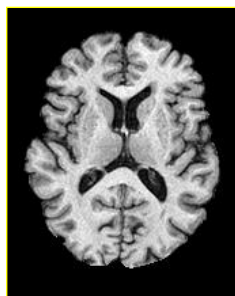
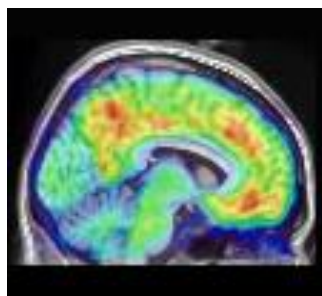


Shared Mechanisms Underlying Age-Related Change in Cognition/Vision/Hearing

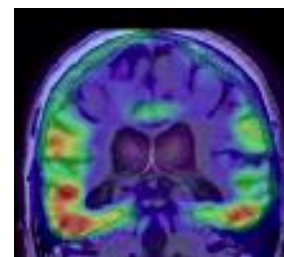
Susan M. Resnick, PhD
Laboratory of Behavioral Neuroscience
Intramural Research Program, NIA



MRI



PET Amyloid
Plaques



PET Tau

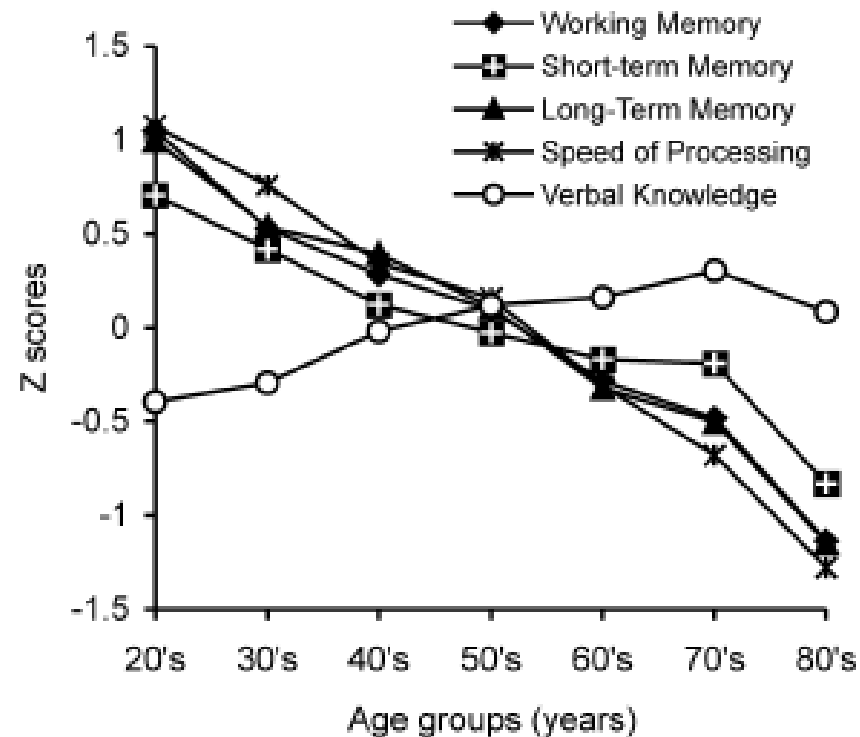
Disclosures

- ❖ Current Funding: NIA IRP Employee
- ❖ No Conflicts

Overview

- ❖ Cognitive and Brain Aging in Unimpaired Older Adults
- ❖ Hearing Loss and Neurodegeneration
- ❖ Imaging Alzheimer's Pathology *In Vivo*
- ❖ The Temporal Sequence of Sensory Loss and Accelerated Cognitive and Brain Aging?
- ❖ Future Opportunities

