

# Sex differences in dementia risk and gray matter volume associated with hearing impairment

P3-356

Fitzhugh MC<sup>1</sup>, Pa J<sup>1</sup>

<sup>1</sup>Department of Neurosciences, Alzheimer's Disease Cooperative Study, University of California, San Diego, CA, USA

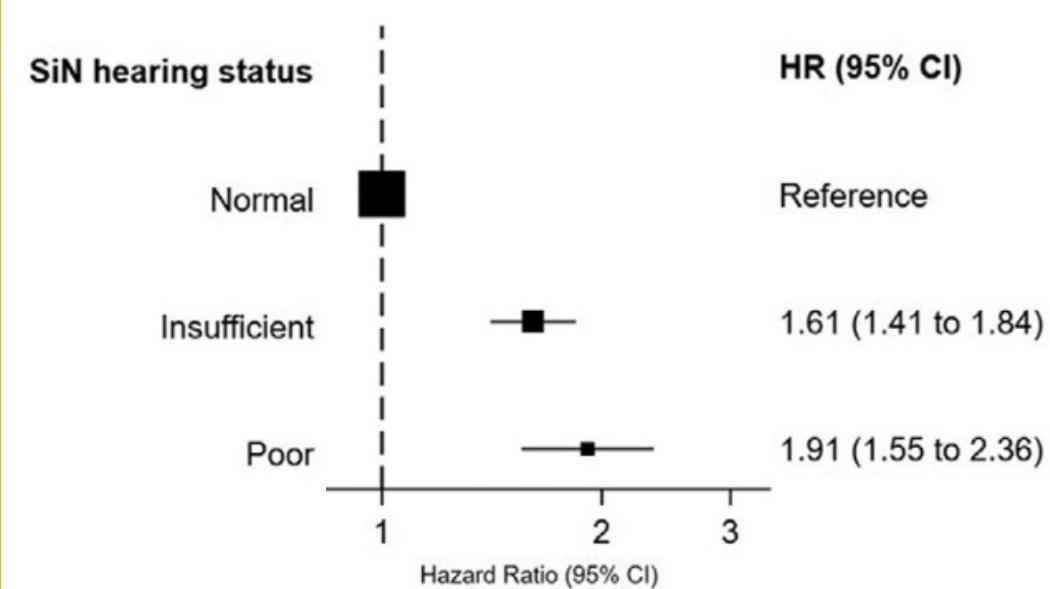
UC San Diego

Women with impaired hearing are at greater risk of dementia and have increased atrophy in memory and auditory brain regions

ISTAART  
ALZHEIMER'S ASSOCIATION  
POSTDOC

## INTRODUCTION

**Background:** Hearing impairment is highly prevalent in older adults<sup>1</sup> and was recently recognized as a significant, modifiable risk factor for dementia<sup>2</sup>.



<sup>3</sup>Stevenson et al., 2021

However, it is unknown if risk differs by sex and what mechanisms may explain the association between hearing loss and dementia risk.

### Purpose:

**Study 1:** Investigate sex differences in the association between hearing loss and dementia risk and examine a psychosocial mediator

**Study 2:** Examine sex differences in the association between longitudinal change in hearing and brain volume

## METHODS

### UK Biobank cohort: Study 1

Table 1. Study 1 participant characteristics (N=133,387)

Age, mean (SD), years	56.7 (8.2)
Education (% , university degree)	34.9
Hx of heart conditions (% , yes)	29.2
Hx of smoking (% , yes)	44.3
Townsend deprivation index, mean (SD)	-1.2 (2.9)
APOE e4 status (% , carrier)	28.2
Psychosocial composite (% , yes)	5.4

- 487 developed dementia over 11 years follow-up

### Study 2

Table 2. Study 2 participant characteristics (N=1,892)

Age, mean (SD), years	62.2 (7.3)
Education, No. (% , university degree)	919 (48.6)
Hx of heart conditions, No. (% , yes)	326 (17.2)
Hx of smoking, No. (% , yes)	612 (32.3)
Townsend deprivation index, mean (SD)	-2.1 (2.5)
APOE e4 Status, No. (% , carrier)	465 (24.6)
Baseline SRT, mean (SD), dB	-6.1 (1.6)
Time between visits, mean (SD), years	2.3 (0.5)

- No dementia cases

Hearing assessed with speech-reception thresholds (SRT), categorized into:

- Normal, insufficient, and poor
- Impairment = insufficient or poor

## RESULTS: STUDY 1

Cox proportional-hazard models investigated sex differences in dementia risk

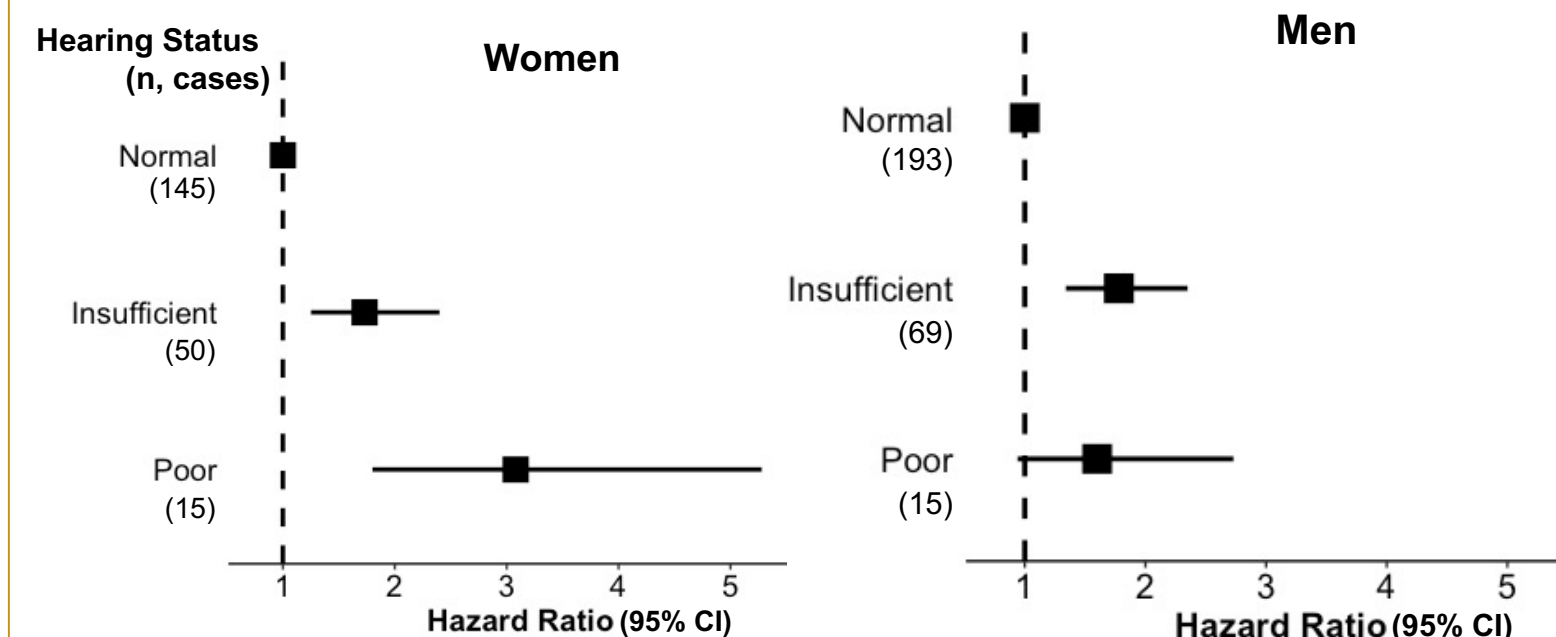


Fig 1. Forest plots showing greater risk of dementia in women with poor hearing compared to men

Table 3. Complete cox regression models in Study 1

	Women (n=73,196)		Men (n=60,641)	
	HR (95% CI)	Sig.	HR (95% CI)	Sig.
Age	1.17 (1.13 – 1.20)	<.001	1.15 (1.12 – 1.18)	<.001
TDI	1.07 (1.02 – 1.12)	.005	1.05 (1.01 – 1.09)	.028
Hx of smoking	1.03 (0.78 – 1.35)	.847	1.14 (0.89 – 1.46)	.285
Hx of heart conditions	1.55 (1.18 – 2.05)	.002	1.35 (1.06 – 1.71)	.016
Education <sup>1</sup> : University	0.65 (0.43 – 0.98)	.039	0.54 (0.39 – 0.76)	<.001
APOE e4 carriers	3.91 (2.96 – 5.15)	<.001	1.92 (1.51 – 2.44)	<.001
Insufficient hearing <sup>2</sup>	1.73 (1.25 – 2.40)	.001	1.78 (1.34 – 2.35)	<.001
Poor hearing <sup>2</sup>	3.08 (1.80 – 5.28)	<.001	1.60 (0.94 – 2.73)	.082

\*Significance at p<0.05. <sup>1</sup>Reference is no secondary education. <sup>2</sup>Reference is normal hearing.

