

I Can't Hear Myself Think

Exploring the Relationship Between Age-Related Hearing Loss, Cognitive Decline and Dementia

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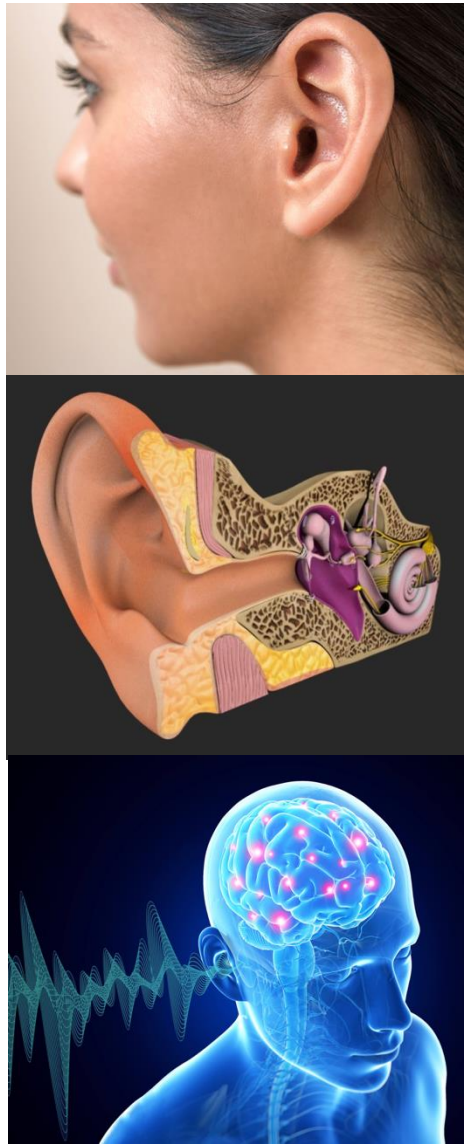
Thinking about Hearing



This is where hearing happens.

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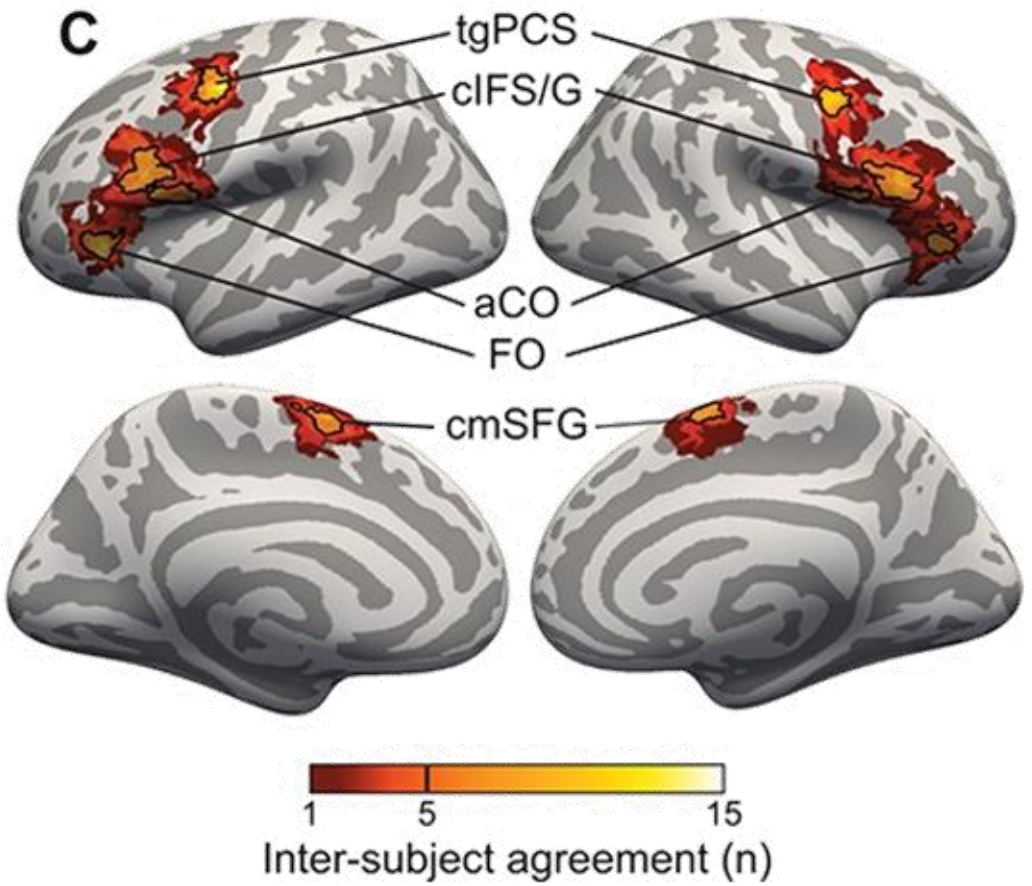


Auditory Processing Goes Beyond the Brainstem and Auditory Cortex

- the process of hearing is something that involves widespread regions in the brain, including temporal, frontal & parietal lobes

- e.g., 5 regions in the frontal cortex specialized for processing auditory stimuli
  Noyce et al., Cereb Cortex, 2022

- it should NOT be surprising that **changes in hearing can profoundly affect the brain**



Hearing Loss and Cognitive Decline



- **Lin et al., Neuropsych, 2011**
  - Baltimore Longitudinal Study on Aging
  - 347 participants ≥ 55 years old

	Age (per year)		Hearing loss (per 25 dB)		
	β[a] (95% CI)	*P*	β[b] (95% CI)	*P*	Δ Age (years) equivalent to 25 dB of hea
Stroop Mixed	−0.33 (−0.48 — −0.18)	<.001	−2.27 (−4.14 — −0.40)	.02	6.8
Trail Making					
Part A, speed	−0.00027 (−0.00040 — −0.00015)	<.001	−0.0016 (−0.0032 — 2.35×10^{-6})	.05	5.8
Part B, speed	−0.00011 (−0.00018 — −0.000044)	.001	−.00074 (−0.0015 — 2.74×10^{-6})	.05	6.7

25 dB of hearing loss → cognitive ageing of about 6–7 yrs

Hearing Loss and Dementia

- **Lin et al., Arch Neurol, 2011**
  - BLSA (N = 369), no suspected dementia
  - audiometric and cognitive testing from 1990–1994
  - followed-up in 2008
- **How many developed dementia?**

  - Risk (after controlling for sex, age, race, education, diabetes, smoking, and hypertension):

  - mild loss (25–40 dB HL): 1.89 (89%)
  - moderate loss (41–70 dB HL): 3.00 (3x)
  - severe loss (>70 dB HL): 4.94 (5x)

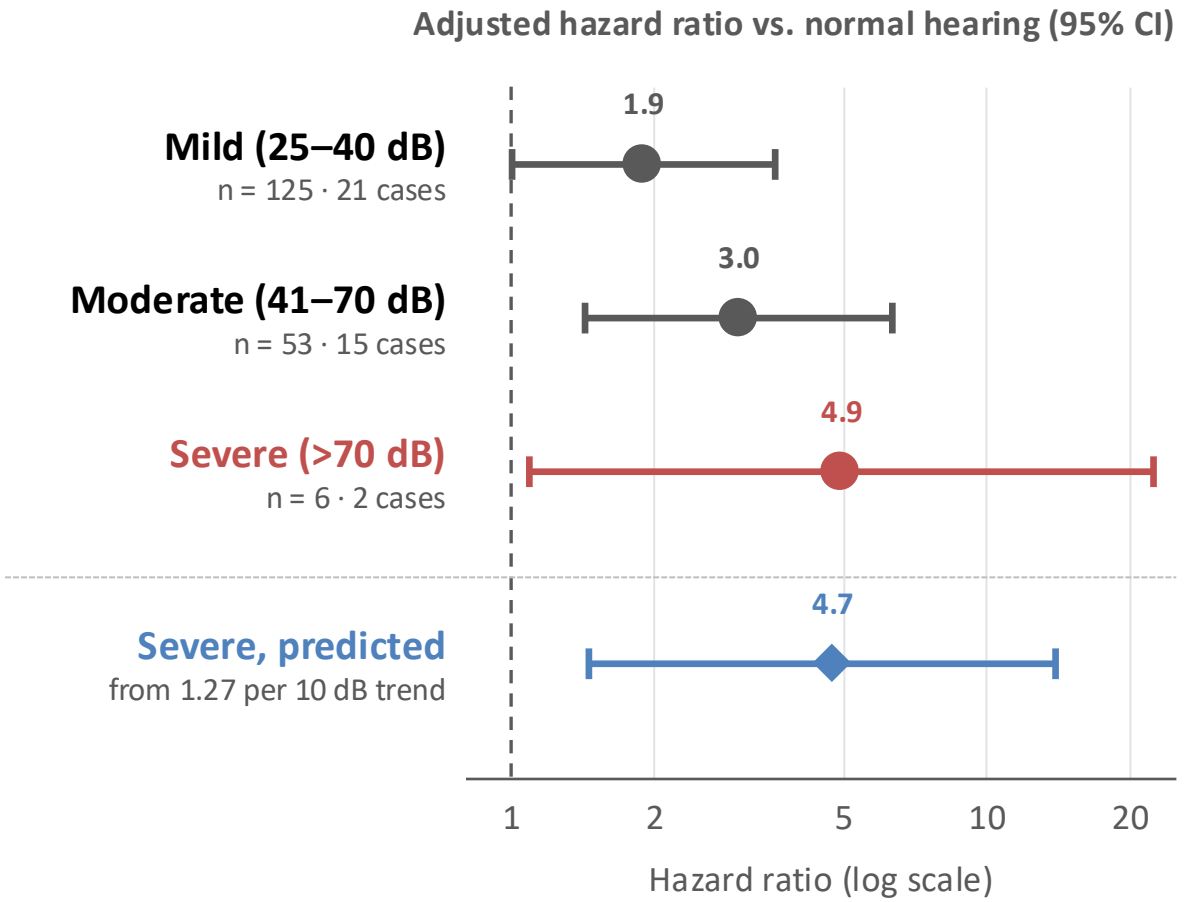
Table 1. Demographic and Clinical Characteristics of Baseline Study Cohort by Hearing Loss Status

	Hearing Loss Status[a]				
	Normal (n=455)	Mild (n=125)	Moderate (n=53)	Severe (n=6)	*P* Value
Development of all-cause dementia during follow-up	20 (4.4)	21 (16.8)	15 (28.3)	2 (33.3)	<.001

Confidence in the Estimate

- 5x dementia risk for severe loss is based on 2 cases out of 6 people
  - 95% confidence interval: **1.1 to 22** times the risk
  - with one more/fewer cases of dementia, risk would be 7x/2.5x

- **dose–response is more reliable (based on 58 cases of dementia)**
  - ~27% more risk per 10 dB
  - it predicts increased risk of dementia ≈ 4.7x times for severe loss