Cross-Sectional Age Differences in Some but Not All Cognitive Functions



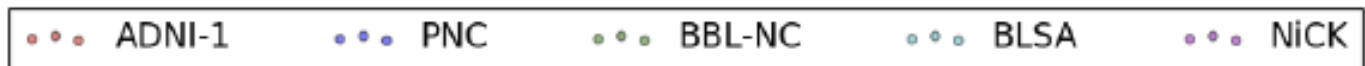
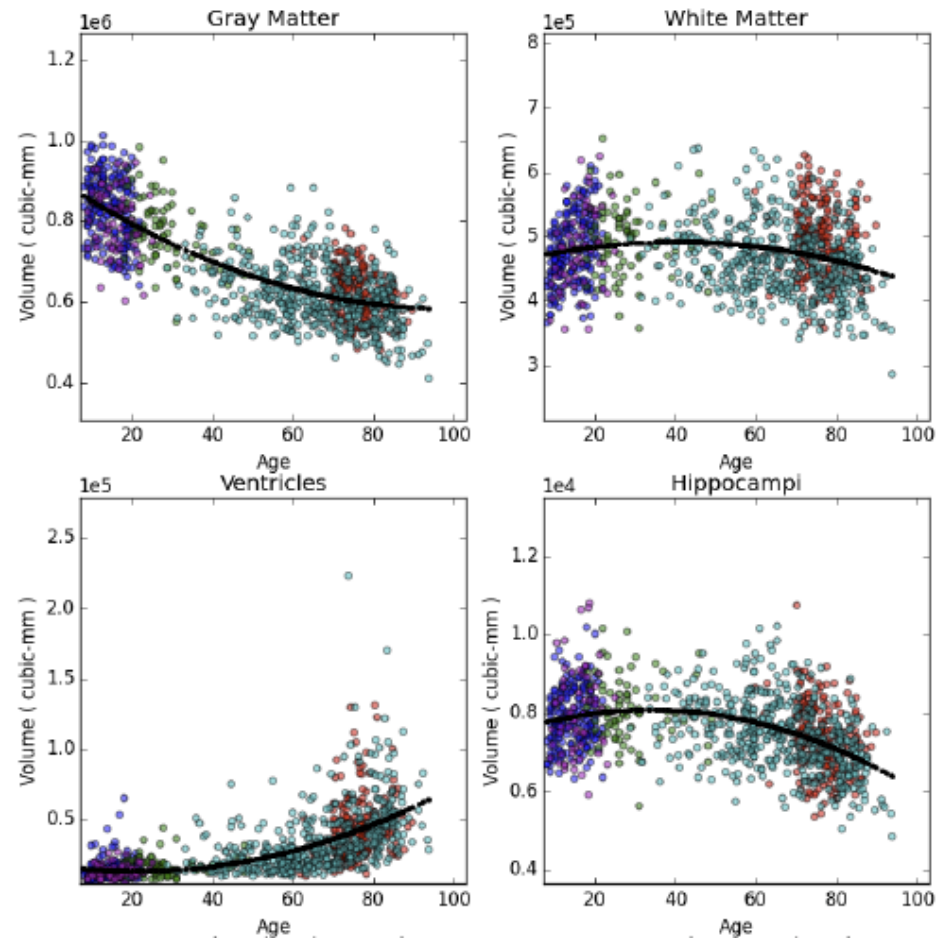
Park and Gutches, 2002

MUSE: Multi-atlas region Segmentation utilizing Ensembles of registration algorithms and parameters, and locally optimal atlas selection

