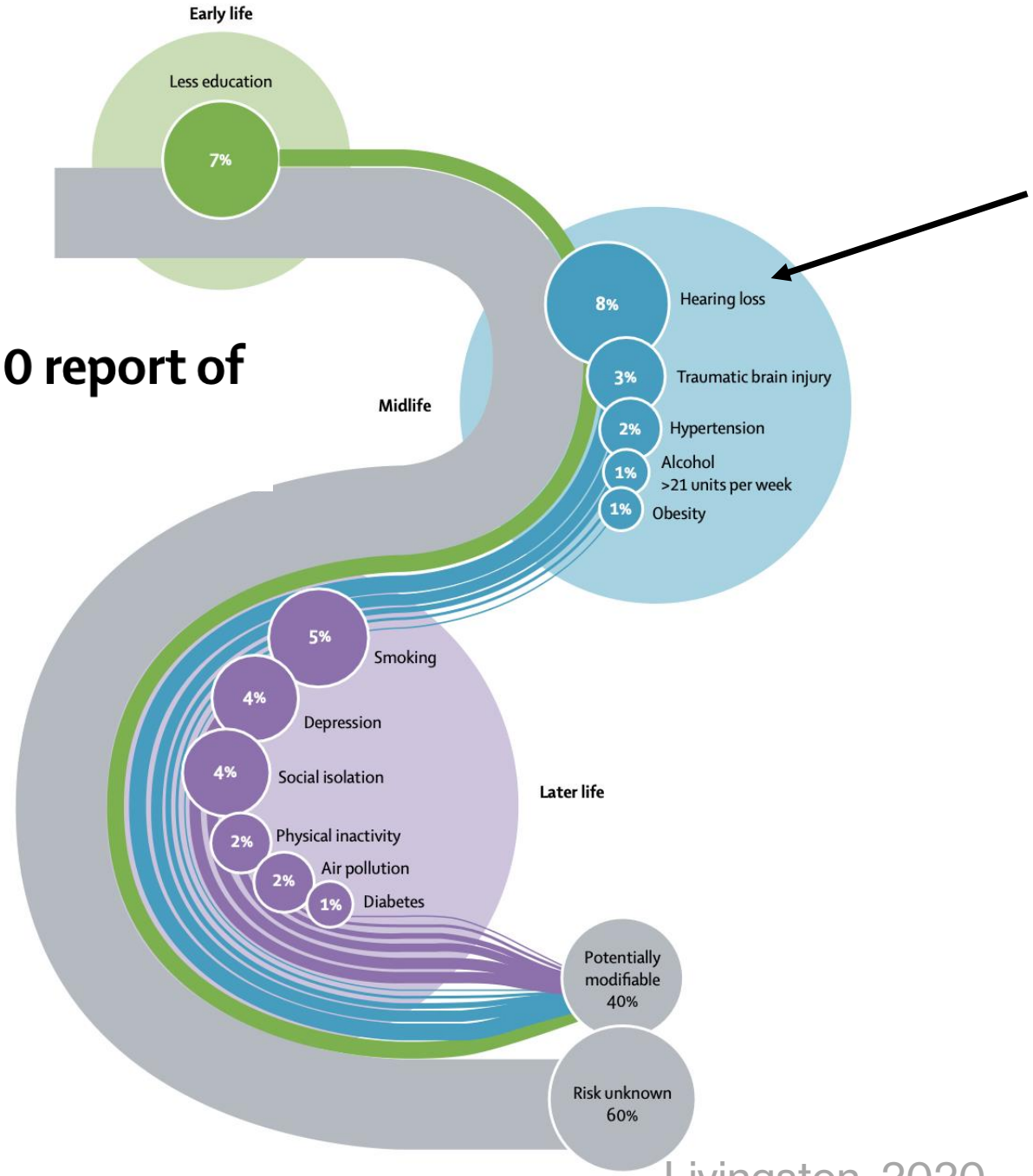


- Lin, 2011

Dementia prevention, intervention, and care: 2020 report of the *Lancet* Commission

