Effects of hearing intervention on cognitive decline: Results of the Aging & Cognitive Health Evaluation in Elders (ACHIEVE) randomized trial*

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ACHIEVE HEALTHY AGING

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ACHIEVE study www.AchieveStudy.org

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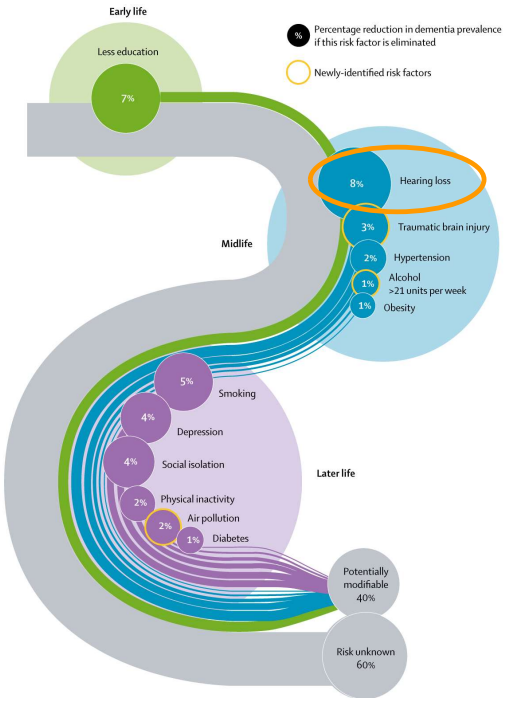
2020 Lancet Commission on Dementia Prevention, Intervention & Care

Potentially Modifiable Risk Factors for Dementia



Hearing loss in mid & late life identified as the single largest potentially modifiable risk factor for dementia

G. Livingston et al., Lancet 2020

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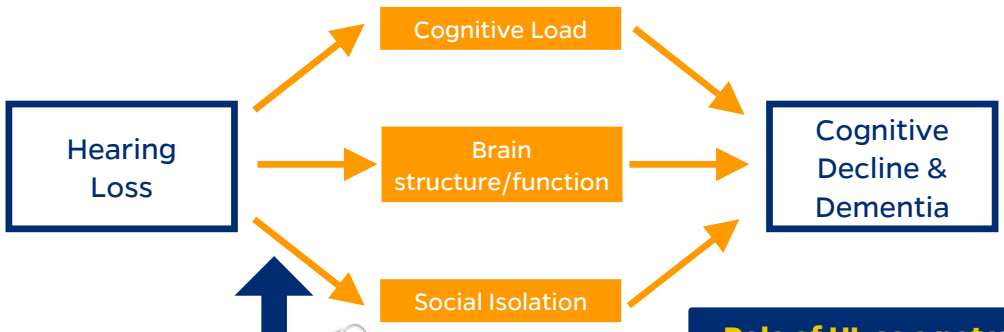
Hearing Loss & Dementia

Hearing Loss as a Modifiable Risk Factor



Hearing loss intervention could:

- Reduce the cognitive load of processing degraded sound
- Provide increased brain stimulation
- Improve social engagement

Role of HL as a potentially modifiable mid/late life risk factor for cognitive decline & dementia

F. Lin & M. Albert, Aging & Mental Health, 2014

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The question of whether treating hearing loss could reduce cognitive decline remained unknown

- Question cannot be definitively answered through observational studies because of bias from residual confounding (e.g., health behaviors, etc.)
- Recent meta-analysis of observational studies (Yeo et al, JAMA Neurology, Feb 2023): Hearing aid use associated with 19% decreased hazard of long-term cognitive decline
- No prior randomized controlled trial has ever investigated effect of hearing intervention on long-term cognitive decline or other functional outcomes (e.g., social isolation, loneliness, etc.)

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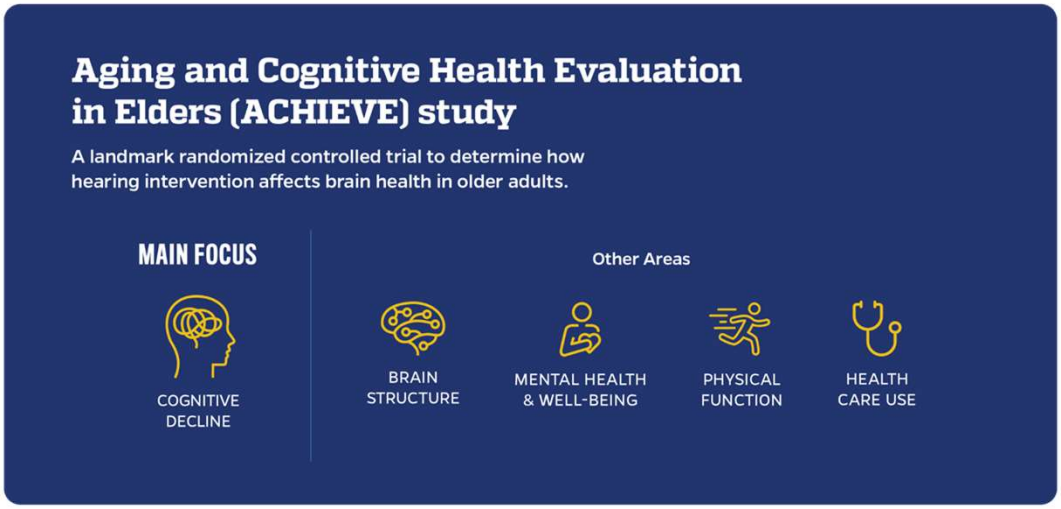
Can treating hearing loss reduce cognitive decline over 3 years in older adults with hearing loss without substantial cognitive impairment?



