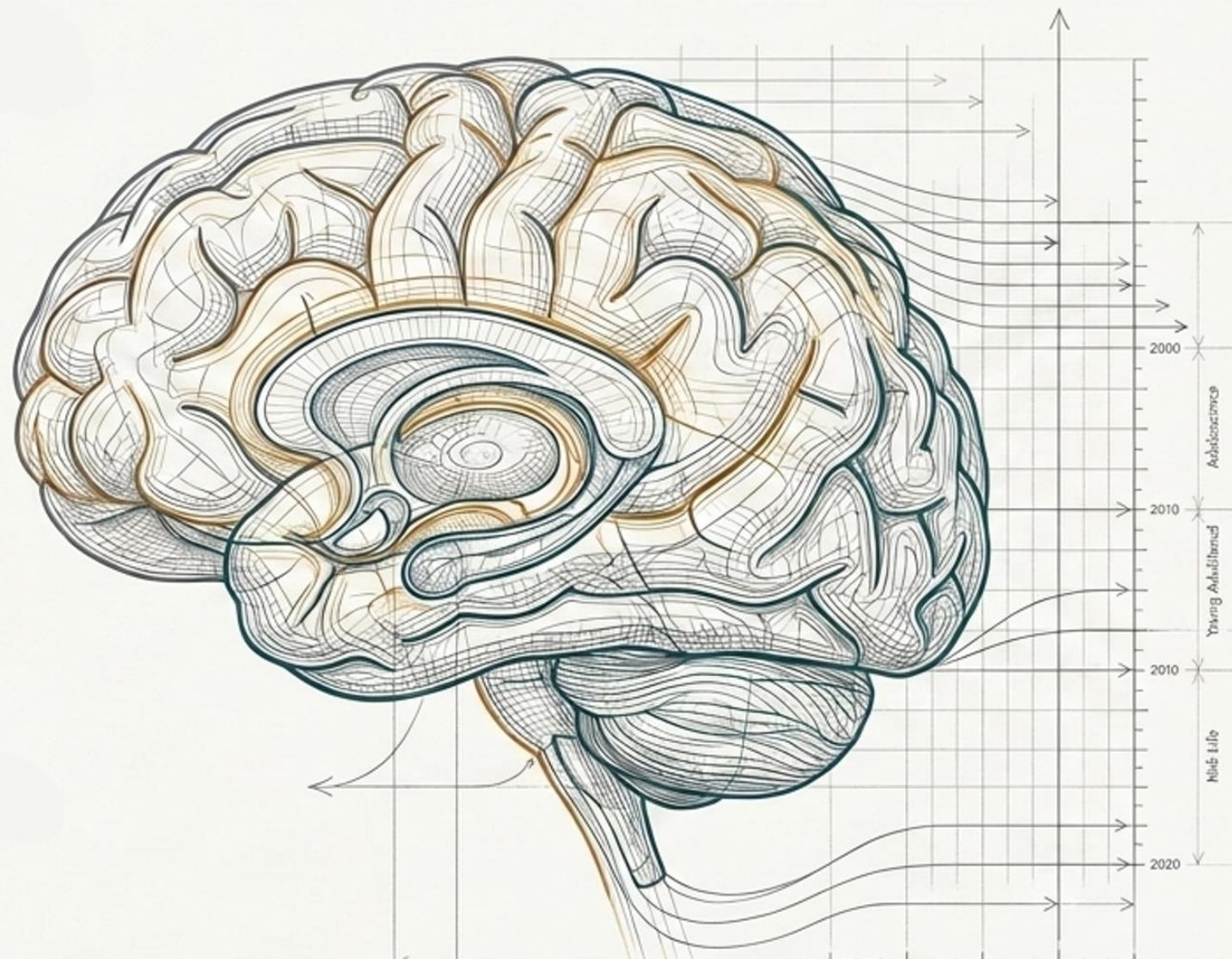


Brain Structure and Function in Midlife: MRI Findings in Adults with FASD

Susan Stoner, Ph.D.
April 19, 2026



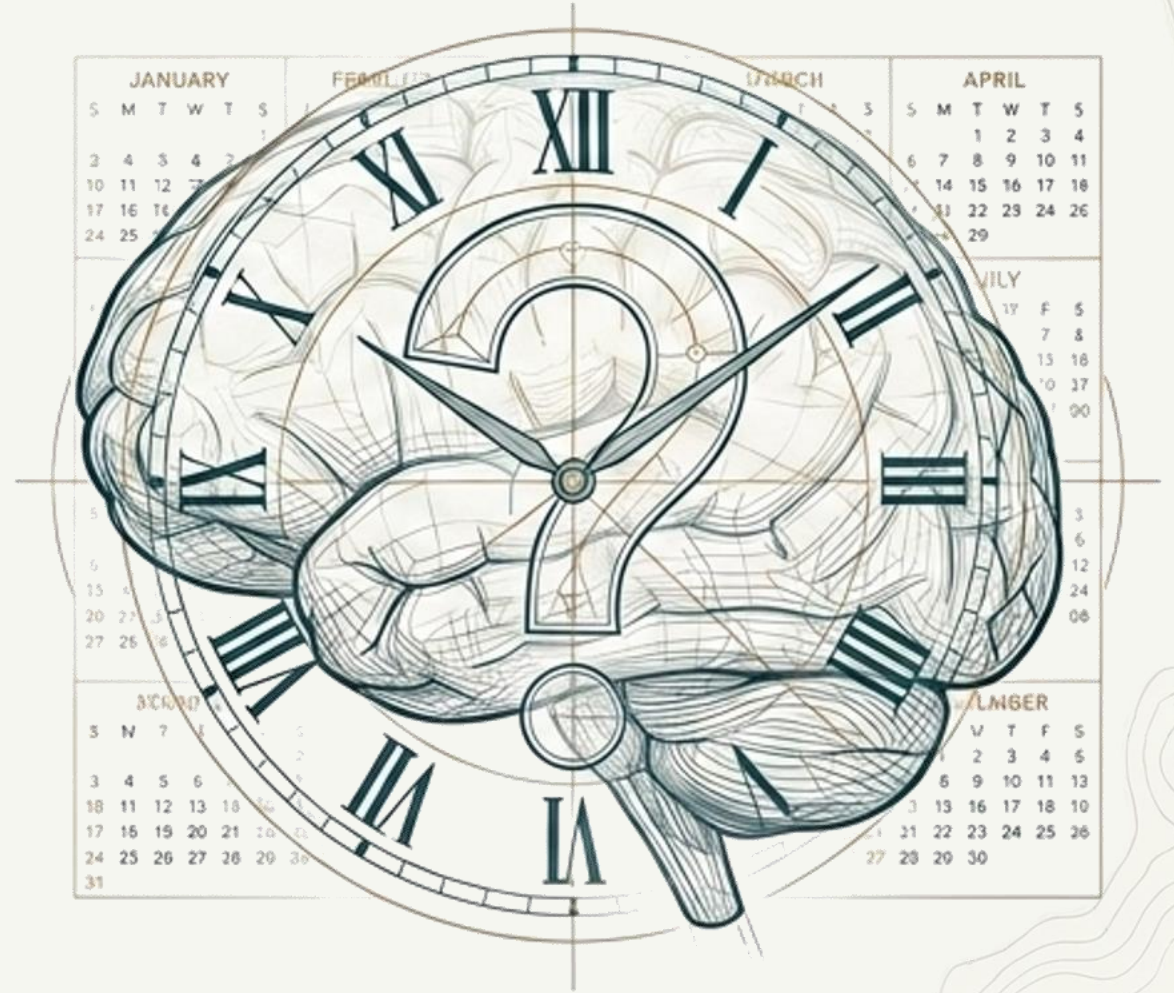
The background of the slide features a light gray topographic map with contour lines, visible in the corners and along the sides. The text is centered in a large, black, sans-serif font.

No conflicts to disclose.