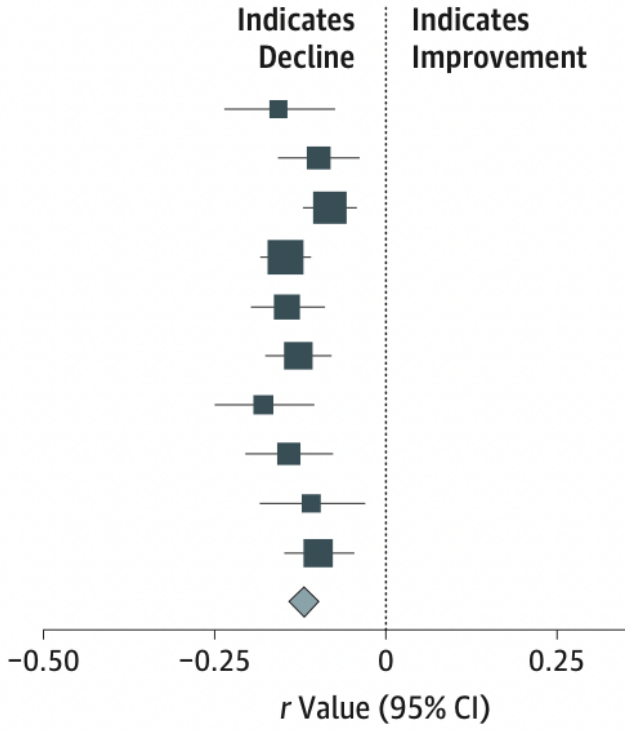


A 2018 Meta-Analysis: Hearing Loss and Cognitive Function

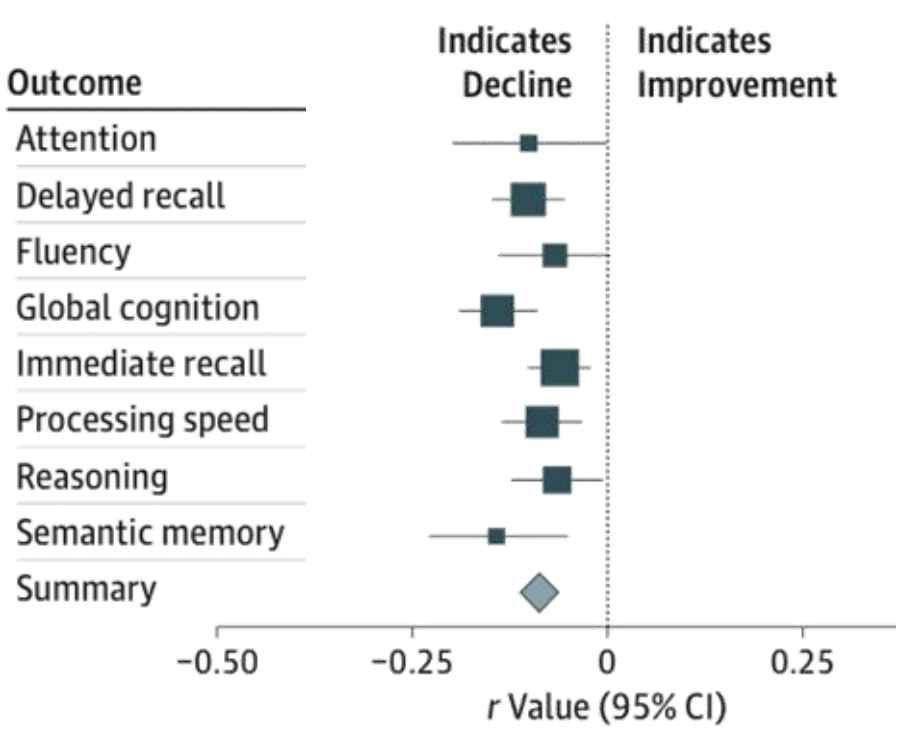
- **Loughrey et al., JAMA Otolarngol, 2018**
  - included **36** studies with **20,264** participants
  - cross-sectional and cohort studies
    - cross-sectional: differences ACROSS people
    - cohort: differences in the SAME people over time
  - significant relationship between hearing loss and ALL tested types of **cognitive function**
  - significant relationship between hearing loss and **dementia risk** measured in both cross-sectional and cohort studies

Figure 2. Forest Plot of Correlations for Cognition Cross-sectional Outcomes

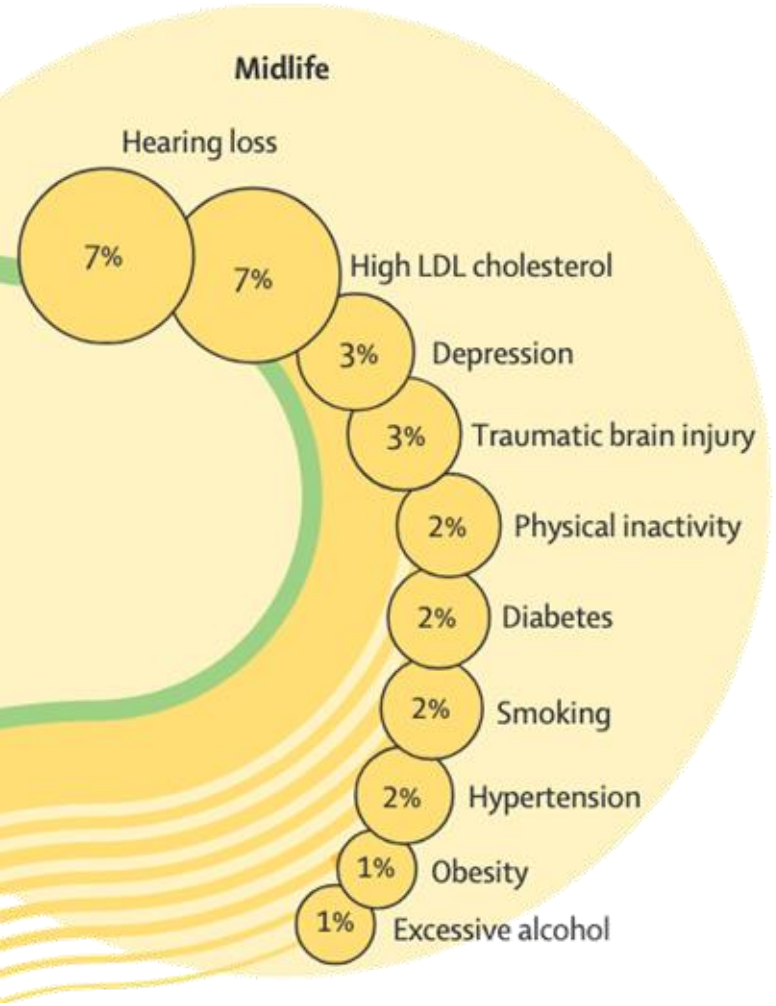
Outcome	No. of Participants/Events	*r* Value (95% CI)
Attention	5159/11	−0.16 (−0.24 to −0.07)
Delayed recall	3808/7	−0.10 (−0.16 to −0.04)
Fluency	4629/9	−0.08 (−0.12 to −0.04)
Global cognition	7702/15	−0.15 (−0.18 to −0.11)
Immediate recall	6747/15	−0.14 (−0.20 to −0.09)
Processing speed	10 660/20	−0.13 (−0.18 to −0.08)
Reasoning	3128/12	−0.18 (−0.25 to −0.10)
Semantic memory	2906/10	−0.14 (−0.20 to −0.08)
Visuospatial ability	669/5	−0.11 (−0.19 to −0.03)
Working memory	4855/9	−0.10 (−0.15 to −0.05)
Summary	15 620/113	−0.12 (−0.14 to −0.10)



Cohort Outcomes



The Lancet Commission on Dementia (e.g., Livingston et al., Lancet, 2017, 2020, 2024)



- hearing loss is one of the largest *potentially* modifiable risk factors for dementia
- this does **not** mean that having a hearing loss puts an individual MORE at risk than any other factor
- **"If we could eradicate/treat all hearing loss, what proportion of dementia cases might be averted?"**
- hearing loss is widespread, so it accounts for more cases at the population level (i.e., this is epidemiological risk, not individual risk)
  - about 7% in Lancet Commission 2024, tied with LDL Cholesterol
  - about 6.5% in Son et al. 2024, based on Canadian Data (CLSA)

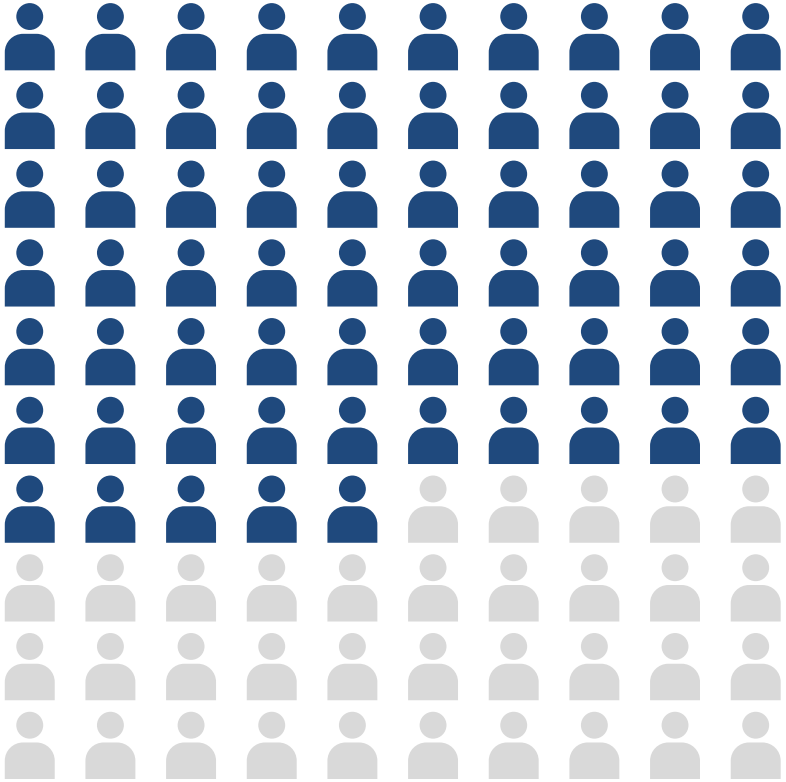
Epidemiological Risk vs Personal Risk

Risk factor	Life stage	Personal Risk	Share of dementia(%)	Risk factor	Life stage	Personal Risk	Share of dementia(%)
Hearing Loss	**Midlife**	**1.4**	**7**	Depression	Midlife	2.2	3
High LDL	Midlife	1.3	7	TBI	Midlife	1.7	3
< Education	Early life	1.6	5	Diabetes	Midlife	1.7	2
Isolation	Late life	1.6	5	< Education	Early life	1.6	5
Depression	Midlife	2.2	3	Isolation	Late life	1.6	5
TBI	Midlife	1.7	3	Vision loss	Late life	1.5	2
Air Pollution	Late life	1.1	3	**Hearing loss**	**Midlife**	**1.4**	**7**
Phys Inactivity	Midlife	1.2	2	High LDL	Midlife	1.3	7
Smoking	Midlife	1.3	2	Smoking	Midlife	1.3	2
Diabetes	Midlife	1.7	2	Obesity	Midlife	1.3	1
Hypertension	Midlife	1.2	2	Phys Inactivity	Midlife	1.2	2
Vision Loss	Late life	1.5	2	Hypertension	Midlife	1.2	2
Obesity	Midlife	1.3	1	+ Alcohol	Midlife	1.2	1
+ Alcohol	Midlife	1.2	1	Air pollution	Late life	1.1	3

Increased Risk ≠ Dementia as a Likely Outcome with Hearing Loss

Canadians aged 70–79

65 in 100 have hearing loss (500–4000 Hz)



4 in 100 are living with diagnosed dementia

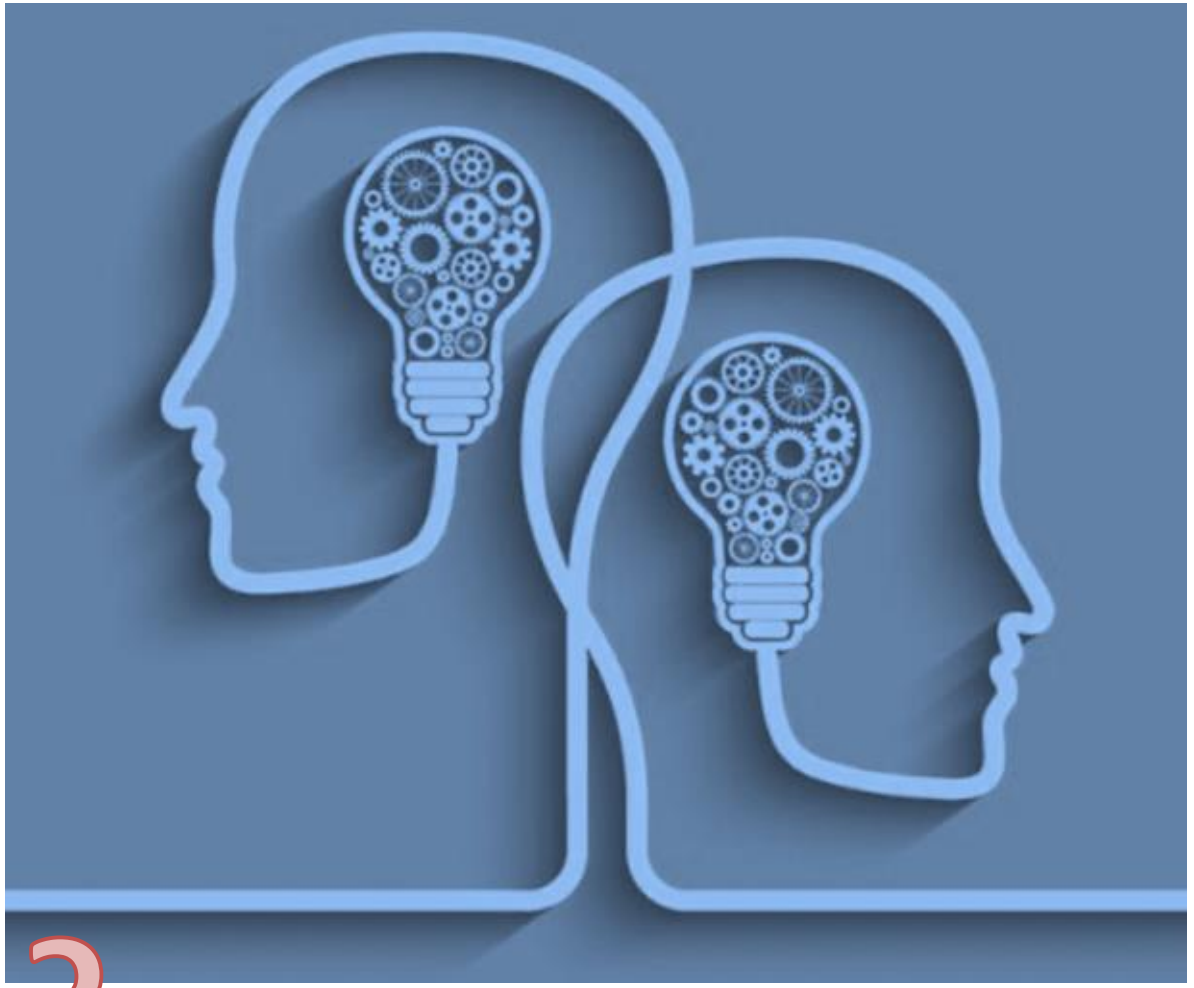


Most people in their 70s with hearing loss do not have dementia

Hearing loss: Feder et al., Health Reports, 2015 (speech frequencies, 0.5–4 kHz). Dementia: Public Health Agency of Canada, CCDSS 2013–14 (70–74: 2.4%; 75–79: 5.9%).

