

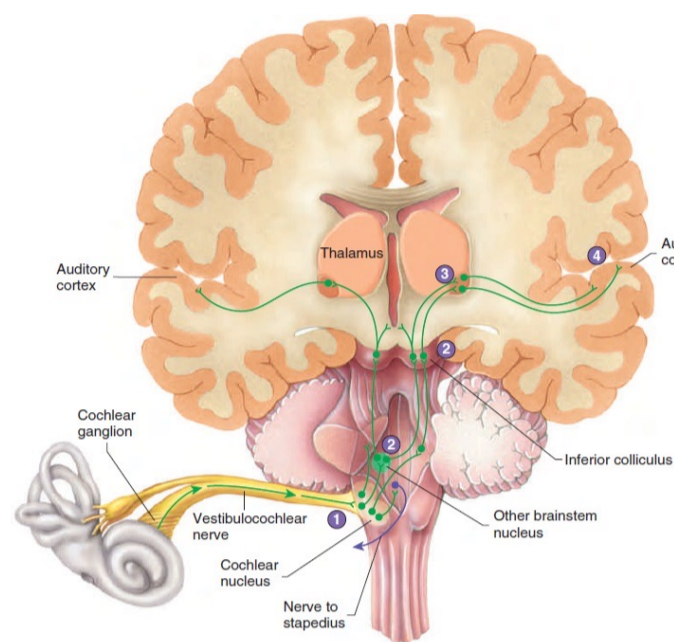
Neuroanatomical markers of Hearing Loss in Alzheimer's Disease

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1. Introduction

Hearing loss is one of the major risk factors for Alzheimer's disease dementia.

Auditory Pathway



Hearing loss can be divided into:

Central

- Auditory pathways of the brain

Peripheral

- Outer, middle, and inner ear

Alzheimer's Disease

Most common type of dementia

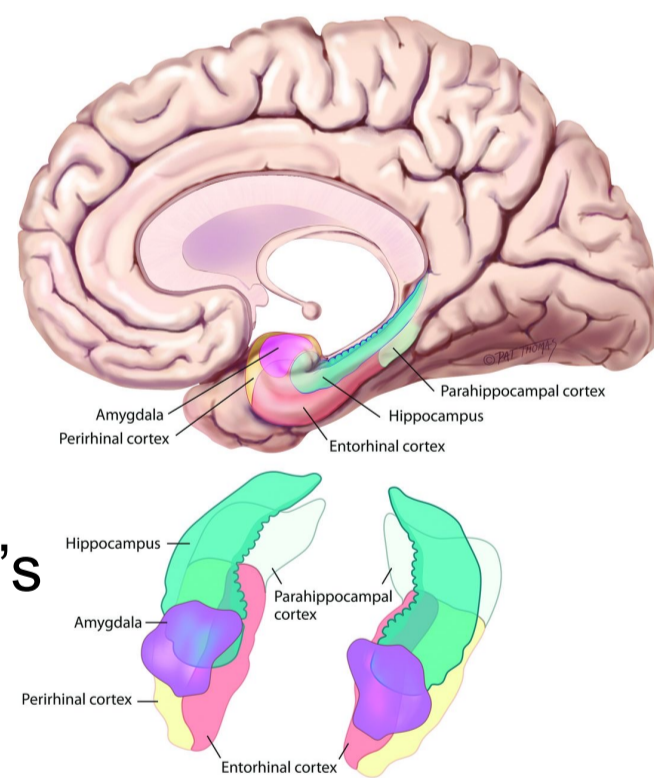
- 1) Accumulation of proteins in the brain
- 2) Brain damage
- 3) Short-term memory deficits
- 4) Progression to more widespread cognitive decline

Medial Temporal Lobe

Role in Memory:

- Formation
- Storage
- Retrieval

First area affected by Alzheimer's pathology



Damage to the Medial Temporal Lobe links Alzheimer's disease (AD) pathology to Central hearing loss

Background

- Hearing loss and Alzheimer's Disease dementia are common in aging populations.
- Investigating their relationship can offer insights into shared mechanisms.
- This can inform approaches to prevention, early detection, and treatment strategies.