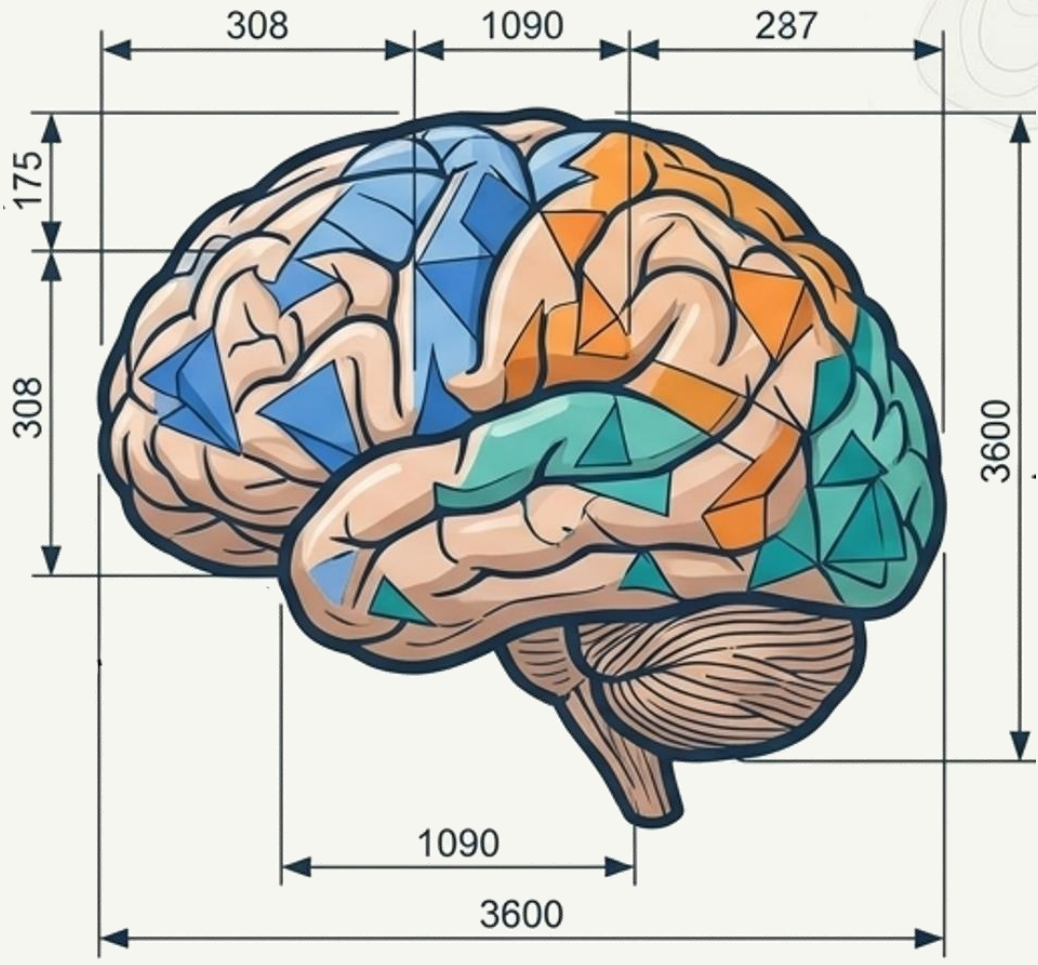
Pediatric Studies



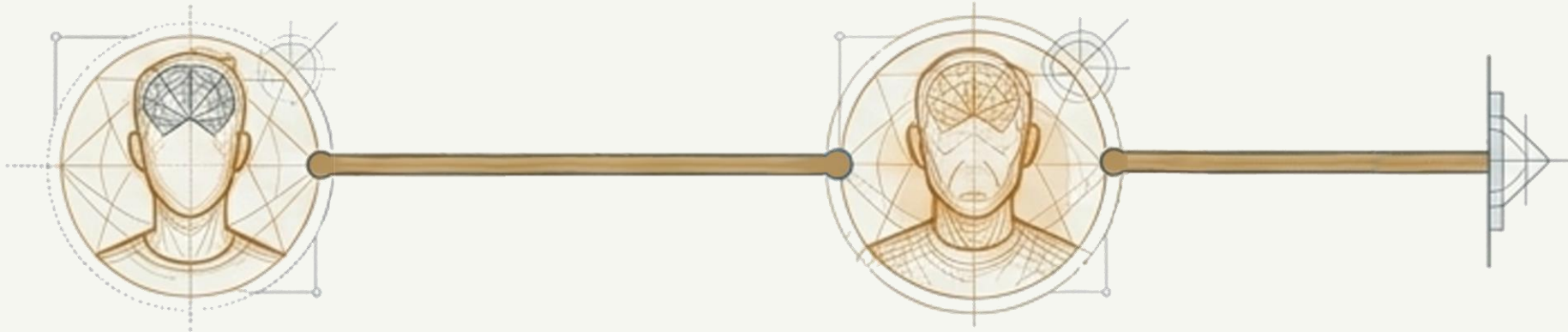
Adult Knowledge Gaps



Measuring the Brain



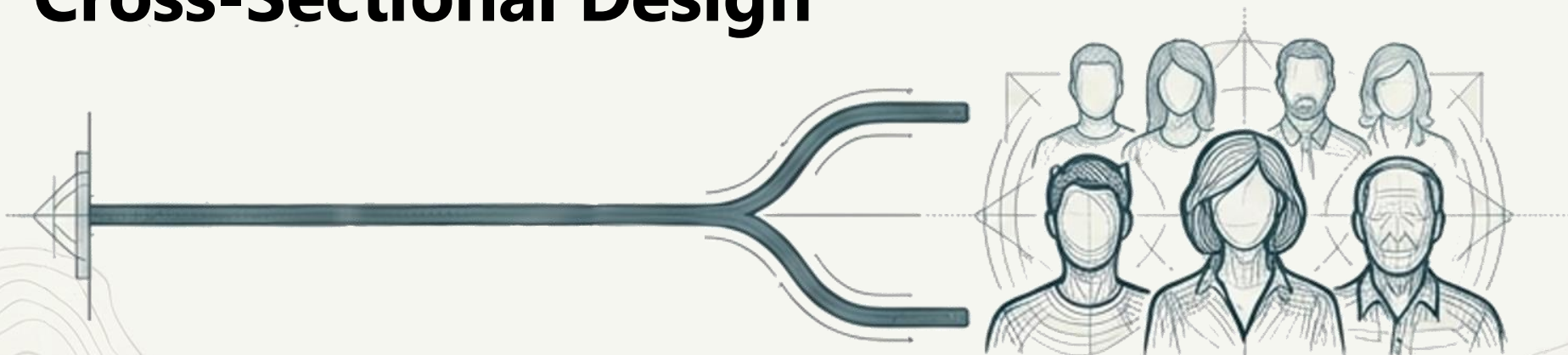
Longitudinal Design



Same person, ages 25

45

Cross-Sectional Design



Different people, ages 30

45

60

Study 1



Longitudinal
Global, Cortex,
Cerebellum
N = 66

Study 2



Cross-Sectional
Subcortical
Structures
N = 76

Study 3



Hybrid
Thalamic
Nuclei
N = 179/69

Healthy Controls

Unexposed, typical development.

Fetal Alcohol Effects (FAE)

Heavy prenatal alcohol exposure resulting in central nervous system dysfunction, but without the full set of defining physical facial features (nondysmorphic).

Fetal Alcohol Syndrome (FAS)

Heavy prenatal alcohol exposure resulting in central nervous system dysfunction, growth deficits, and cardinal facial dysmorphism.



Original Investigation | Substance Use and Addiction

Brain Volume in Fetal Alcohol Spectrum Disorders Over a 20-Year Span

Adolf Pfefferbaum, MD; Edith V. Sullivan, PhD; Kilian M. Pohl, PhD; Amanda Bischoff-Grethe, PhD; Susan A. Stoner, PhD; Eileen M. Moore, PhD; Edward P. Riley, PhD

Abstract

IMPORTANCE Anomalous brain development and mental health problems are prevalent in fetal alcohol spectrum disorders (FASD), but there is a paucity of longitudinal brain imaging research into adulthood. This study presents long-term follow-up of brain volumetrics in a cohort of participants with FASD.