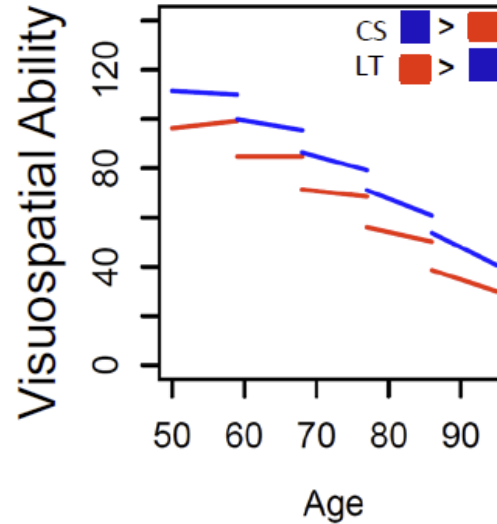
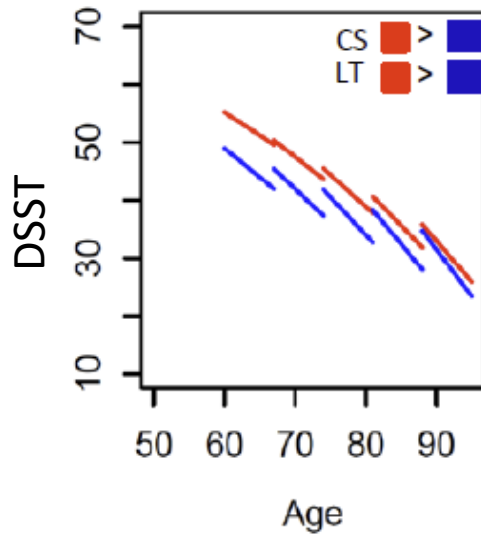
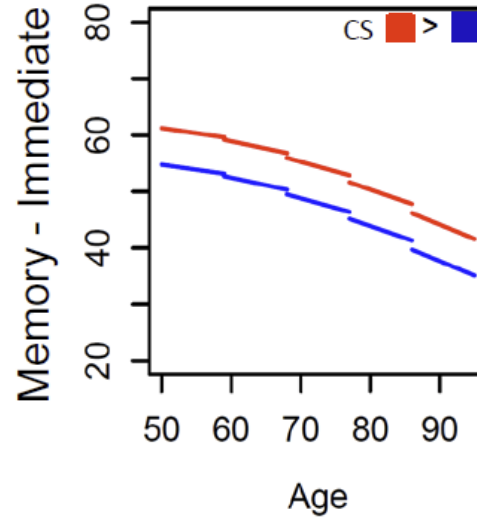
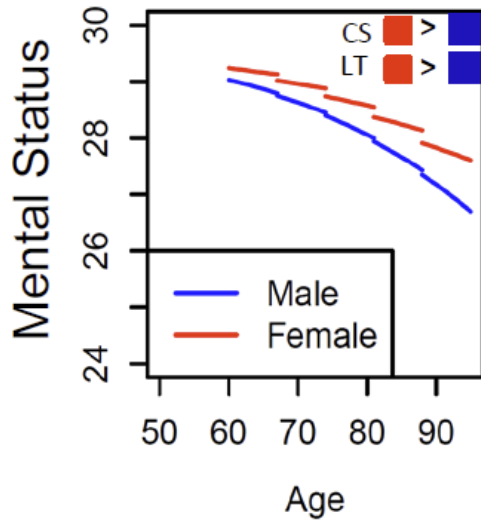


Jimit Doshi^{a,1}, Guray Erus^{a,*,1}, Yangming Ou^{a,b}, Susan M. Resnick^c, Ruben C. Gur^d, Raquel E. Gur^d, Theodore D. Satterthwaite^d, Susan Furth^e, Christos Davatzikos^a, for the Alzheimer's Neuroimaging Initiative²:

Cross-Sectional Age Associations: Age 8 to 96



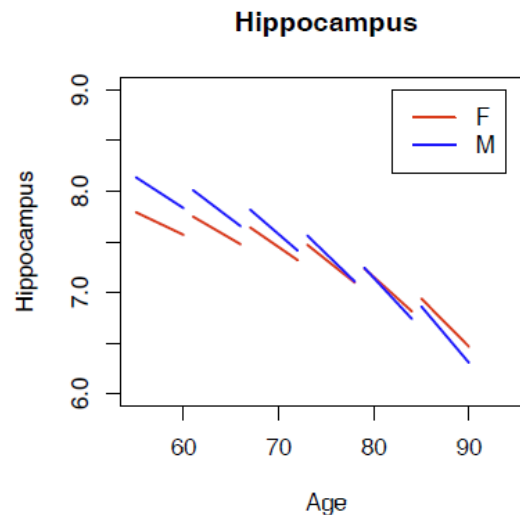
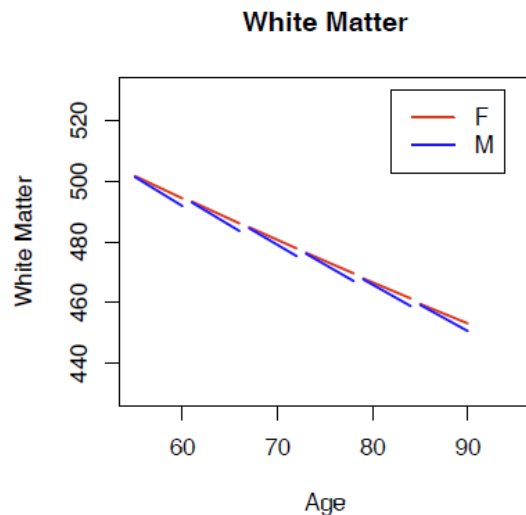
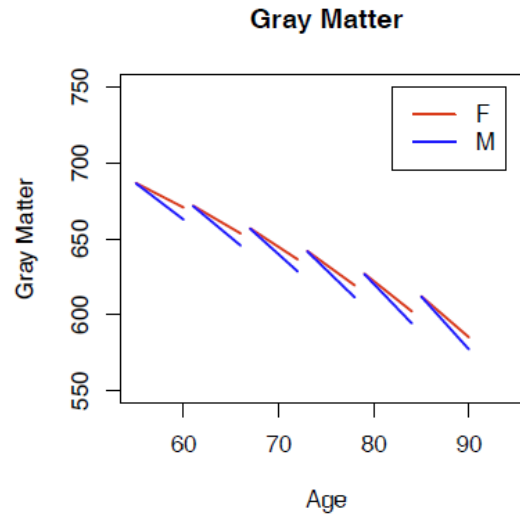
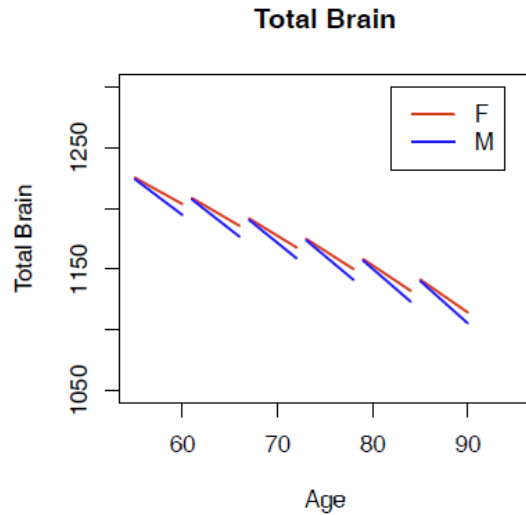
Sex Differences in Cognitive Aging



Baltimore Longitudinal Study of Aging	
N	1065-2127
Data points N	2942-9319
Sex (% Male)	52.7
Baseline Age	67.7 (9.3) 50.0 – 95.8
Follow-up interval (yrs)	6.7 (5.6) 0 – 34.1
N visits per subject	4.2 (3.4) 1 – 22
Education (yrs)	16.4 (2.5) 8 – 21

- Levels: Men Show Lower Mental Status, Verbal Memory, and Executive Function but Higher Visuospatial Performance
- Slopes: Men Show Greater Decline in Mental Status, Executive Function and Visuospatial Performance