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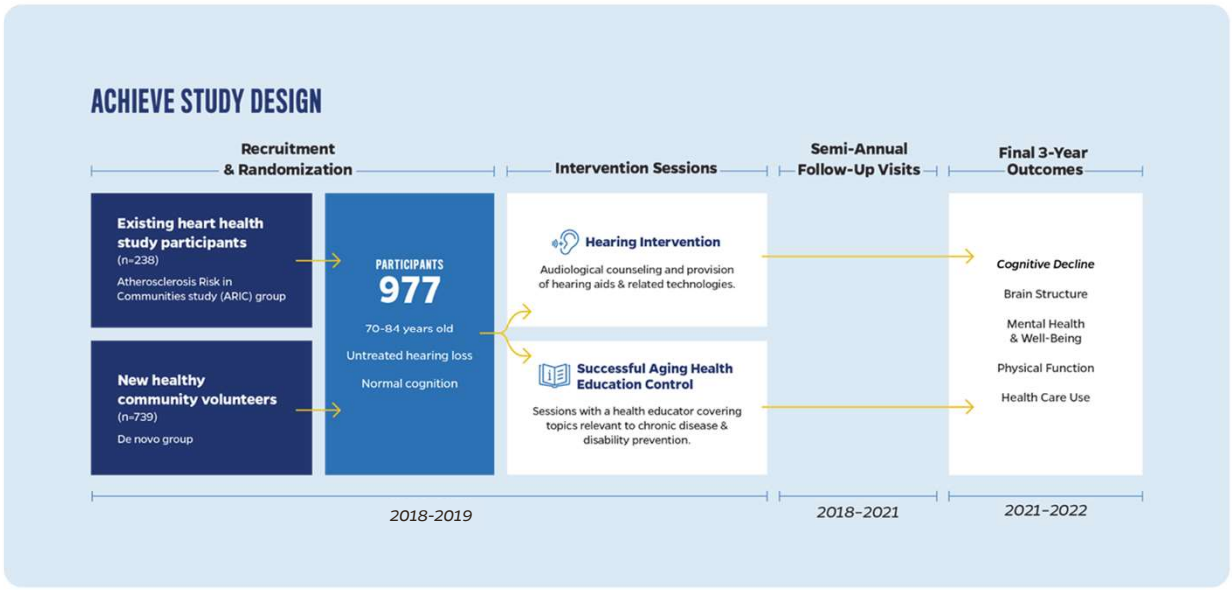

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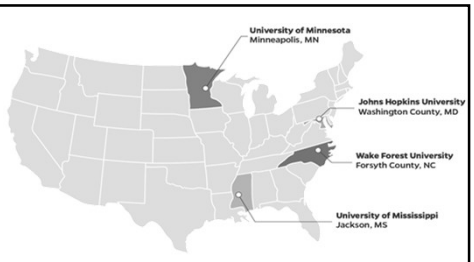
The ACHIEVE study cohort (n = 977) came from two distinct study populations at each site



- **ARIC cohort** (n = 238) – ARIC participants were a random sample of the field site communities recruited and followed since 1987
- **De novo cohort** (n = 739) – New healthy volunteers responded to advertisements for a healthy aging study
  - De novo participants had fewer baseline risk factors for cognitive decline & dementia compared to ARIC

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Design: Randomization & Interventions

- Eligible participants randomized 1:1 to hearing intervention versus health education control, stratified by severity of hearing loss, recruitment source (ARIC vs de novo) & field site

Hearing Intervention	Health Education Control
• Best-practices hearing intervention provision with a certified study audiologist • 4 sessions to receive hearing loss education and hearing aids & related technologies (streamers, remote mic, etc.) • Semiannual visits thereafter for 3 years to receive booster sessions	• Established program (10 Keys) to promote understanding of key health topics (nutrition, etc.) important for healthy aging • 4 sessions with a certified health educator to cover healthy aging topics • Semiannual visits thereafter for 3 years to receive booster sessions