Overall relative risk of dementia for individuals with hearing loss =1.94

Eliminating this risk factor could lead to an 8% reduction in dementia prevalence



Livingston, 2020

Also associated with hearing loss

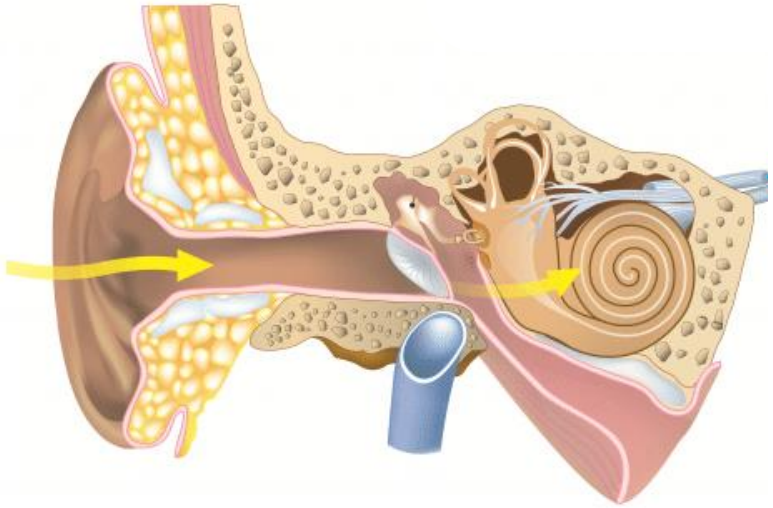
- Poor balance/ Falls
- Loneliness
- Depression
- Hospitalizations
- Early mortality