Sex Differences in Brain Aging



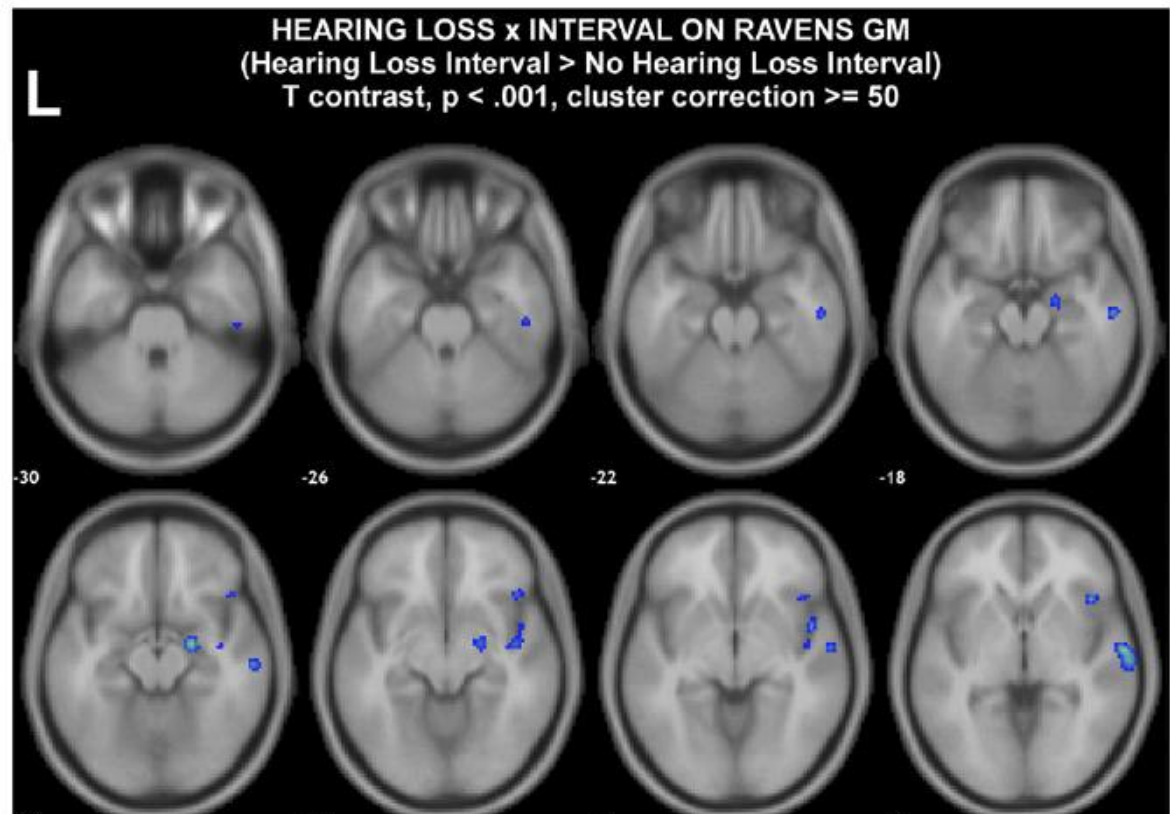
Baltimore Longitudinal Study of Aging	
N	686
N Scans	2123
Sex (% Male)	47.8
Baseline Age	71.4 (8.6) 55.0 – 92.4
Follow-up interval (yrs)	3.4 (5.0) 0 – 20.6