How do we think about these findings?

- may encourage people to take hearing seriously
- may introduce an element of fear into the diagnosis and management
- may help sell more hearing aids
- may increase stigma around hearing loss
- may provide a means to prevent, mitigate or reverse cognitive decline and dementia



Can Audiologists do Anything about Cognitive Decline and Dementia?

- in Lin et al., 2011, hearing aid use was tracked <u>but did not affect results</u>

- **How is hearing loss related to cognitive decline and dementia?**
  - what is the most current evidence?

- **What should we be doing?**
  - screening for decline/dementia?
  - recommending treatment to prevent/mitigate/reverse dementia?
  - modifying clinical care in light of possible dementia?
  - public messaging?

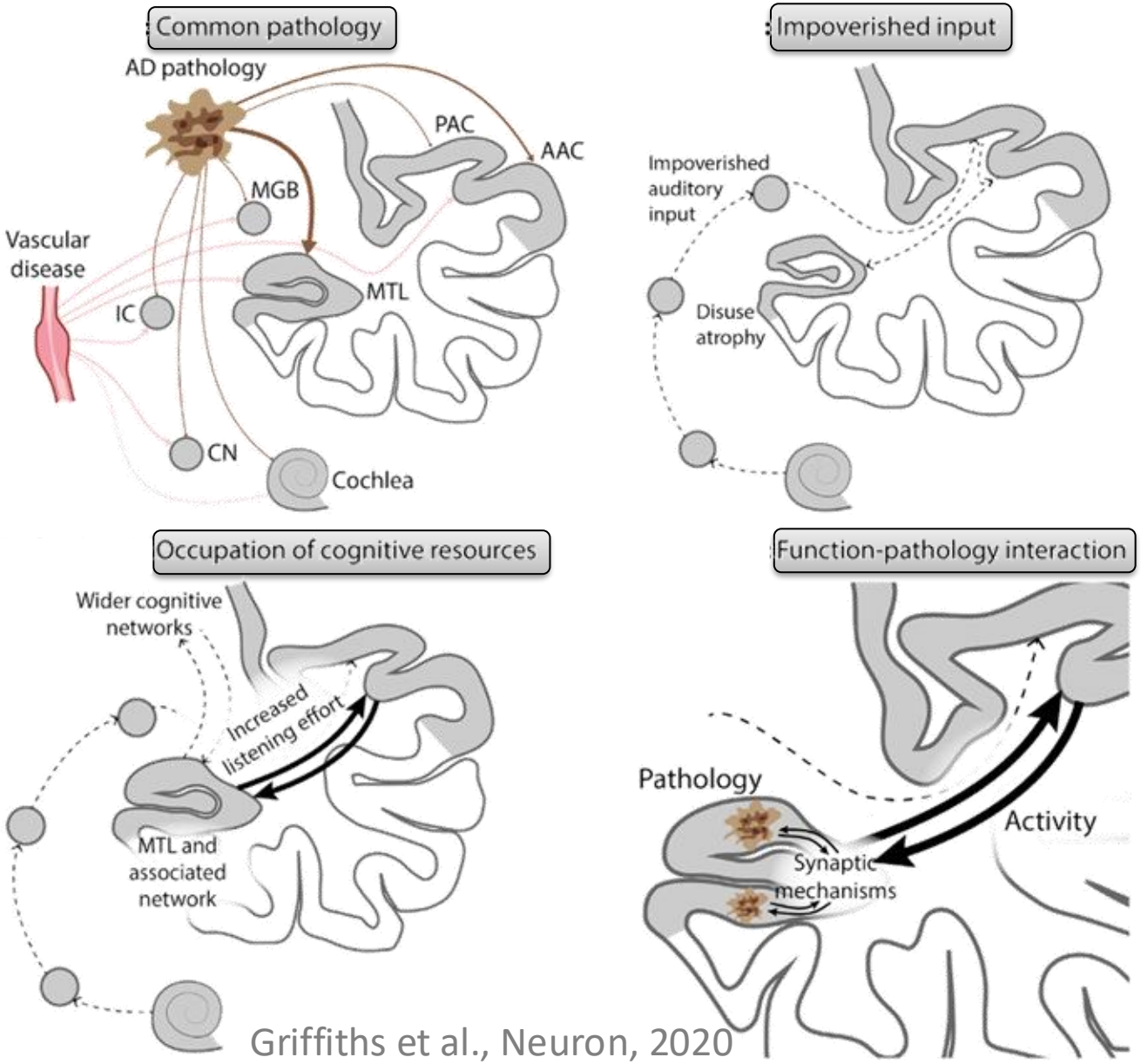


How is hearing loss related to cognitive decline and dementia?

We first need to know the answer(s) to this question.

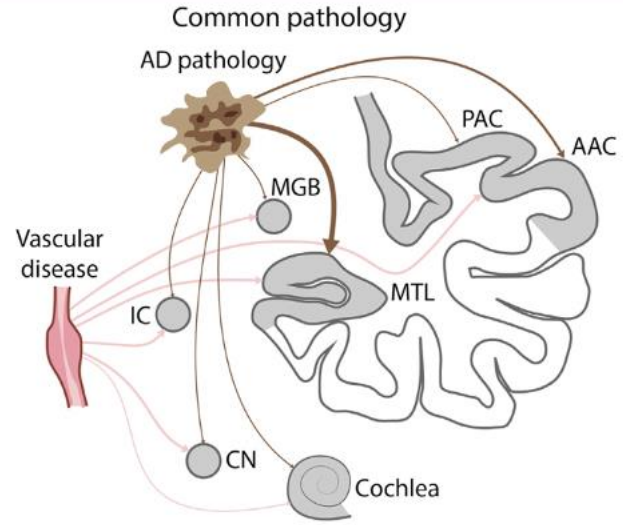
Four Possibilities:

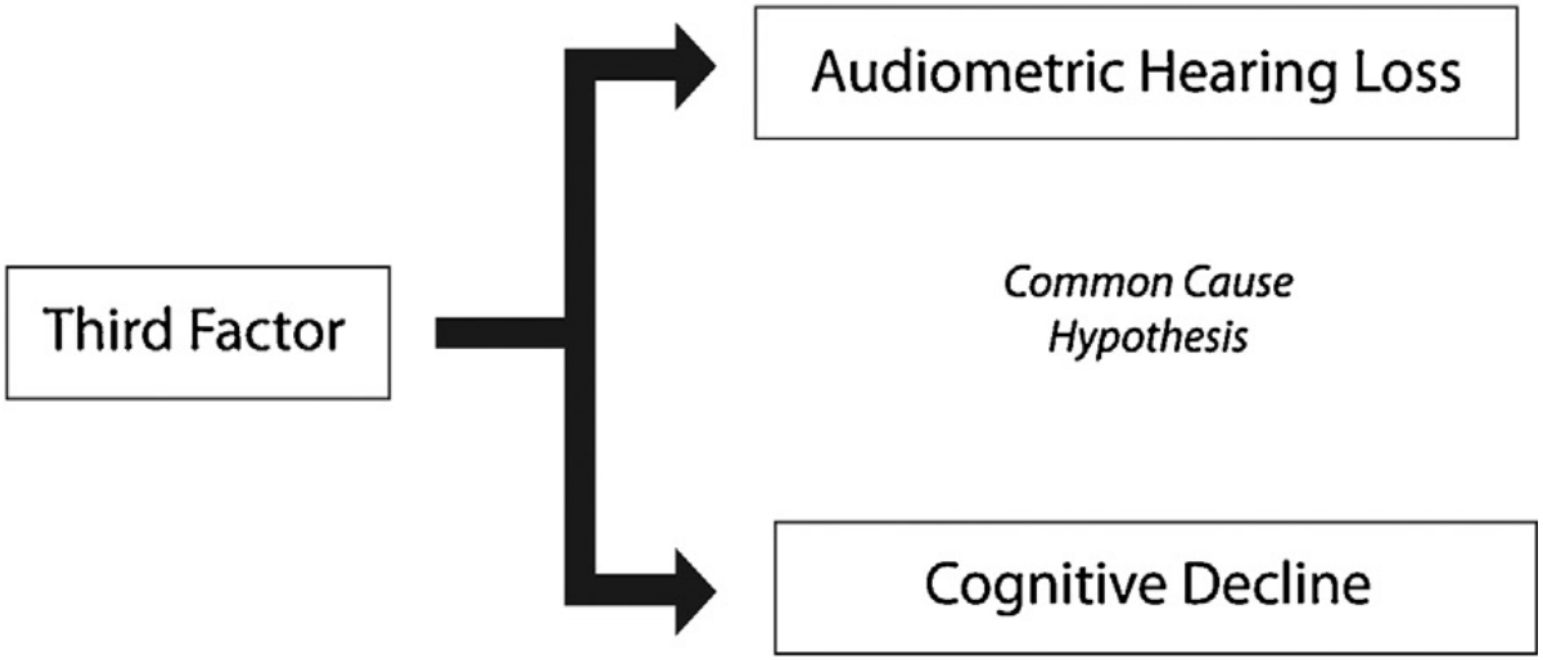
1. Common Pathology (3rd Factor)
2. Occupation of Cognitive Resources (Cognitive Load)
3. Impoverished Input (Sensory Deprivation)
4. Function-Pathology Interaction



Griffiths et al., Neuron, 2020

Common Pathology

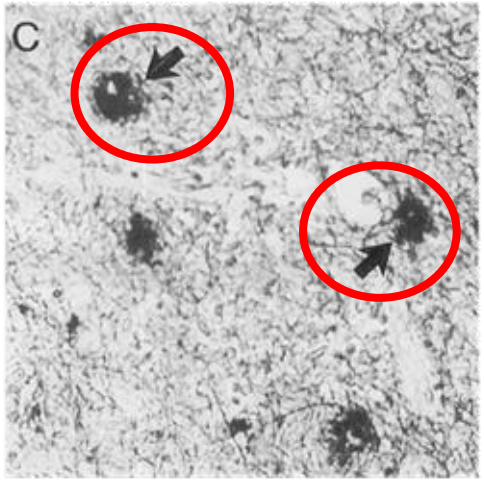




Wayne & Johnsrude, 2018

Common Pathology

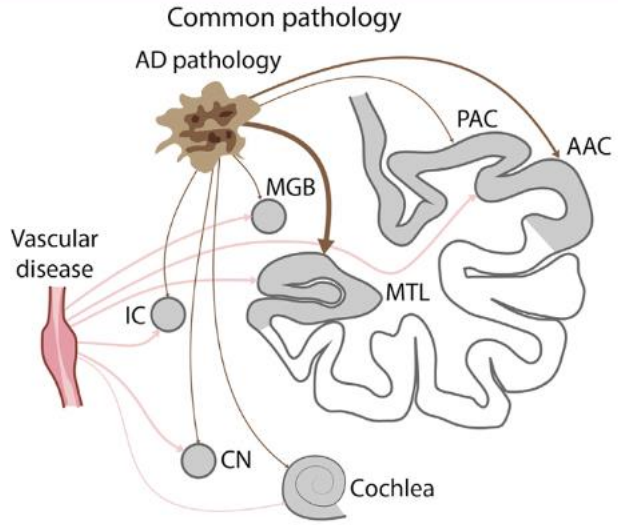
- neuropathology causing Alzheimer's disease could also affect auditory pathway
  - pathological changes related to Alzheimer's have been described in the auditory pathway
    (Baloyannis et al., Acta Otolaryngol, 2009; Parvizi et al., Ann Neurol, 2001; Sinha et al., Neurol, 1993)
  - and in the cortex
    (Baloyannis et al., Acta Otolaryngol, 2011; Lewis et al., J Neurosci, 1987)
- poor blood supply could lead to vascular dementia and vascular damage to cochlea
  - vascular pathology commonly occurs in the cochlea (often involved in hearing loss)
    (Kurata et al., JAMA Otolaryngol, 2016)



From Sinha et al., 1993
senile plaques in IC

Common Pathology

- Can this explain the association?