2. Aim

Assess the relationship between Alzheimer's disease dementia and hearing loss through the analysis of neuroimaging data for

1. brain volume and cortical thickness, and central hearing test outcomes.
2. white matter tract integrity and central hearing test outcomes using diffusion weighted MR imaging.

3. Methods

42 Participants

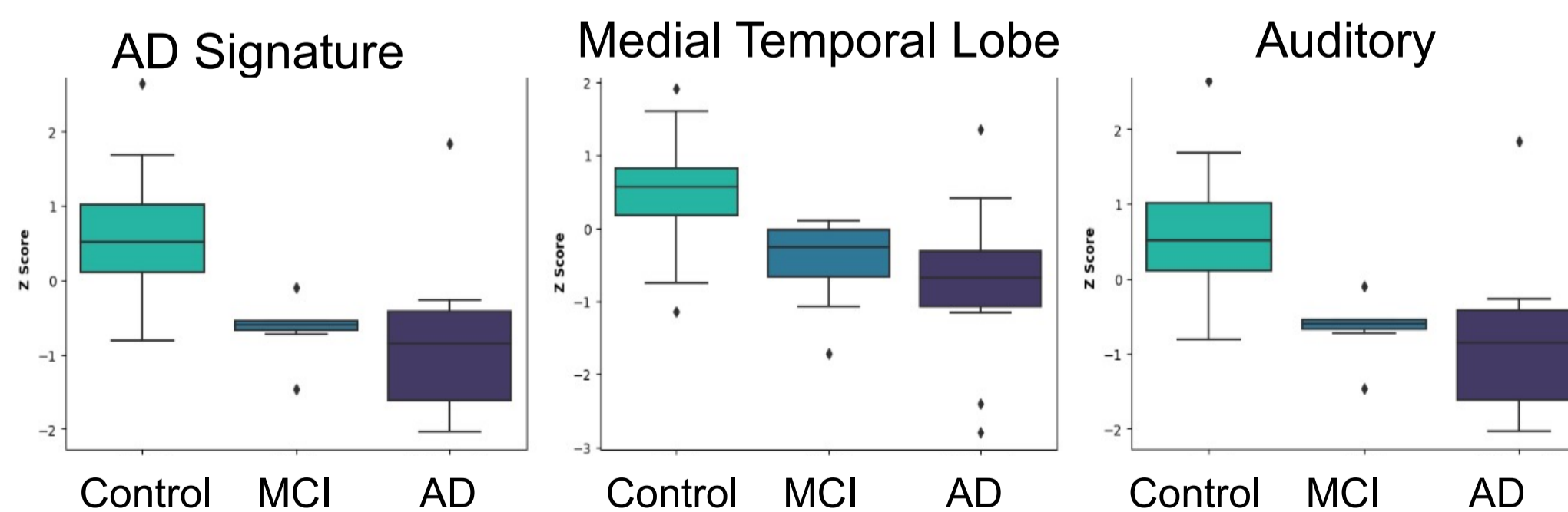
Alzheimer's Disease Continuum N = 18		
Control N = 24	Mild Cognitive Impairment (MCI) N = 7	Alzheimer's Disease Dementia (AD) N = 11

Assessments used:

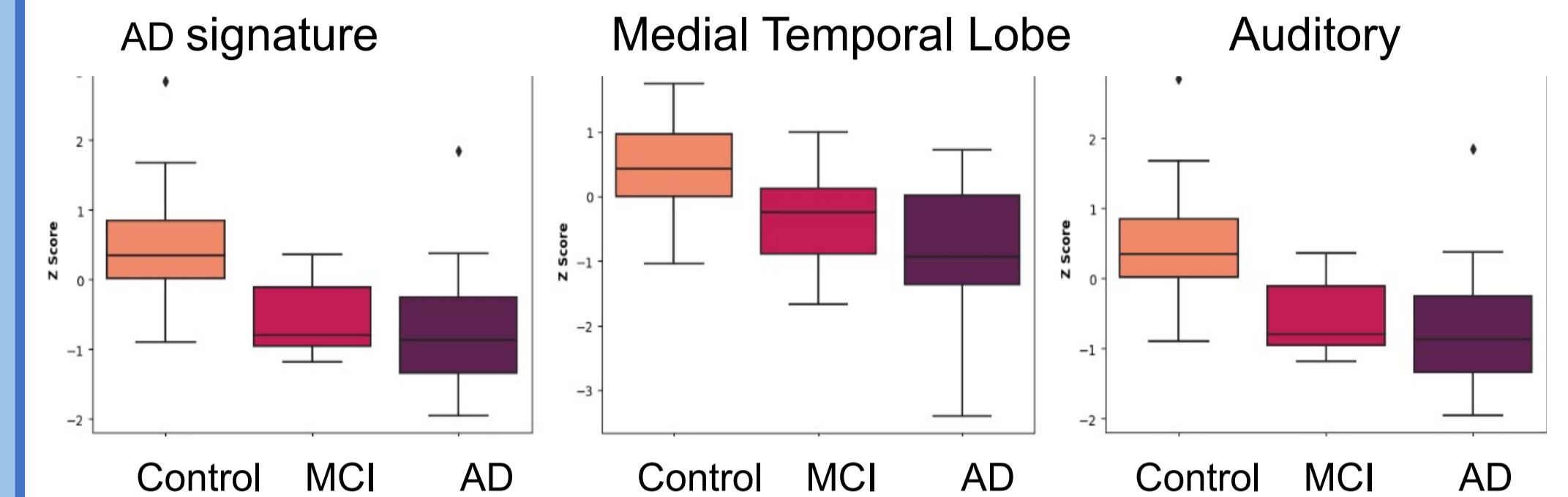
Hearing tests	MRI Scans	Softwares
Central – Speech in Noise (SiN) & Auditory Working Memory (AWM)	Structural – T1 & T2	sMRIprep & Freesurfer – Structural MRI preprocessing
Peripheral – Pure Tone Audiometry (PTA)	Diffusion Weighted Imaging (DWI)	DSIstudio – DWI tractography