Davis, 2016

Peripheral Auditory Processing

Outer, middle and inner ear
Cochlea
Auditory Nerve

Detection of sound
Measured by **audiometry**

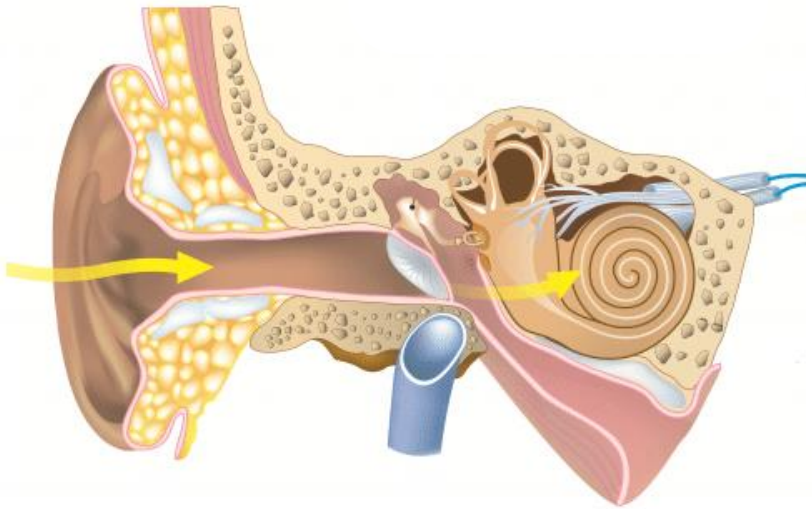


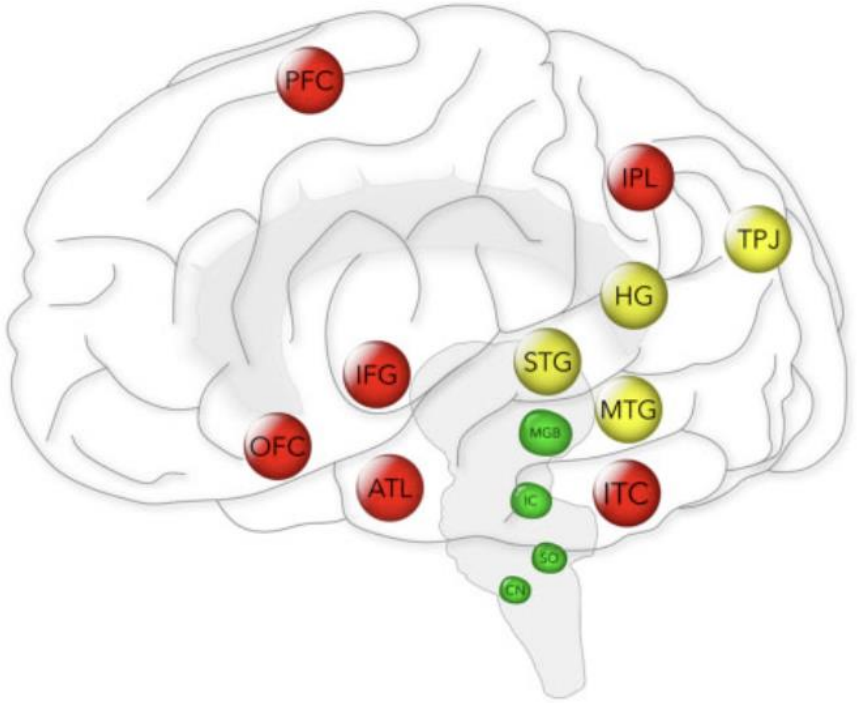
Most studies looking at the association between dementia and hearing loss are studying this

https://teachmeanatomy.info/neuroanatomy/pathways/auditory-pathway/