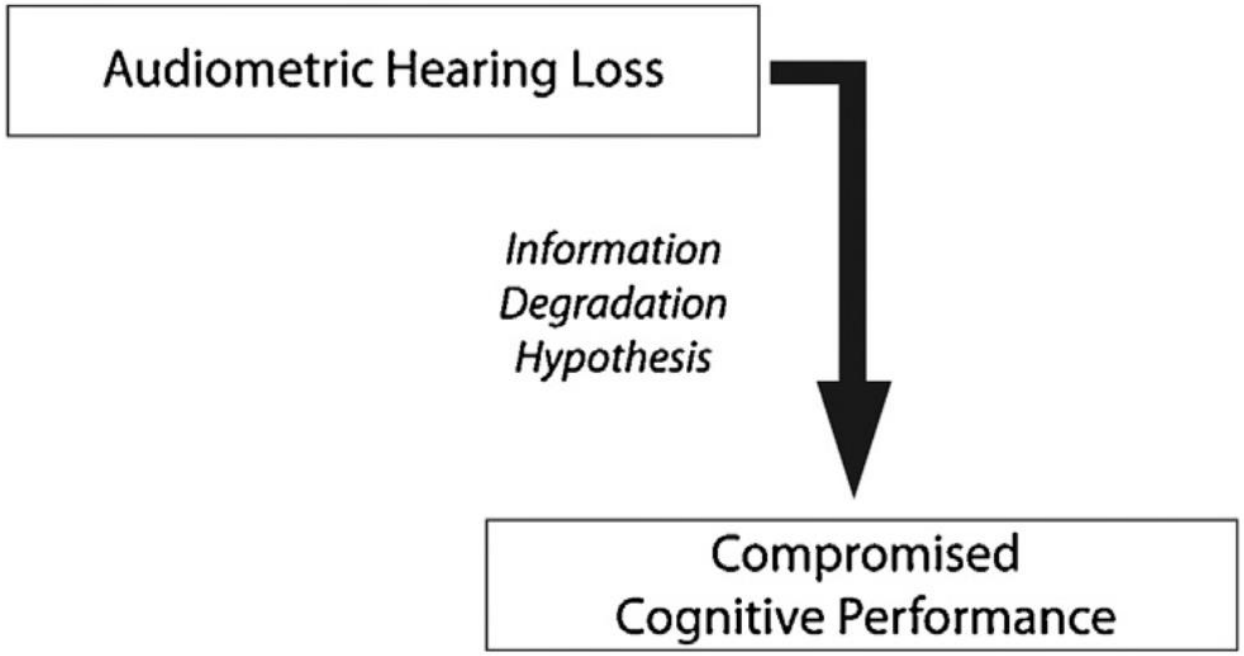
<u>Vascular Dementia</u>

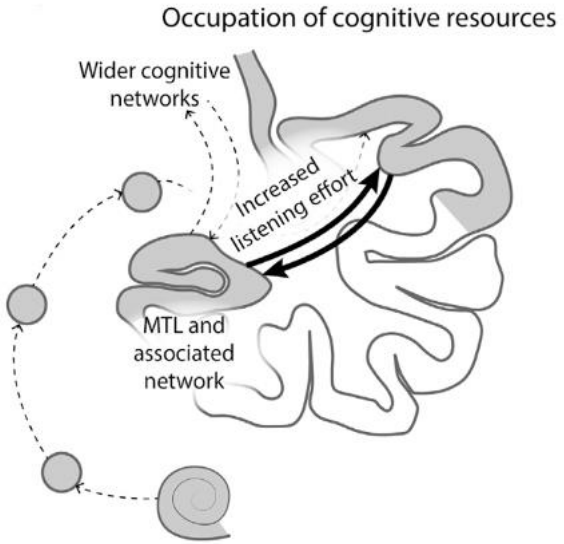
- in Loughrey et al.'s 2018 meta-analysis, vascular risk factors contributed significantly to cognitive decline, **but effects remained significant when controlling for vascular risk factors**
- in Livingston et al.'s 2017 meta-analysis, **risk of dementia survives correction for vascular risk factors**
- the majority of dementia cases in Livingston et al., 2017 **are due to Alzheimer's**

<u>Alzheimer's Dementia</u>

- most age-related losses are sloping high-frequency losses (characteristic of cochlear degeneration, not brainstem/cortical issues)

Degraded Information Occupies Cognitive Resources

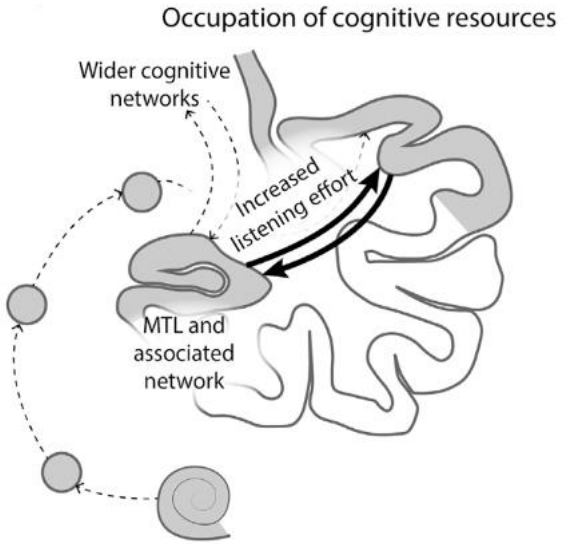




Wayne & Johnsrude, 2018

Degraded Information Occupies Cognitive Resources

- **information degradation hypothesis**
  - declines in cognitive performance due to compensation for impaired auditory input
    (Pichora-Fuller, Int J Audiol, 2003)
  - higher-level cognitive processing is compromised because mental resources have been diverted to perception
  - this has been shown extensively using dual-task paradigms
    (Gagné et al., Trends Hear, 2017)



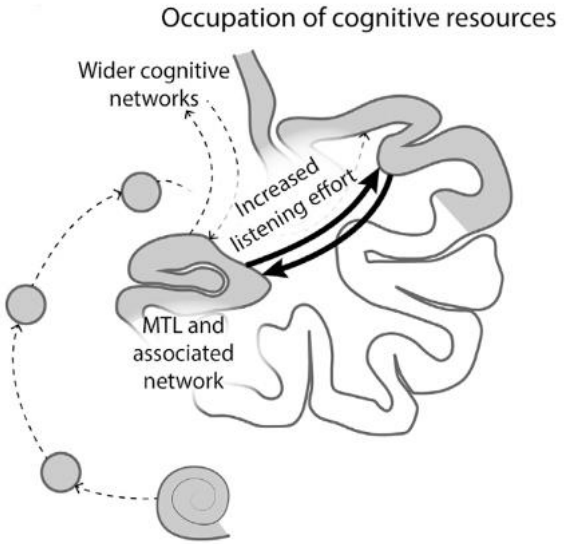
Driving on Bad Roads — Makes Driving Harder



- requires more focus on driving, allowing for less focus on other things

Degraded Information Occupies Cognitive Resources

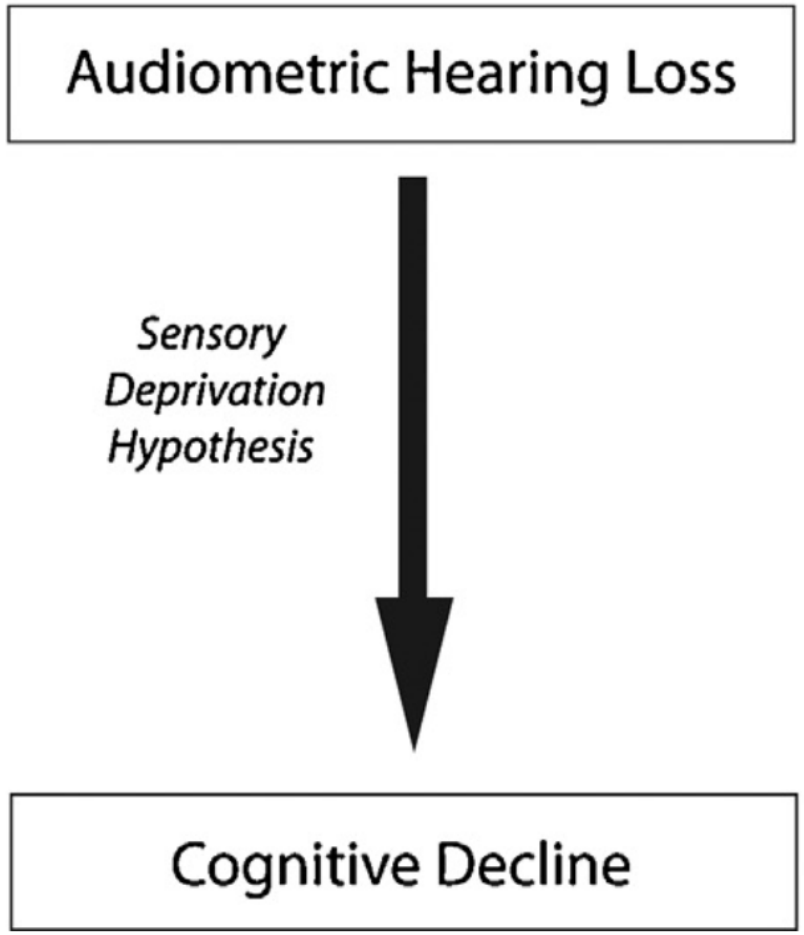
- evidence:
  - memory is poorer for degraded speech inputs
    (Pichora-Fuller et al., J Acoust Soc Am, 1995)
  - executive function is impaired with effortful listening
    (Wingfield & Tun, J Am Acad Audiol, 2007)

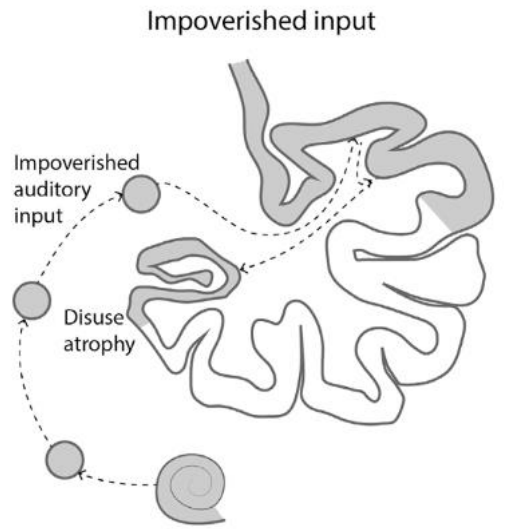


- this is almost certainly a major component of the hearing loss—cognition relationship

- but this can't easily explain deficits in cognition that do not involve hearing (e.g., Stroop tasks, trailmaking)

Impoverished Input/Sensory Deprivation Leads to Brain Changes





Wayne & Johnsrude, 2018

Driving on Bad Roads — Damages Cars



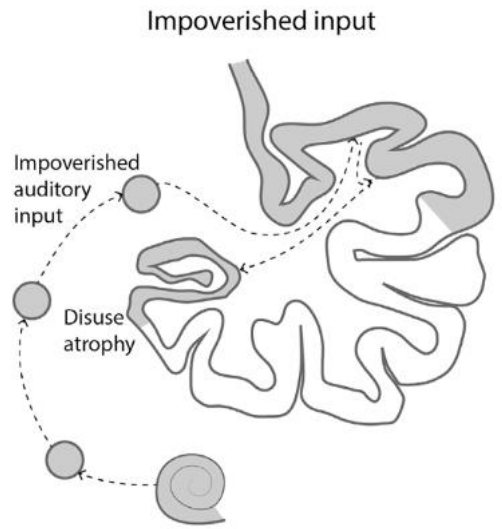
- yes, it’s harder to drive but it can also damage the car over time

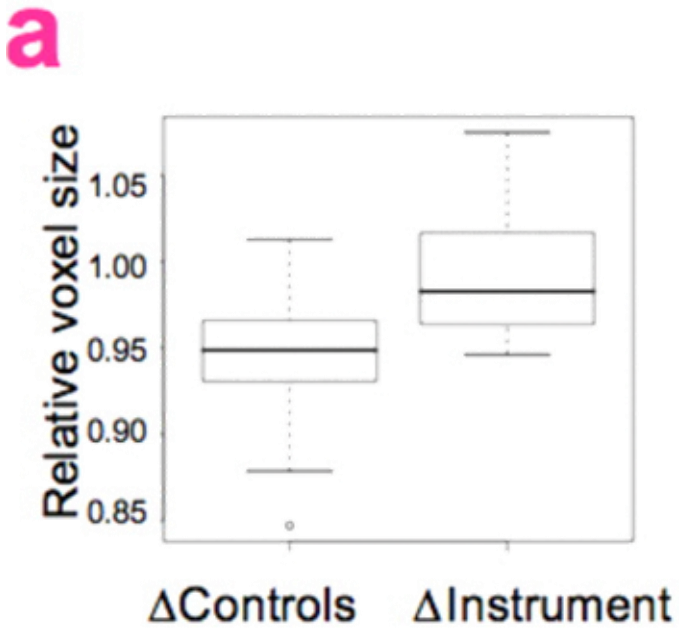
Impoverished Input — Sensory Deprivation

- idea: hearing loss may lead to decreased sound, speech and language input i.e., auditory deprivation → negative effects on brain structure and function
  - this could be exacerbated by ***social isolation***

- enrichment and deprivation change brain structure and function—synapses, axons, glia, cortical thickness etc.
  (Markham and Greenough, Neuron Glia Biol, 2004)