N scans per subject	3.1 (3.3) 1 – 17
Education (yrs)	16.8 (2.6) 8 – 21

After ICV adjustment, males show faster volume loss in all four regions.

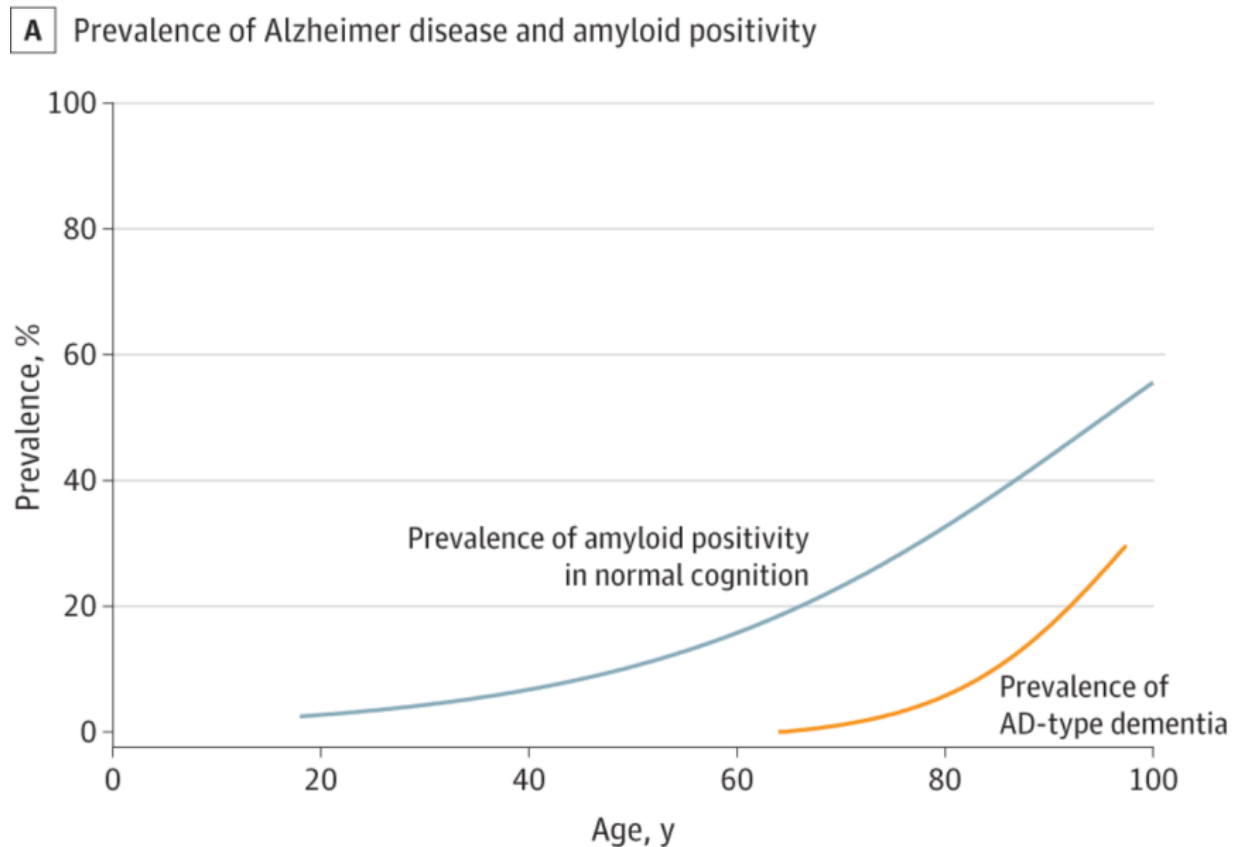
Hearing Impairment is Associated with Greater Rates of Volume Loss in BLSA