Central Auditory Processing

Enables the brain to understand and make sense of environmental sounds
Complex and distributed process
Requires general cognition to be intact
Sound-in-noise test





Johnson, 2021

https://teachmeanatomy.info/neuroanatomy/pathways/auditory-pathway/

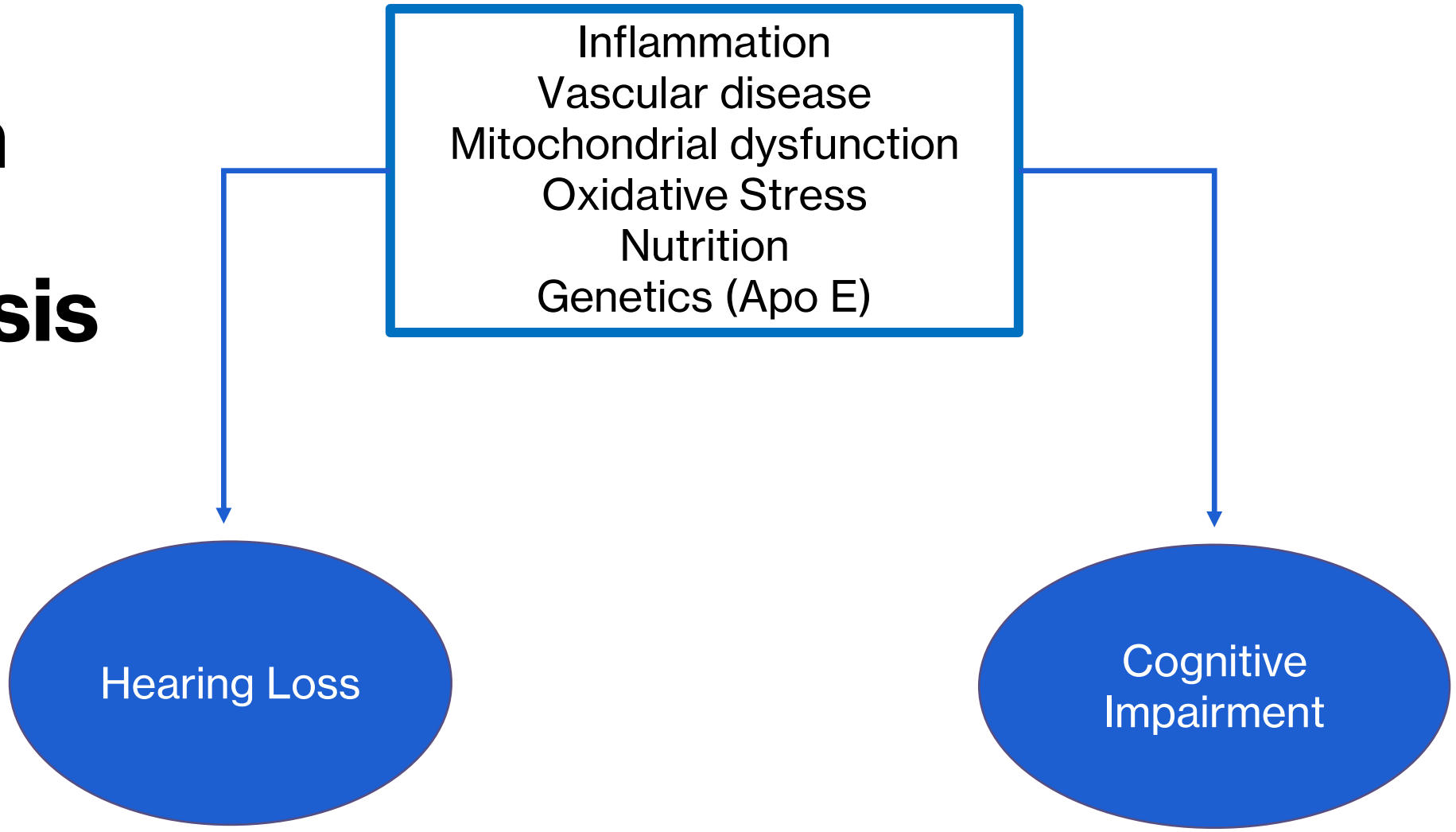
Does Hearing Loss Cause Dementia?