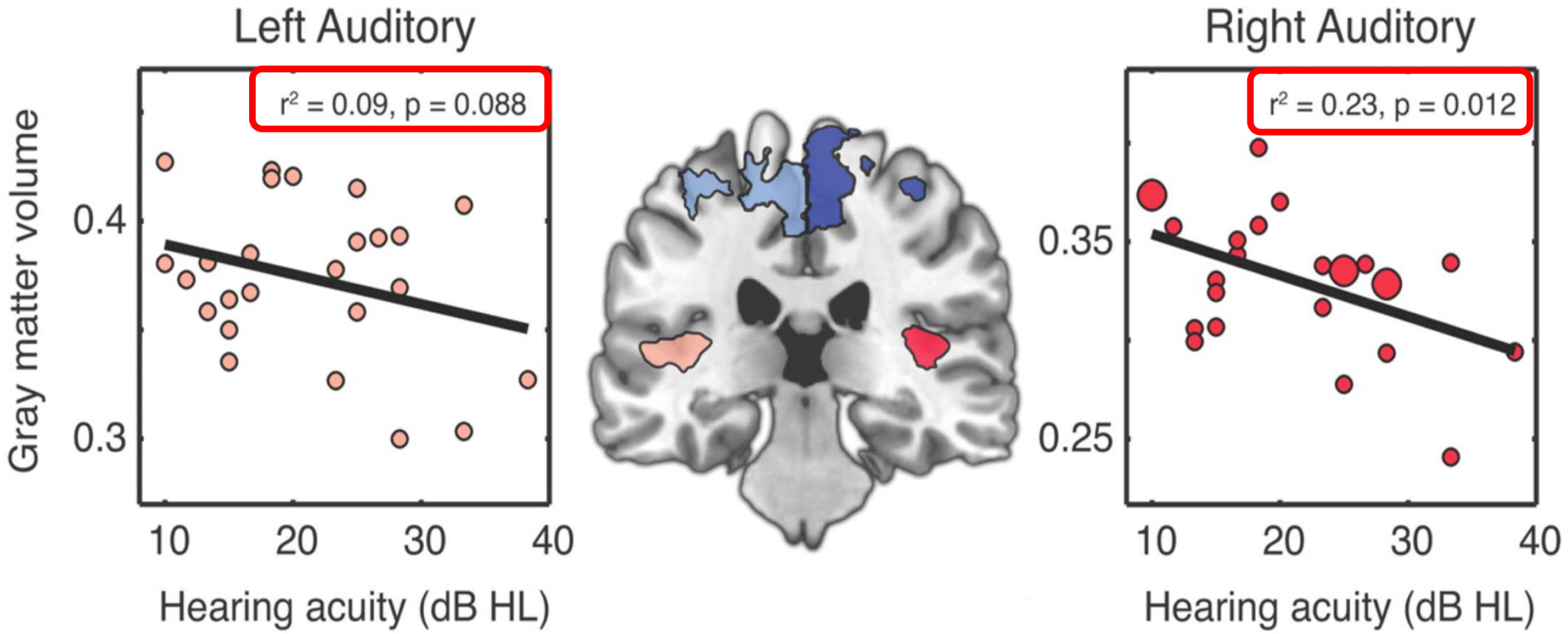
- musicianship changes structure of auditory cortex and hippocampus
  (Hyde et al., J Neurosci 2009 showed brain changes in children after 15 months of musical training)





Does the Brain Change with Hearing Loss?

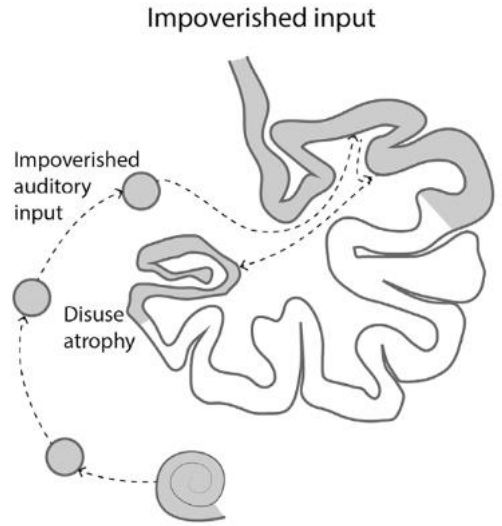
- peripheral hearing loss is associated with:
  - reduced cortical volume in the primary auditory cortex
    (Peelle, et al. , J Neurosci, 2011, Eckert, et al. JARO, 2012)



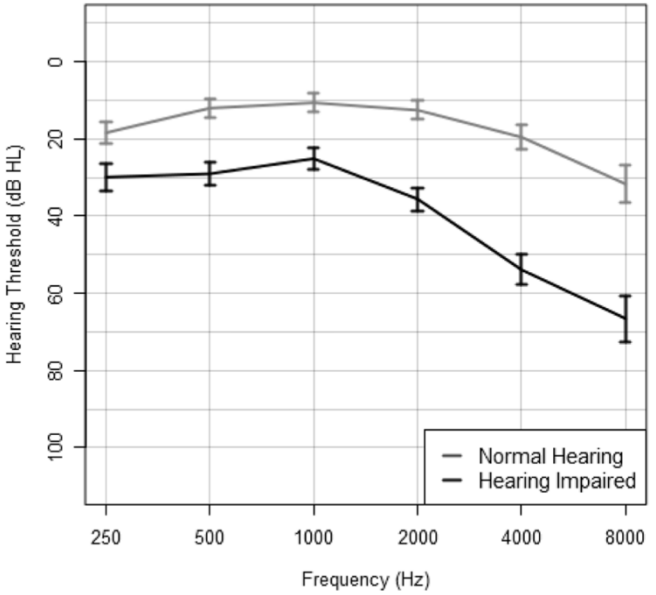
Peelle et al., 2011

Brain Changes with ARHL — Longitudinal Data

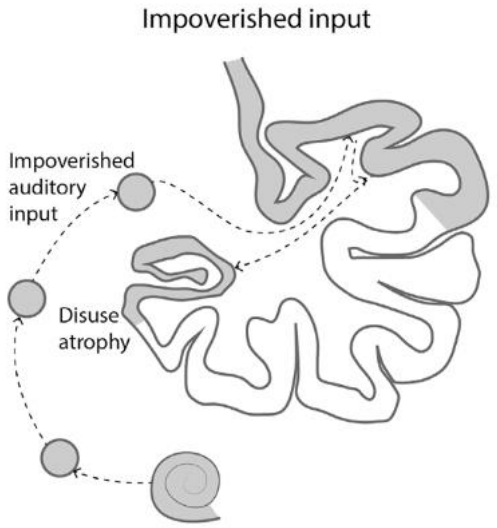
- **Lin et al, Neuroimage, 2014**
  - 126 participants (56–86 yrs at baseline; enrolled 1994+)
    - no epilepsy, stroke, bipolar, prior dementia diagnosis, severe cardiac disease, pulmonary disease, metastatic cancer (no scans after dementia diagnosis)
  - hearing testing (500–4000 Hz) & 1–10 MRIs (avg. 6 over 6 years);
  - ~60% had hearing in the normal range
  - few used hearing aids in the sample (authors' note)



- Results
  - brain volumes decreased with age, but decreased <u>faster with hearing loss</u>
  - decline was mainly in (but not limited to) the temporal lobes
  - stronger associations between hearing loss and rates of decline were observed in the **right** temporal lobe



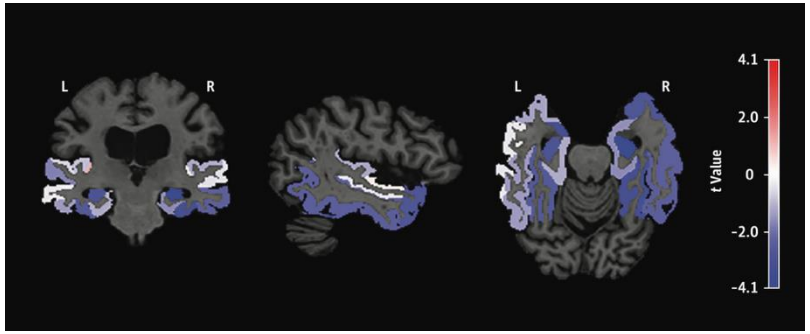
Late-Life Brain Changes after Mid-life Hearing Loss



- **Armstrong et al., JAMA Otolaryngology HNS, 2019:** Association of Midlife Hearing Impairment with Late-Life Temporal Lobe Volume Loss

  - 194 individuals (no baseline cognitive impairment, stroke, head injuries, Parkinson disease, or bipolar disorder)
  - Hearing loss identified in midlife (45–65); BLSA (1990–1994)
  - brain volume changes (MRI) evaluated **~19 years later** (2008–2015), **over a 6-year period**

- Results
  - poorer midlife hearing in **better ear/right ear** associated with steeper late-life declines in the right temporal gray matter, right hippocampus, and left entorhinal cortex
  - **no** associations between poorer midlife hearing in the **left** ear with late-life volume loss



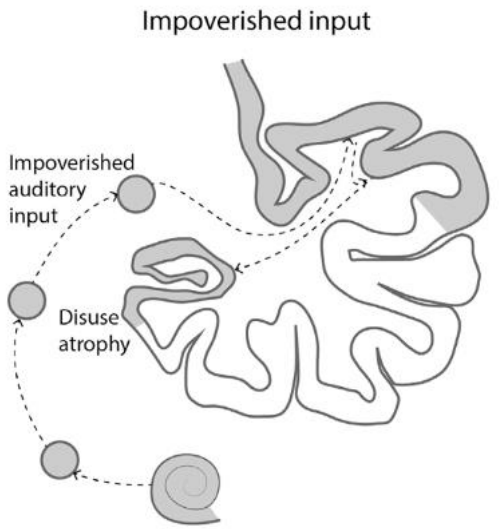
Impoverished Input — Sensory Deprivation

- **Does the brain change with hearing loss?**

- **Yes—there is high-quality evidence for this:** the brain changes with age-related hearing loss, over the long-term

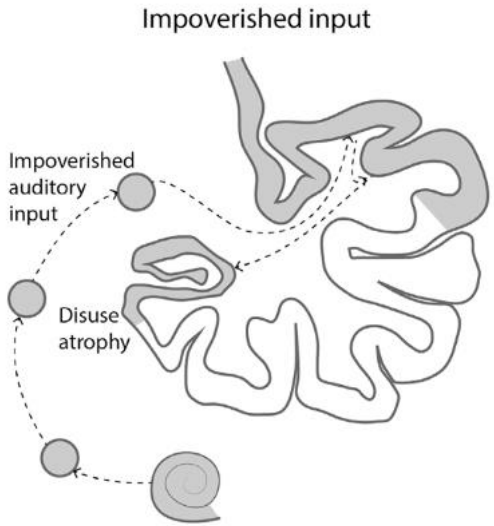
- changes are greatest in the right temporal lobe

- mid-life hearing predicts late-life brain changes



Possible Effect of Social Isolation?

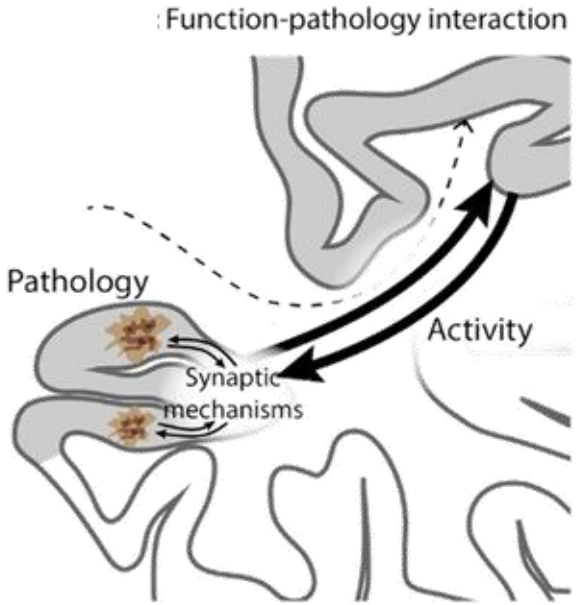
- **Hämäläinen et al., Sci Rep 2019:** does social isolation explain the link between hearing loss and cognition?
  - 30,029 Canadians aged 45–85 (CLSA), with audiometry and cognitive testing
  - social factors were linked to both hearing and cognition
  - but they did not significantly impact the hearing–cognition association

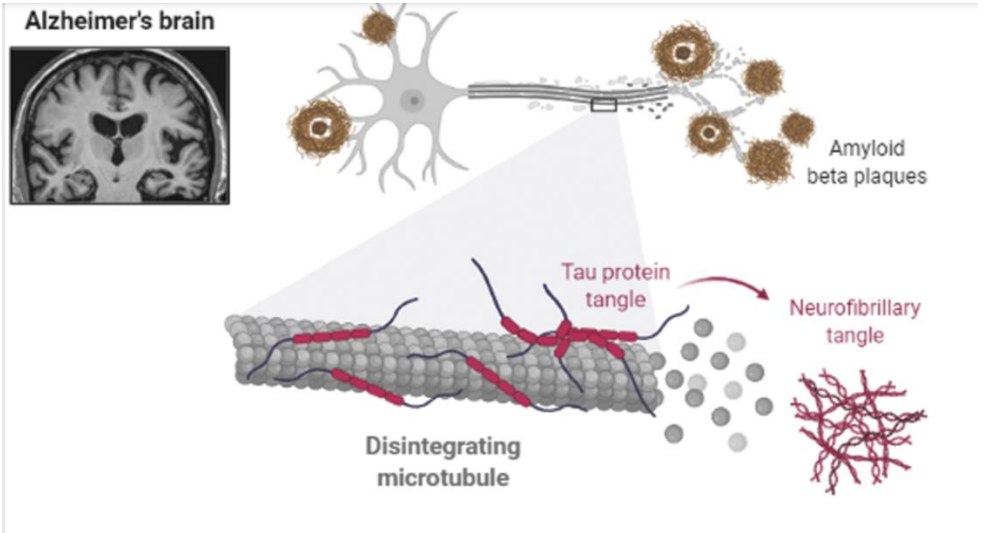


social isolation may play a small part, but cannot account for most of the link

Might it be more than just ‘sensory deprivation’?