- Hearing impairment is largest risk factor after presence of APOE4 in both women and men
- Social isolation/depression composite score only accounted for 1.2 - 4.3% of risk

## RESULTS: STUDY 2

Linear mixed models stratified by sex were examined if change in brain volume over 2 years differed by change in hearing

### Women

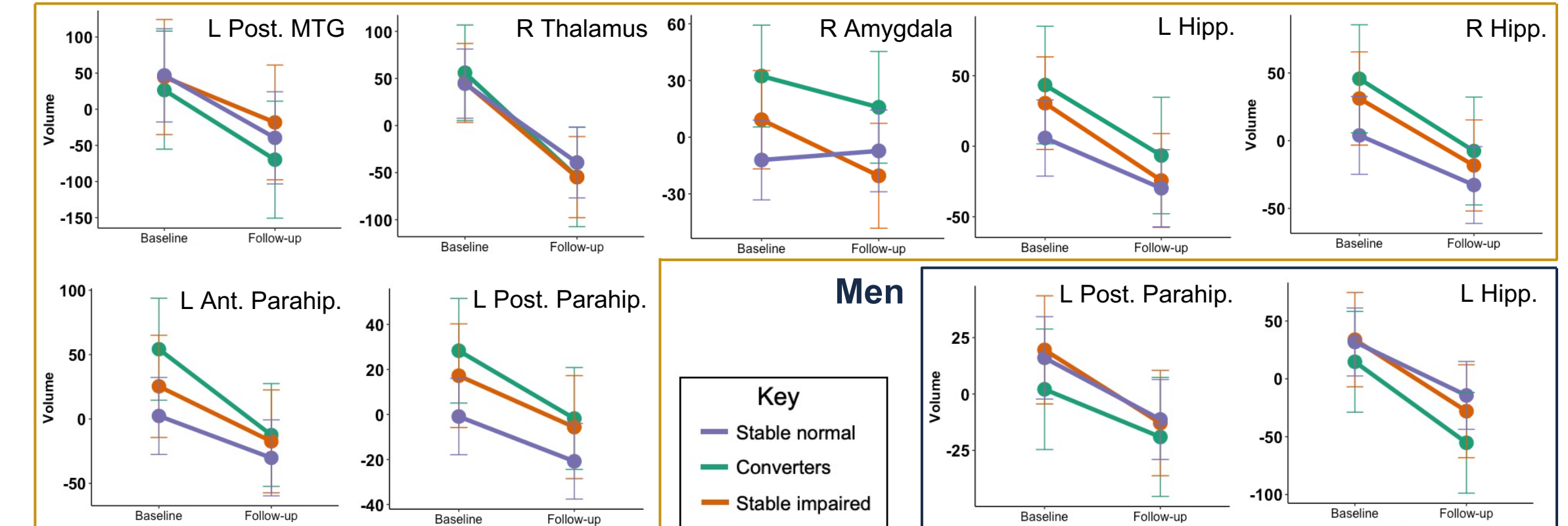


Fig 2. Plots of significant time-by-hearing interactions on brain volume showing greater rates of atrophy in those who converted to impaired hearing or who maintained impaired hearing over 2 years

- Women who converted from normal to impaired hearing, or had stable impairment, had increased atrophy in several auditory and medial temporal regions
- Men who converted to or maintained impaired hearing had increased atrophy in two hippocampal regions only

## CONCLUSIONS

- Women with hearing impairment have increased risk of dementia and increased atrophy in more medial temporal and auditory regions compared to men
- After APOE4, hearing impairment was largest risk factor for dementia
- Social isolation and depression did not explain the association between hearing impairment and dementia

## REFERENCES

1. Lin et al., 2011, Arch Intern Med
2. Livingston et al., 2017, Lancet
3. Stevenson et al., 2021, Alz & Dem

## CONTACT

mfitzhugh@ucsd.edu  
@Dr\_Fitzhugh

ALZHEIMER'S ASSOCIATION  
ALZHEIMER'S ASSOCIATION INTERNATIONAL CONFERENCE  
AAIC 22