4. Results

Volume in different brain regions



Cortical thickness in different brain regions



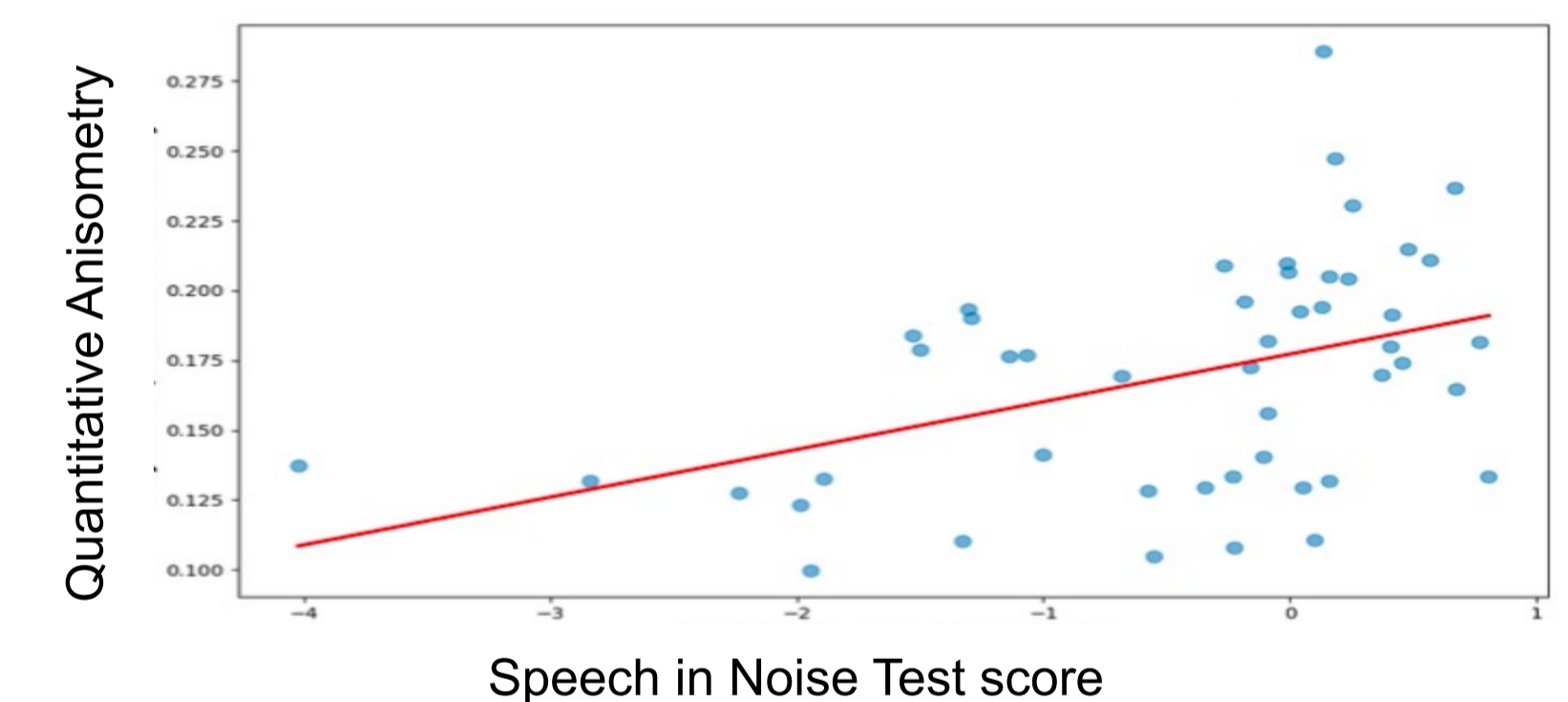
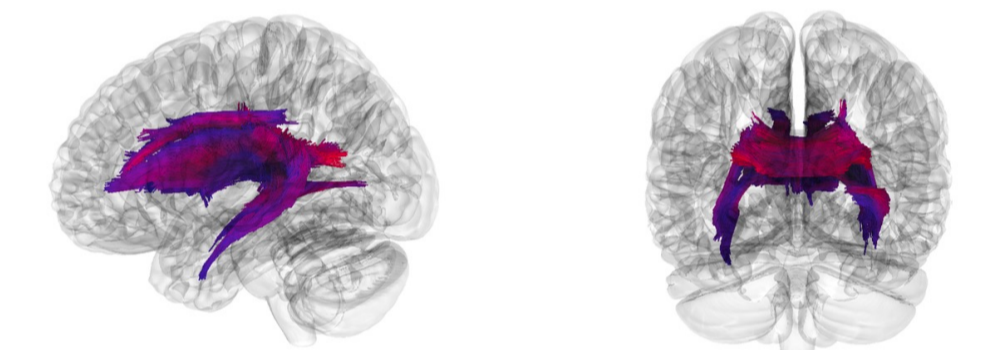
Volume and thickness in the regions shown have a positive correlation with both Speech in noise and Auditory working memory tests

Quantitative Anisometry (QA)

Measures white matter tract connectivity

Tracts identified with lower QA across the AD continuum:

Thalamic Radiation	Fornix
Corpus Callosum	Cingulum



5. Conclusion

- Cross-sectional evidence establishes a connection between auditory cognitive performance and neuroimaging markers of neurodegeneration in Alzheimer's disease.
- The findings imply that neurodegeneration in Alzheimer's disease may have an impact on central hearing.
- Central hearing loss may potentially serve as one of the initial indicators of cognitive impairment in Alzheimer's disease.

References:

1. Livingston G, Sommerlad A, Orgeta V et al. Dementia prevention, intervention, and care. Lancet. 2017;390:2673-734
2. Griffiths TD, Lad M, Kumar S, Holmes E, McMurray B, Maguire EA, Billig AJ, Sedley W. How Can Hearing Loss Cause Dementia? Neuron. 2020 ;108(3):401-412

Acknowledgements:

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