- idea: loss of input doesn’t just lead to cognitive decline or dementia, but rather, **degraded auditory processing continually interacts with pathological processes**
  (Griffiths et al., 2020)



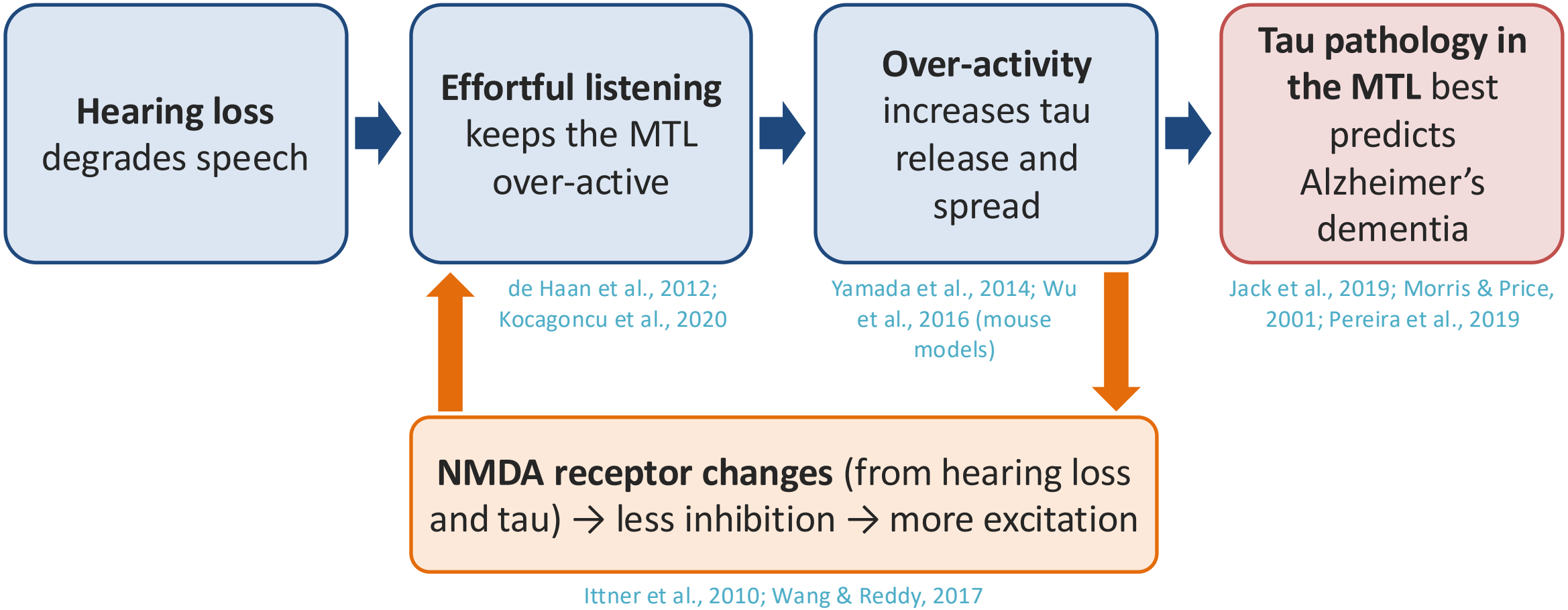


How Might This Work? One Possibility…

- the medial temporal lobe (MTL) is critical for auditory perception
  - the hippocampus is tuned to acoustic features
  - it is required for recognition of sounds
  - **it is heavily involved in the perception of degraded speech**
- so hearing loss may keep the MTL working harder

Aronov et al., 2017; Barascud et al., 2016; Covington et al., 2018; Schapiro et al., 2014; Bishop & Miller, 2009; Blank et al., 2018; Davis et al., 2011

One Possibility: Effortful Listening, Excitotoxicity and Tau

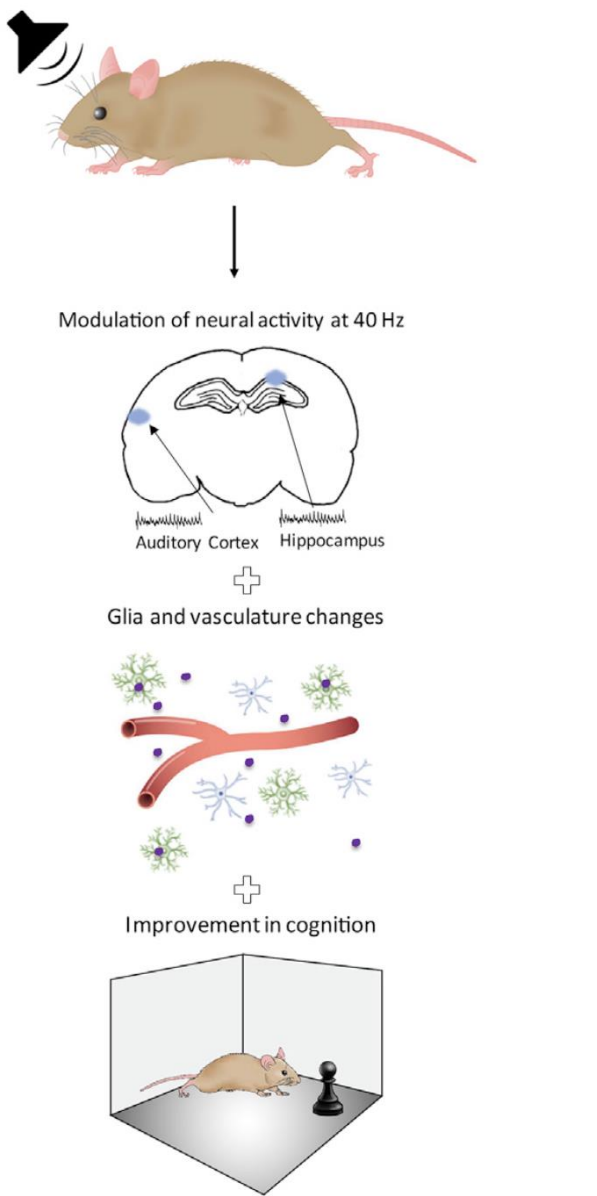


A Second Possibility…

- degraded auditory input due to hearing loss may lead to *reduced oscillatory activity* in the medial temporal lobe

- the medial temporal lobe (and hippocampus in particular) shows strong oscillations in the gamma range — around 40 Hz
  - this activity is decreased by reductions in cortical thickness in the temporal lobe (Schuler et al., 2022)
  - reductions in cortical thickness occur with hearing loss (Peelle et al., 2011)
  - this activity (~40 Hz) is decreased in Alzheimer's dementia before plaques appear (Iaccarino et al., 2016; Martorell et al., 2020)

Support for a Role of Gamma in Dementia (40 Hz)



- stimulating the brain at 40 Hz *reduces* Alzheimer's pathophysiology (Iaccarino et al., 2016); leads to memory improvements (Martorell et al., 2019)

- mouse model of Alzheimer's (5XFAD)
  - 7 days of stimulation with 40 Hz modulated sound
    - reduction of amyloid in auditory cortex and hippocampus
    - improved spatial and recognition memory
    - benefits were greater with combined visual and auditory stimulation

- proposed mechanisms:
  - gamma rhythm restoration (attenuated in Alz. mice before plaques appear)
  - microglia activation (brain's immune cells; engulf amyloid)
  - glymphatic clearance
  - blood vessel widening
  - protection of neurons, synapses and white matter

40 Hz Stimulation: Where Does the Evidence Stand?

In mice

- consistent benefits: less amyloid and tau, preserved neurons and synapses, better memory
- works with light, sound, or both
- one lab has found that 40 Hz light flicker does not reach the hippocampus (although 40 Hz sound does reach the hippocampus)

In people

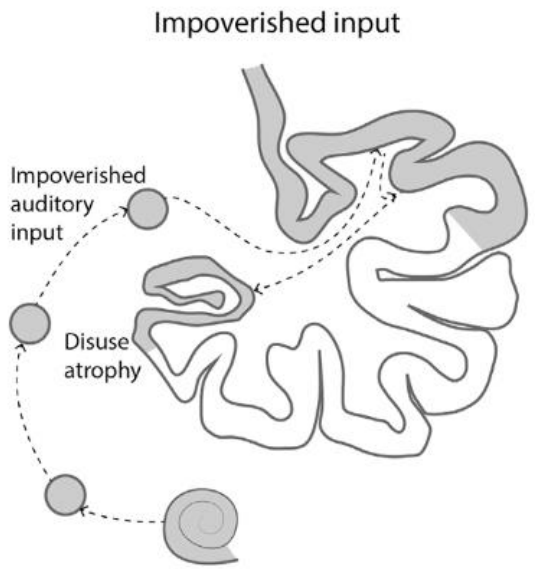
- 40 Hz light + sound reaches the human hippocampus
- small trials (n = 15–76): less brain atrophy; less white matter loss; mixed effects on memory and daily function
- mostly developer-funded; HOPE trial (~670 people) results pending
- review in Hyun et al. 2026 (Geroscience)

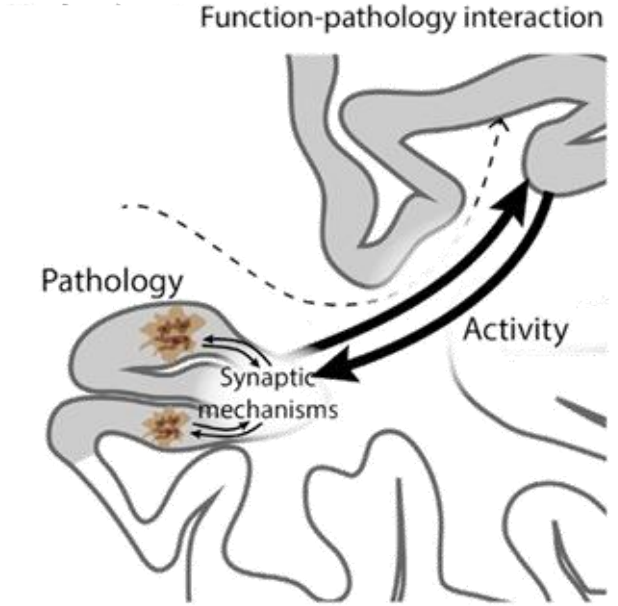
Mice: Iaccarino et al., 2016; Martorell et al., 2019; Adaikkan et al., 2019; Murdock et al., 2024; Soula et al., 2023. People: Chan et al., 2022; Mlinarič et al., 2025; Cimenser et al., 2021; Hajós et al., 2024; Da et al., 2024; review: Hyun et al., 2026; HOPE: ClinicalTrials.gov NCT05637801

Hearing Loss and Dementia — Mechanisms

- hearing loss is linked to long-term brain changes (consistent evidence)

- these changes could result from things such as:
  - impoverished input (sensory deprivation)
  - excitotoxicity: effortful listening → more tau release and spread
  - NMDA receptor changes → loss of inhibition
  - reduced 40 Hz oscillatory activity

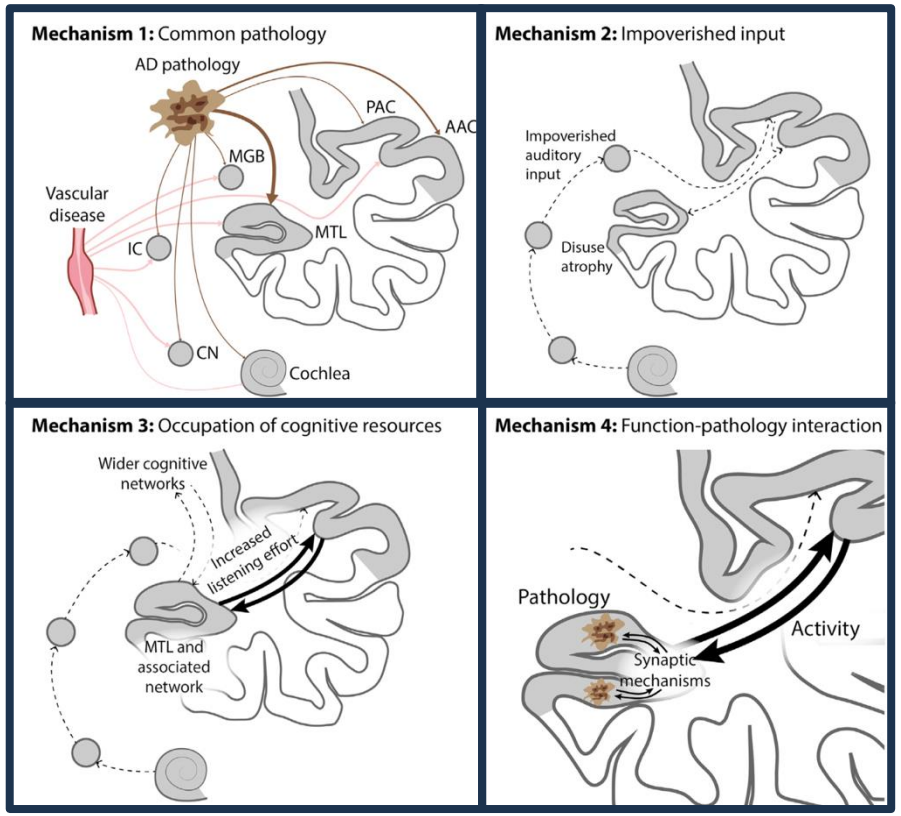




NMDA receptors and gamma rhythms: Sivarao et al., 2015

Can Audiologists do Anything about Cognitive Decline and Dementia?