- ❖ Whole Brain
 - ❖ Temporal Gray
- R>L

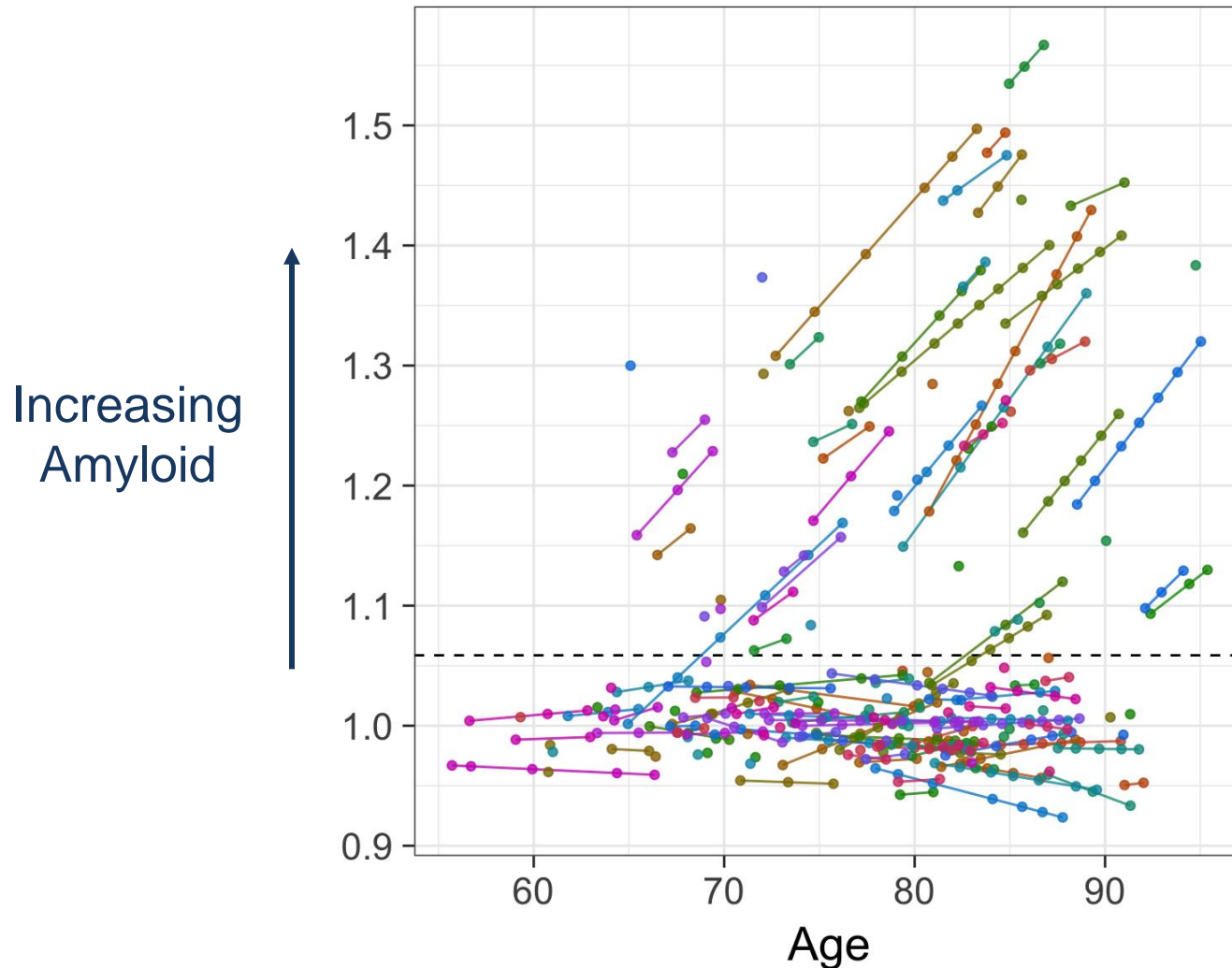
STG
MTG
ITG
PHG



Evolution of AD Pathology: Amyloid Pathology in Normal Cognition



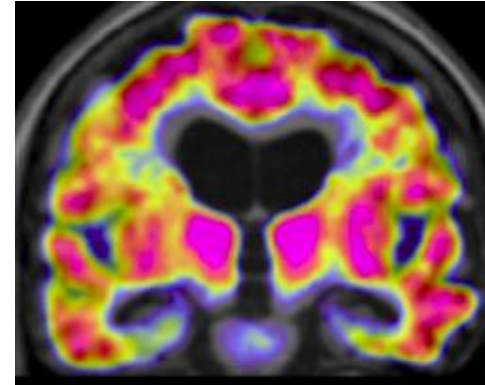
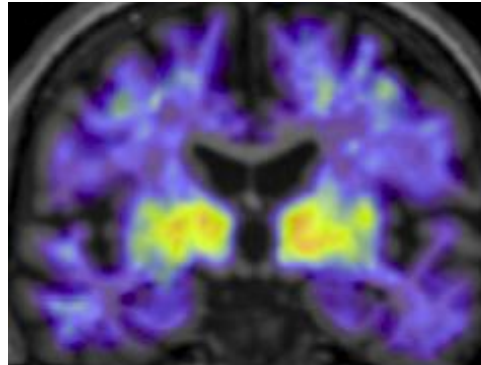
Amyloid Accumulation Over Time in BLSA Participants with Normal Memory



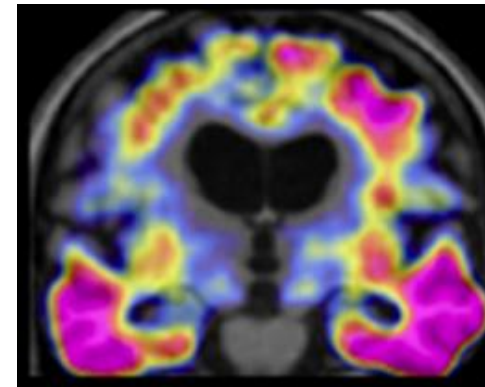
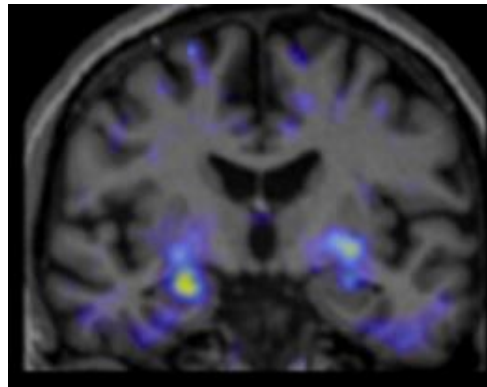
180 Participants
446 PET Scans