- Correlation does not imply causation
- Hearing loss could be a risk factor and a promoter of cognitive impairment
- It could be early sign of dementia
- Or the consequence of impairment of more general cognitive abilities needed for central auditory processing

Explanatory Hypotheses

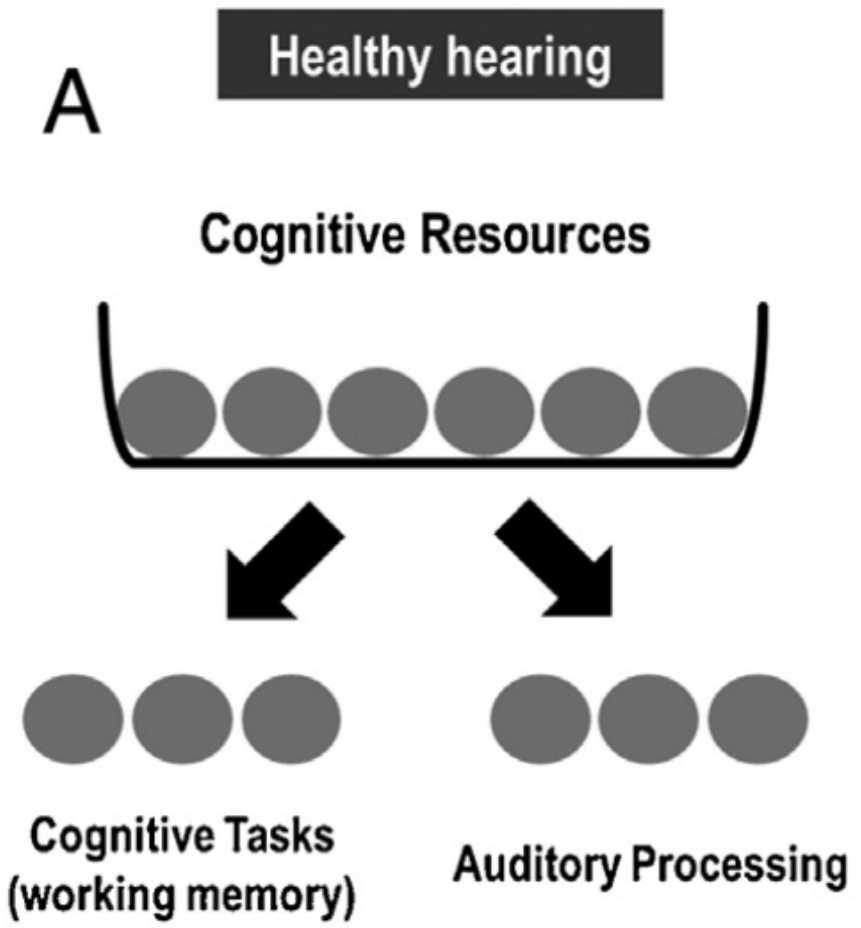
- Common Cause Hypothesis
- Information Degradation Hypothesis
- Sensory Deprivation Hypothesis