- **How is hearing loss related to cognitive decline and dementia?**
  - what is the most current evidence?



- **Common Pathology**
  - could explain some cases, but much more unlikely in cases of Alzheimer's Dementia
- **Occupation of Cognitive Resources**
  - poor hearing may impair cognitive performance on auditory tasks
  - does not easily explain poor performance on non-auditory tasks
- **Impoverished Input/Sensory Deprivation**
  - there is strong evidence for this
  - the brain changes with hearing loss
  - function-pathology interactions are also possible and have plausible mechanisms
- **What should we be doing about it?**

Can Audiologists do Anything about Cognitive Decline and Dementia?

- **What should we be doing?**
  - screening for decline/dementia?
  - recommending treatment to prevent/mitigate/reverse dementia?
  - modifying clinical care in light of possible dementia?
  - public messaging?

- screening is contra-indicated for adults who are not symptomatic for cognitive impairment
  (Canadian Task Force on Preventive Health Care, CMAJ, 2016; see Pichora-Fuller, Can Audiol, 2023 issue 3)

- symptoms of cognitive impairment
  (from Weinstein, same issue)
  - falls
  - signs of changes in cognition (e.g. memory changes, forgetting where things are placed, difficulty expressing thoughts and ideas)
  - concerns from patients/family members about memory
  - asking the same question over and over again
  - taking longer than usual to process incoming information/respond to questions being asked
  - difficulty expressing themselves when answering history questions
  - difficulty following directions

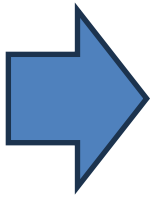
If Considering Screening…



- LIMIT: only consider if there are symptoms of cognitive impairment
- USE: evidence-based tools (e.g., the Montreal Cognitive Assessment or MoCA), after training
- CONSULT: referral pathways must be understood
  - we do not diagnose cognitive decline/dementia; screenings are used to make decisions about referral

Can Audiologists do Anything about Cognitive Decline and Dementia?

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Can Hearing Aids Help?

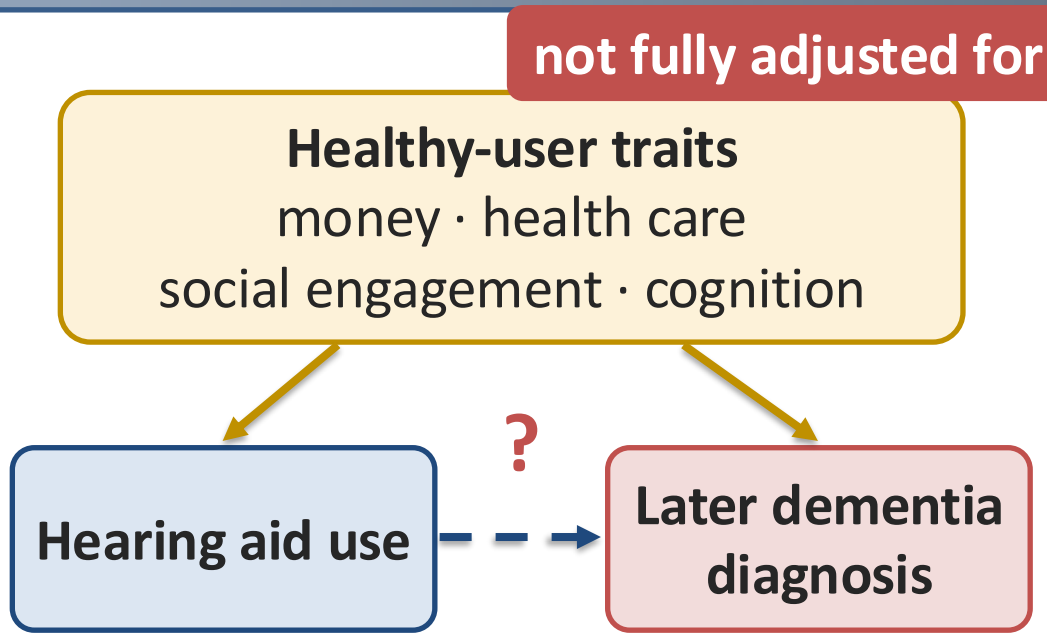
- **Bucholc et al., Trans Res Clin Int, 2021:** retrospective study of 2114 MCI/dementia patients with hearing loss
  - data from the National Alzheimer's Coordinating Center (NACC) database (2005–2018)
  - explored dementia onset and progression with/without hearing aids
  - adjusted for age, sex, race, education, and dementia rating (CDR-SB):

- Group 1: 939 with MCI diagnosis at baseline (68% with hearing aids)
  - MCI patients using hearing aids had a **significantly lower risk of converting to dementia**
  - median time to incident dementia was longer for HA users (4 years vs 2 years)

- Group 2: 1175 with dementia diagnosis at baseline (60% with hearing aids)
  - mean annual change in dementia rating (CDR-SB) 1.3 points lower in hearing aid users

Can Hearing Aids Help? Limitations

- observational (i.e., people were not randomly assigned to get hearing aids)
  - healthier people may be more likely to get hearing aids & less likely to have dementia
- non-HA users might be diagnosed sooner because of problems hearing
- no controls for income, vascular risk, depression, APOE, social engagement



Tester: "apple, table, penny"

Patient: "apple… **cable**… penny?"

✗ **scored as a memory error**

Can Hearing Aids Help?



- **Yeo et al., JAMA Neurol, 2023:** meta-analysis of 8 studies, with 126 903 participants
  - significantly lower hazards of cognitive decline among hearing aid users compared with participants with uncorrected hearing loss (HR, 0.81; 95% CI, 0.76-0.87)
  - a 19% decrease in hazard of cognitive decline with use of hearing aids
- meta-analysis of 11 studies, with 568 participants
  - a 3% increase in short-term cognitive function with use of hearing aids

Can Hearing Aids Help?



- **ACHIEVE Study (Lin et al., Lancet, 2023, Livingston, Lancet, 2023):** long. rand. control: 977 adults (70–84 yrs), untreated hearing loss
  - 739 community volunteers (healthier)
  - 238 from the ARIC heart study cohort (more risk factors for cognitive decline)
  - randomly assigned to treatment (hearing aid + counselling) or health education
  - cognitive measures at beginning and after 3 years

- results:
  - primary analysis (all participants): no effect on 3-year cognitive decline
  - ARIC cohort only : 48% slower cognitive decline with hearing intervention
  - ARIC control-group declined 2.7× faster than community volunteer control group, so more decline to prevent

- **a possible benefit of hearing aids on cognition for higher-risk adults**
- **a secondary analysis (i.e., promising but not definitive)**

—more results expected 2027

Can Hearing Aids Help? — Summary of the Evidence

Study	Design	Hearing aid finding
Bucholc et al., 2021	records review, 939 (MCI)	slower progression to dementia (HR 0.73)
Yeo et al., 2023	meta-analysis, 8 studies	less cognitive decline (HR 0.81)
Lin et al., 2023 (ACHIEVE)	randomized trial, 977	no overall effect; benefit in high-risk subgroup
Grenier et al., 2024	cross-sectional, 62,072	users no better than non-users (OR 0.94)
Mur et al., 2025	trial emulation, 59,768	higher risk (RR 1.43); null after adjustment
Cribb et al., 2026a	trial emulation, 2,777	fewer dementia diagnoses (RR 0.67); cognition same
Cribb et al., 2026b	trial emulation, 2,842	no change in blood biomarkers

■ benefit (observational) ■ mixed ■ no effect

Mixed evidence except for weaker (observational) studies.

Driving on Bad Roads — Does Treatment Fully Repair?



- Do hearing aids and audiological treatment/counselling make hearing normal? (do they fix the potholes?)

- benefit may be limited to higher-risk groups or may take many years to appear
  - consider that late-life cognitive decline and dementia risk are predicted by mid-life hearing loss

Recommending treatment to prevent/mitigate/reverse dementia?

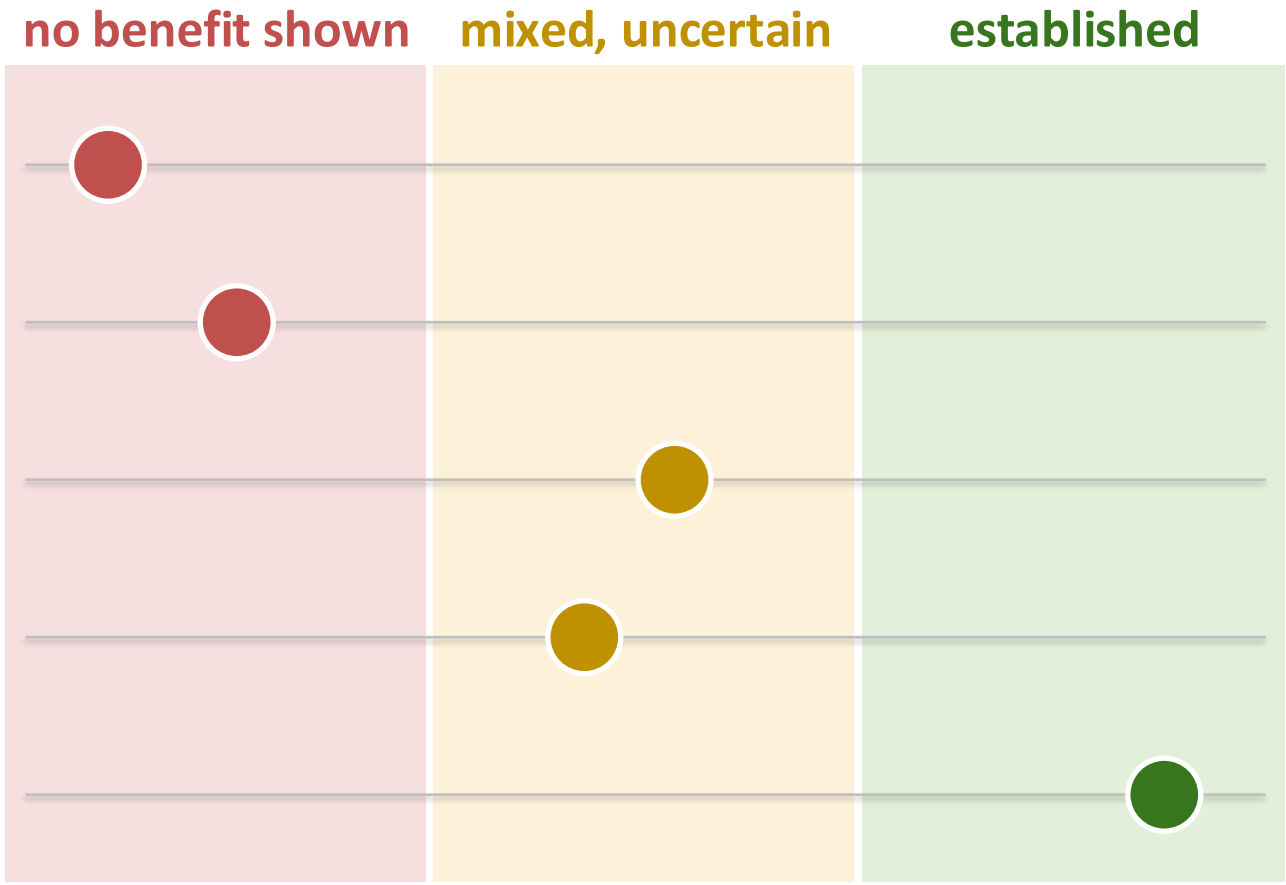
reverse dementia
no studies show this

slow cognitive decline
ACHIEVE: no overall effect; ASPREE: no change

slow decline in higher-risk adults
ACHIEVE higher-risk subgroup only

delay dementia diagnosis
positive but mixed evidence

communication, falls, social engagement
significant evidence



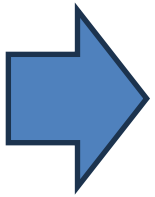
The ACHIEVE Study — Secondary Analyses (2024–2026)