OBJECTIVE To test whether brain tissue declines faster with aging in individuals with FASD compared with control participants.

DESIGN, SETTING, AND PARTICIPANTS This cohort study used magnetic resonance imaging (MRI) data collected from individuals with FASD and control individuals (age 13-37 years at first magnetic

Key Points

Question Do cortical volumes decline faster in individuals with a fetal alcohol spectrum disorders (FASD) than unaffected controls over 20 years from adolescence to middle age?

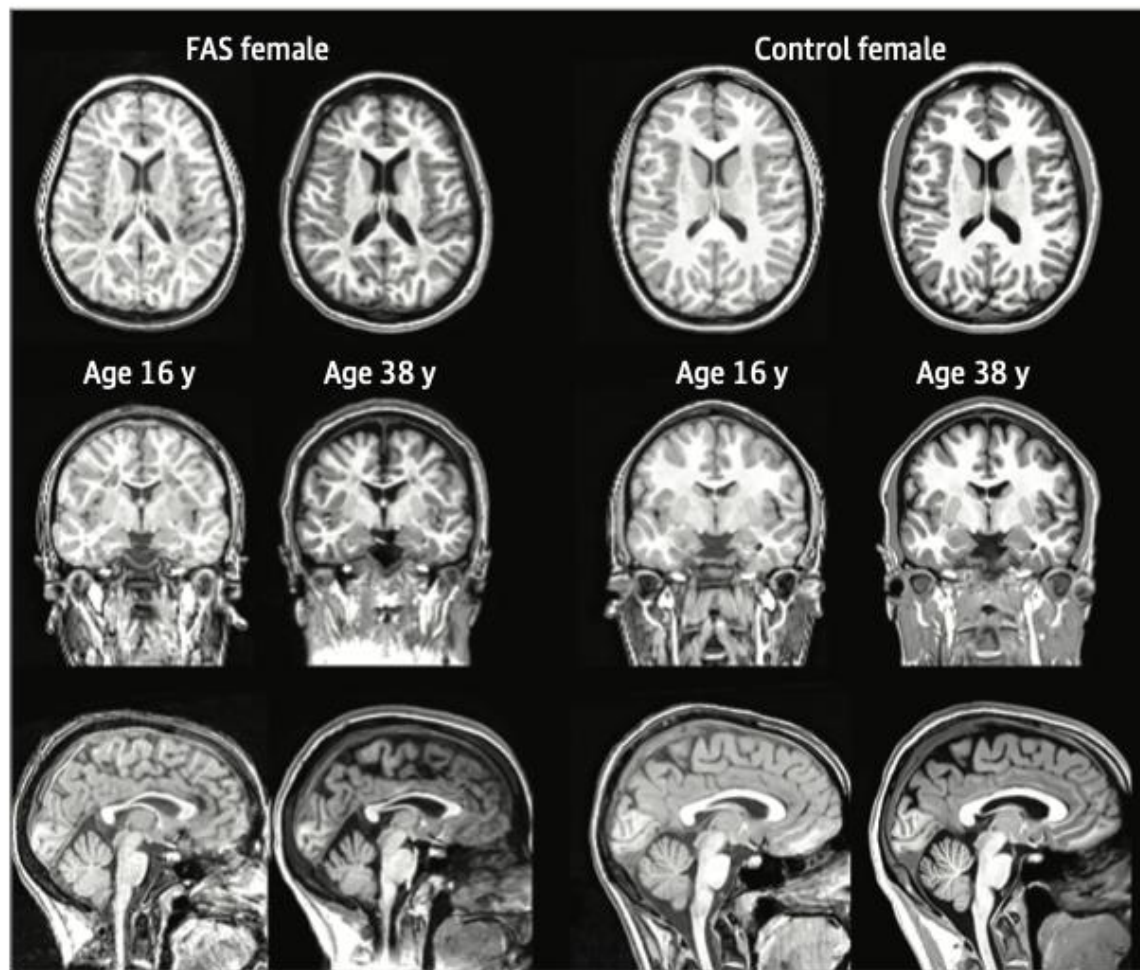
Findings This cohort study among 66 individuals, including 26 healthy controls, 18 individuals with fetal alcohol effects, and 22 individuals with fetal alcohol syndrome found that cortical