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ACHIEVE Neurocognitive Battery

1. *Digit Span Backwards (DSB)
2. Boston Naming Test (BNT)
3. Word Fluency Test (WFT)
4. Animal Naming Score (ANS)
5. Digit Symbol Substitution (DSS)
6. Trail Making Test A (TMTA)
7. Trail Making Test B (TMTB)
8. Incidental Learning (ILR)
9. *Logical Memory Test (LMT)
10. Delayed Word Recall (DWR)

All tests are used to compute a factor score of global cognition that is standardized to baseline (mean 0, standard deviation 1)

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* Indicates tests with only auditory stimuli

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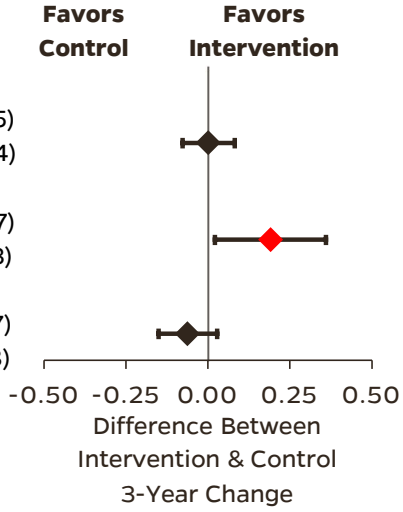
3-Year Change in Cognitive Function

	3-Year Change β (95% CI)
Total (N = 977)	
Control	-0.202 (-0.258, -0.145)
Intervention	-0.200 (-0.256, -0.144)
ARIC (N=238)	
Control	-0.402 (-0.536, -0.267)
Intervention	-0.211 (-0.349, -0.073)
De Novo (N=739)	
Control	-0.151 (-0.215, -0.087)
Intervention	-0.213 (-0.277, -0.148)



In the ARIC cohort, hearing intervention reduced 3-year global cognitive decline by 48%

3-way interaction: p = 0.010

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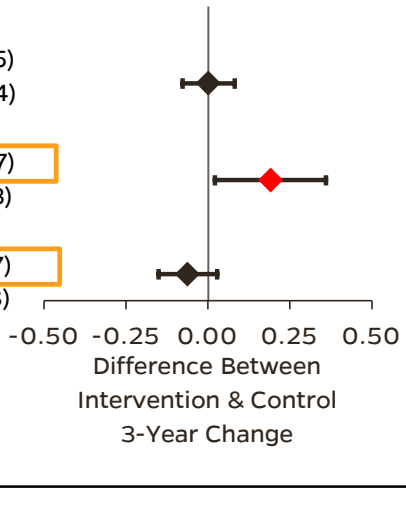

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Rate of cognitive change ~3x slower in **De novo** than **ARIC** controls

3-way interaction: p = 0.010

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Hearing Intervention & 3-Year Cognitive Outcomes

Summary

- In the total combined cohort, hearing intervention had no effect on reducing cognitive decline within 3 years
- Strong effects in ARIC (48% reduction) suggests that hearing intervention reduces cognitive decline within 3 years in populations at risk for cognitive decline
- No effect observed in De novo → Slow rate of cognitive change would limit ability to observe any positive effect of hearing intervention within just 3 years
  - Slow cognitive decline likely reflects self-selection of "healthy volunteers" in the de novo cohort (vs. ARIC participants coming from a randomly-selected cohort recruited 30+ years ago)

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ACHIEVE Study – Implications

- Findings support previous recommendations from 2020 Lancet Commission on Dementia & 2021 U.S. National Plan for Alzheimer's Disease to address hearing loss in dementia prevention strategies
  - Hearing interventions : 1) are underused; 2) are without risk; 3) improve self-perceived communication & lessen loneliness; & 4) substantially reduce cognitive decline in those at increased risk
- Government actions are needed for:
  - Insurance coverage of hearing intervention for adults (services vs. devices)
  - Regulations for OTC hearing aids to drive innovation & affordability
  - Public awareness campaigns for hearing – www.HearingNumber.org initiative

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What's next for ACHIEVE?

- Determining 3-year effects on other outcomes gathered in the ACHIEVE study: brain MRI structure, health-related quality of life, depression, hospitalizations, physical activity & functioning, health care costs

- Longer term follow-up of the entire cohort needed to observe for hearing intervention effects on those at decreased risk (de novo cohort) & risk for developing cognitive impairment (e.g., adjudicated dementia)
  - 6-year follow-up study is underway (NCT05532657, R01AG076518)

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Thank you!

www.AchieveStudy.org

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