Outcome	Hearing intervention vs control (3 years)	Source
Communication (HHIE-S)	✓ about 9 points better (0–40 scale), from 6 months on	Sanchez et al., 2024
Falls	✓ 27% fewer falls over 3 years	Goman et al., 2025
Social isolation, loneliness	✓ small: kept about 1 more person in social network	Reed et al., 2025
Fatigue	✓ small benefit on one of two measures	Bessen et al., 2024
Cognition, highest-risk 25%	✓ 62% slower decline (risk groups defined afterwards)	Pike et al., 2025
Blood biomarkers (n = 164)	✓ slower rise in inflammation	Pike et al., 2026
Quality of life (RAND-36)	✗ no overall effect; small gains in social function, energy	Huang et al., 2024
Physical activity (worn sensor)	✗ no effect	Schrack et al., 2025
Leisure activity, TV viewing	✗ no effect	Martinez-Amezcua et al., 2025
Physical function (SPPB, grip)	✗ no effect	Deal et al., 2026

Sanchez, J Am Geriatr Soc, 2024; Bessen, J Gerontol A, 2024; Huang, JAMA Netw Open, 2024; Goman, Lancet Public Health, 2025; Reed, JAMA Intern Med, 2025; Pike, Alzheimers Dement, 2025; Schrack, J Am Geriatr Soc, 2025; Martinez-Amezcua, J Gerontol A, 2025; Deal, PLoS One, 2026; Pike, EClinicalMedicine, 2026

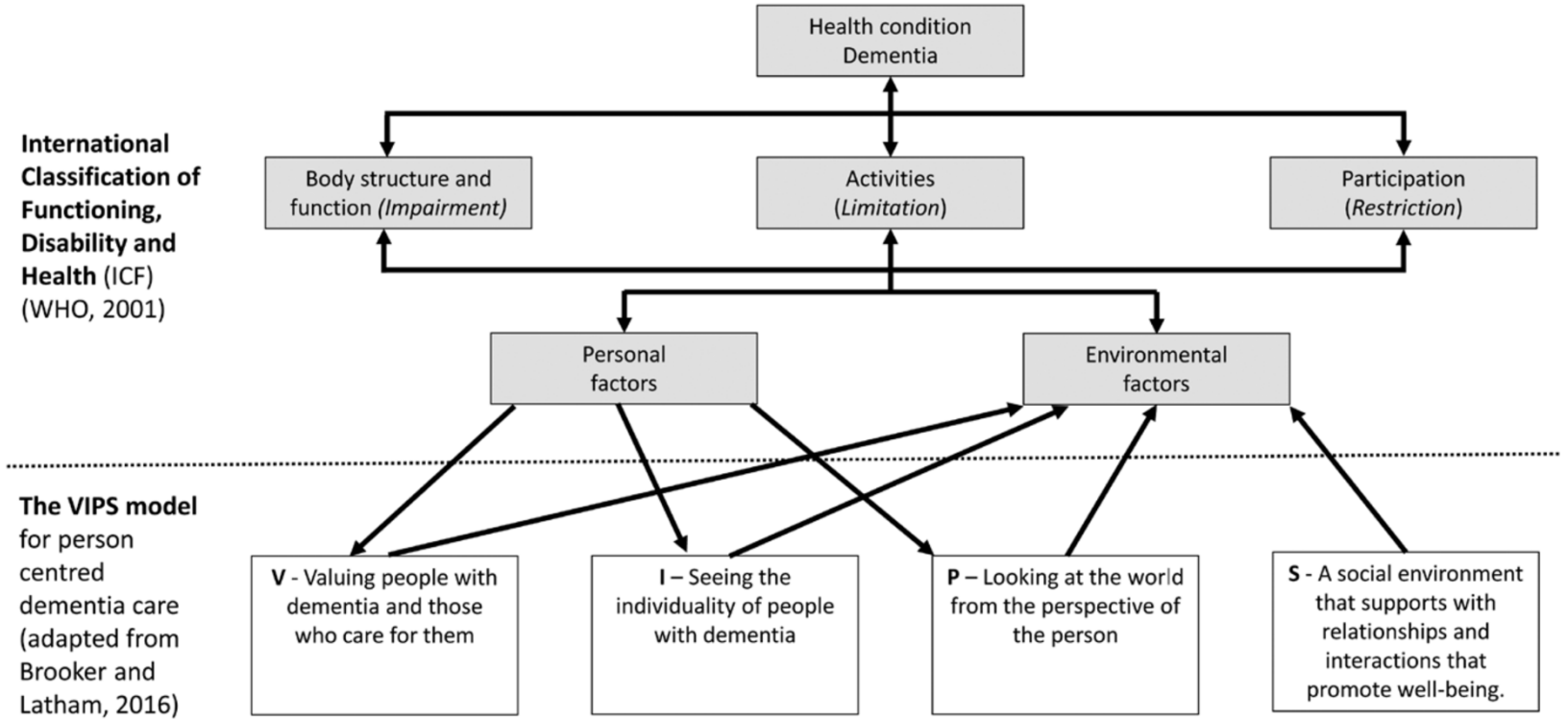
Can Audiologists do Anything about Cognitive Decline and Dementia?

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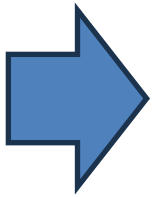
Modifying Clinical Approach for Cog. Decline/Dementia

- **strong recommendation:** **Dawes et al., Hearing Assessment and Rehabilitation for People Living With Dementia, Ear and Hearing, 2022**
  - a comprehensive review of best practice recommendations for the assessment and rehabilitation for persons with dementia based on current evidence



Can Audiologists do Anything about Cognitive Decline and Dementia?

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Views on Aging and Hearing Matter (see Pichora–Fuller, Can Audiol, 2023 v.10, issue 3)

- **Blustein et al., J Am Geriatric Soc, 2023: "It is time to change our message about hearing loss and dementia"**
  - "Hearing loss is the largest (potentially modifiable) independent risk factor for dementia" may lead to overestimation of personal risk
  - Hearing Loss already has a negative stigma
    - can already appear less intelligent (esp. with bluffing)
    - people with hearing loss may be more negatively affected (e.g., embarrassed, underemployed) if immediate suspicion of dementia
  - UK joint statement: recommend hearing aids for their proven benefits, not to prevent dementia (BSA, BAA & BSHAA, 2024, 2026)

Resource — see ‘Marketing Resources’ on the CAA Website

Canadian Academy of Audiology
Academie Canadienne d'audiologie

CAA FAST FACTS FOR PRIMARY CARE

Hearing Health and Cognitive Health in Aging Adult Patients:

How to Frame the Conversation

Over the past several decades, there has been a great deal of research and discussion about the connections between hearing loss and cognitive decline. While we do not know whether treating hearing loss will reduce the risk of dementia, there is limited evidence showing that treating hearing loss may mitigate cognitive decline in some people at increased risk for dementia (Lin et al., 2023). We do know, however, that treating hearing loss can have positive effects on communication. Better communication, in turn, can have positive effects on overall cognitive, social, emotional and functional well-being.

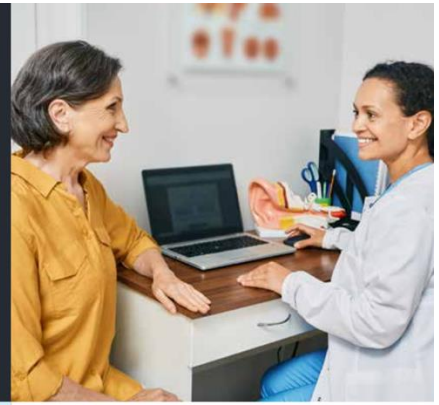
When Should Hearing Loss be Screened?

Age-related hearing loss (ARHL; sometimes called presbycusis) is common in the aging population. The prevalence of ARHL increases markedly with age. Reports of difficulty understanding speech in group or noisy situations may start in middle age. By 75 years of age, about half of Canadians will have a clinically significant hearing loss (Mick et al., 2021). From the time of first noticing hearing problems, many people delay help-seeking for a decade. The World Health Organization (WHO) recommends that hearing screening for older adults start at 50 years of age (WHO, 2021). Importantly, hearing loss is one of the key capacities that the WHO recommends be included in integrated primary care for older people (ICOPE; WHO, 2024) and screening techniques (including the WHO online app) are suggested.

Older people with hearing loss may have faster cognitive decline compared to people with normal hearing (Phillips et al., 2022). Audiologic rehabilitation can support patients with hearing loss and their families. Treatments, including the use of technologies (e.g., hearing aids), counselling, and training in communication strategies, can help to overcome communication barriers in social interactions (Mick et al., 2018). Those who hear better are more apt to engage in physical and social activities, which may be protective against cognitive decline (Pichora-Fuller, 2025).

Where Does Aging Happen in the Auditory System?

There are different sub-types of ARHL. The “sensory” type (e.g., in people with a history of occupational noise exposure) and the “metabolic” type (e.g., in people with diabetes or cardiovascular risk factors) present as a gradual high-frequency sensorineural hearing loss when audiometric pure-tone detection thresholds are measured. In addition, “neural” type ARHL across multiple levels of the auditory nervous system may affect speech understanding in noise, even when there is no more than a mild degree of hearing loss as measured by audiometry.



How Hearing Loss May Affect Cognitive Performance

In ideal listening conditions (e.g., when a person with normal hearing talks to a friend in their home), the brain can easily and rapidly convert incoming speech sounds as the person is understanding the conversation. However, much of everyday life happens in challenging listening conditions (e.g., when a person has hearing loss and there are many people talking while walking on a downtown street that is crowded and noisy). Importantly, listening in everyday life can become even more challenging when hearing loss is combined with other age-related health issues (e.g., vision or mobility impairments). In many of the challenging conditions of everyday life, the brain must work harder to process auditory inputs and to combine the multiple sensory and motor cues needed to successfully perform activities such as conversing while crossing a busy street.

Person-centered approaches to make it easier to listen while participating in everyday activities may include one or more rehabilitative technological, environmental, behavioural and/or attitudinal approaches.

Using a hearing aid and/or other assistive technologies can help by improving the quality of incoming auditory information. Listening environments can be modified by reducing background noise to simplify auditory information and by improving lighting to enhance the person’s ability to see helpful visual speech cues. Counselling and training can help older hard-of-hearing adults and their friends and family to learn and apply new conversational strategies to minimize the negative effects of poor communication on relationships and emotional responses. Person-centered rehabilitation can make listening easier and more enjoyable. Reducing the cognitive effort needed to listen, especially in challenging conditions, can improve cognitive performance on measures such as memory (Phillips et al., 2022) and more generally support healthy aging (Blustein et al., 2023).

Symptoms and Warning Signs

- Patients experiencing hearing loss, particularly as they age, may complain that they have difficulty hearing and following conversations. This difficulty may be more pronounced in the presence of background noise. Difficulties hearing and understanding may be noticed gradually, starting in middle age.
- Patients complaining of social withdrawal or reduced physical activity because of problems hearing and engaging in communication and social interaction should be evaluated by an audiologist.
- Sudden hearing losses require immediate evaluation by an audiologist or otolaryngologist.

Supportive Tips

- Encourage patients to know their hearing ability. Encourage testing before there are complaints provides a baseline for patients. Hearing health is an important part of overall health.

Treatment and Management

- Audiologic rehabilitation can support patients to hear better, including the use of technologies (e.g., hearing aids), counselling, and training in communication strategies.
- Audiologists are trained professionals who can discuss person- and family-centered solutions to manage hearing loss.

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Date: March 2025

Reviewed by: Steven Aiken, Ph.D

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7. World Health Organization (2024). Integrated care for older people (ICOPE): guidance for person-centred assessment and pathways in primary care, 2nd ed., Geneva, Switzerland. https://www.who.int/publications/i/item/9789240103726

We advocate for a “hearing better can help you live and think better” message and approach to guiding patients to prioritize their hearing health in the context of healthy aging (see also Blustein et al., 2023).

Conclusions and Recommendations

1. Hearing loss is associated with cognitive decline + greater risk of dementia
   - this may be *partially* explained by third causes
   - real world cognition likely impacted by cognitive load issues
   - hearing loss also changes the brain over time (mid-life → late-life)
2. Consider screening **only** if cognitive decline is suspected, **only** using evidence-based tools, and **only** when referral pathways are established.
3. Hearing aids **might** reduce cognitive decline in some people at risk for dementia and **might** slow dementia onset; evidence mixed and uncertain.
4. Care approach should include thoughtful accommodations for dementia.
5. Messaging to the public should avoid fearmongering and focus on known benefits of hearing interventions and audiological care.