Common Cause Hypothesis



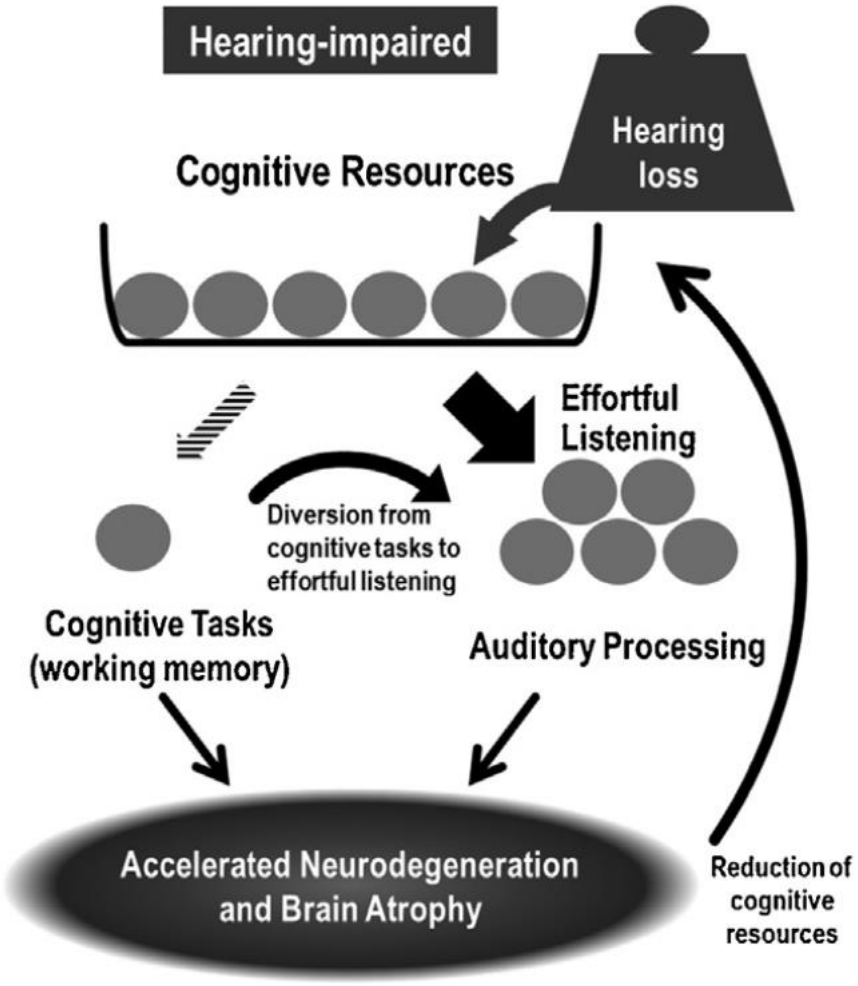
Uchida, 2019;Jafari, 2021

Information Degradation Hypothesis



Uchida, 2019

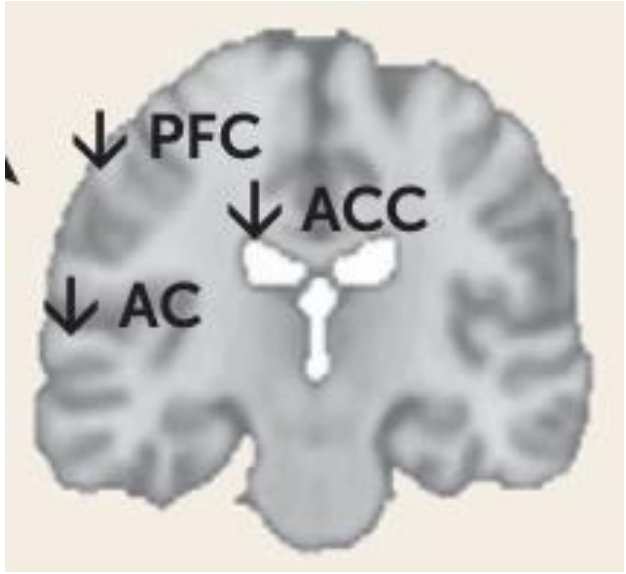
Information Degradation Hypothesis



Uchida, 2019

Sensory Deprivation Hypothesis

“USE IT OR LOSE IT”



Tarawneh, 2022; Rutherford, 2018

Review

Age-related hearing loss and cognitive decline: MRI and cellular evidence

Zahra Jafari, Bryan E. Kolb, and Majid H. Mohajerani

- Structural MRI
  - Accelerated atrophy of
    - Total brain volume
    - Regional brain volumes in the temporal lobe including the hippocampus
    - Medial pre-frontal cortex
    - Anterior cingulate cortex
- Functional MRI
  - Altered functional connectivity in networks involved in regulating attention, salience detection and cognition

Jafari, 2021; Wang, 2022


Hearing Loss
Verbal Communication Failure
Decreased socialization
Depression, apathy, social isolation
Cognitive Impairment

Uchida, 2019

Is there any evidence to suggest that wearing hearing aids can attenuate cognitive decline?

Hearing intervention versus health education control to reduce cognitive decline in older adults with hearing loss in the USA (ACHIEVE): a multicentre, randomised controlled trial

*Frank R Lin, James R Pike, Marilyn S Albert, Michelle Arnold, Sheila Burgard, Theresa Chisolm, David Couper, Jennifer A Deal, Adele M Goman, Nancy W Glynn, Theresa Gmelin, Lisa Gravens-Mueller, Kathleen M Hayden, Alison R Huang, David Knopman, Christine M Mitchell, Thomas Mosley, James S Pankow, Nicholas S Reed, Victoria Sanchez, Jennifer A Schrack, B Gwen Windham, Josef Coresh, for the ACHIEVE Collaborative Research Group**

Lin, 2023

ACHIEVE Study

- 3 Year study
- Hearing impaired adults aged 70-84
- Compared a hearing aid intervention (n=490) with a heath education intervention (n=487)
- Use of hearing aids reduced rate of cognitive decline by 48% in a subset of participants who were at a higher risk of cognitive decline
  - Lower baseline cognitive scores
  - More risk factors for cognitive impairment (more likely to be older, female, Black, lower education and income, higher rates of diabetes and hypertension, and to live alone)
  - Faster rate of cognitive decline

Lin, 2023

Conclusion

- Hearing loss is a potentially modifiable risk factor for dementia
- Not hearing can affect basic brain structure and function
- In addition to optimizing cognition, wearing hearing aids may improve quality of life, socialization and reduce your risk of depression
- Get evaluated if you have concerns
- Wear your hearing aids!

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