PET Scan Imaging of Plaques and Tangles

Amyloid
PiB



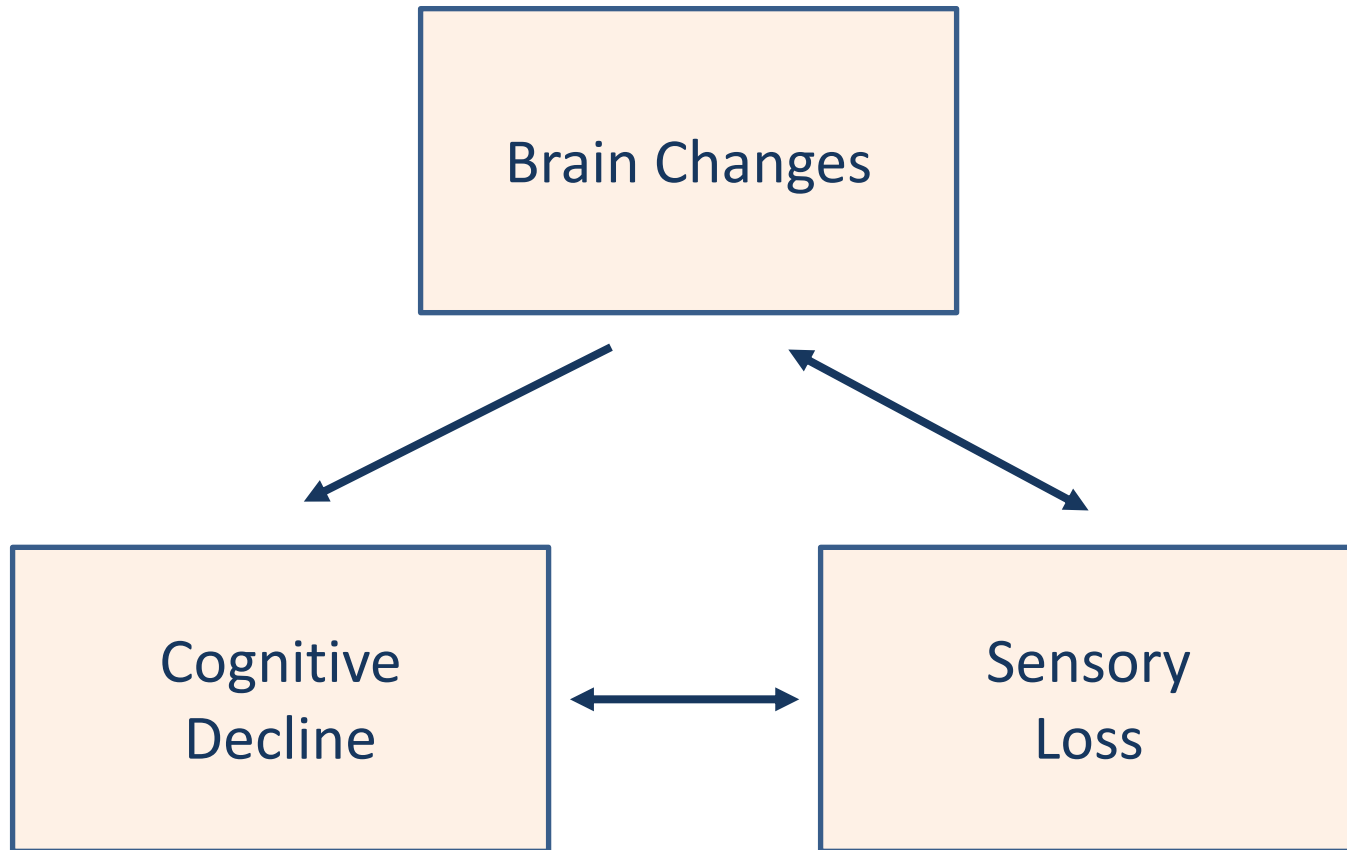
Tau
AV-1451



Normal
Memory

Alzheimer's
Disease

Temporal Sequence of Associations between Sensory Loss and Brain and Cognitive Changes



Gaps and Opportunities

❖ Knowledge Gaps:

- To what extent are associations between hearing/vision loss and cognition due to shared brain changes? (central vs peripheral)
- What are the temporal relationships between sensory loss and accelerated cognitive and brain changes?

❖ Research Opportunities:

- Addition of hearing assessment to ongoing prospective studies of cognitive and brain health
- Clinical trials embedded within observational studies