Table 1. Participant Demographic Characteristic for the 3 Groups

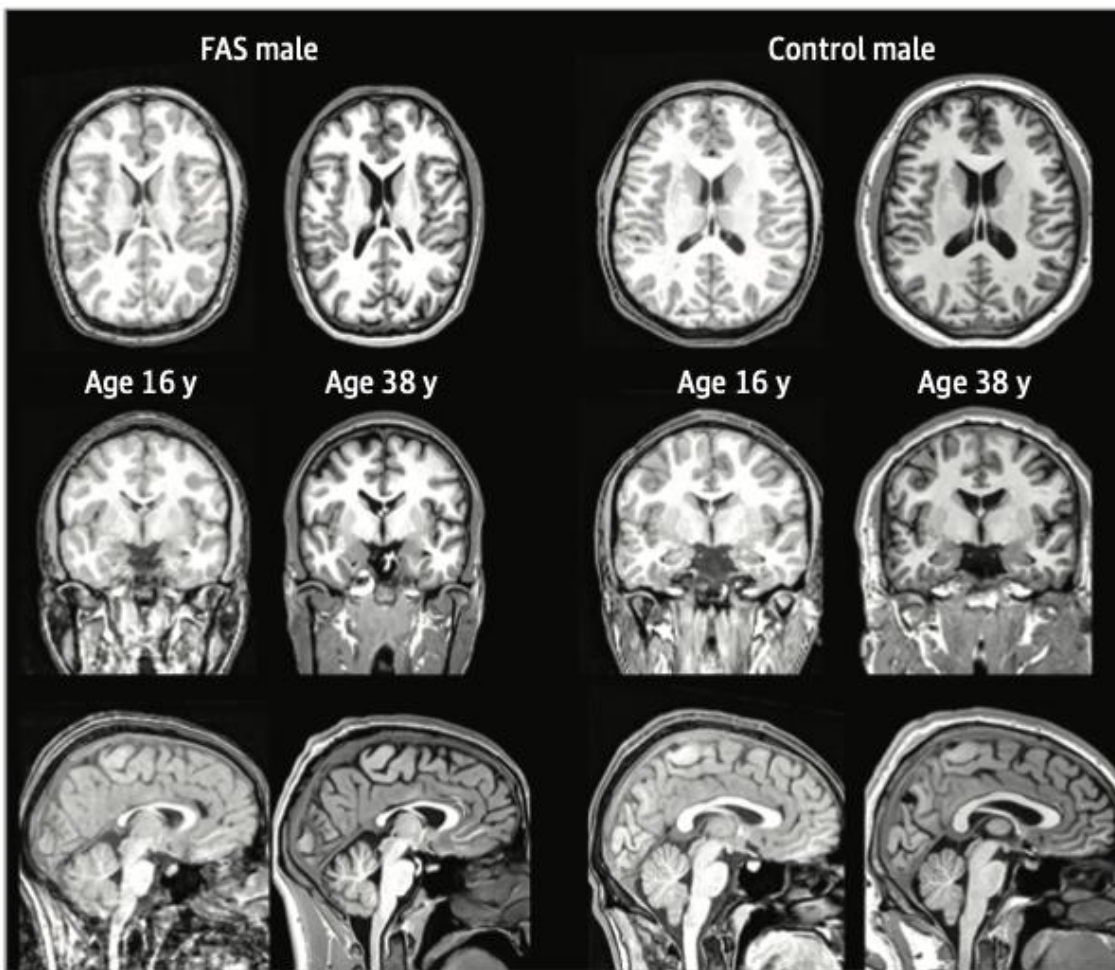
Characteristic	Mean (SD)		
	Control (n = 26)	FAE (n = 18)	FAS (n = 22)
Age at MRI1, y			
Male	21.3 (6.8)	22.8 (6.2)	21.3 (6.8)
Female	19.1 (5.6)	19.4 (5.8)	19.1 (5.6)
Total	20.2 (6.1)	21.3 (6.1)	20.1 (4.7)
Age at MRI2, y			
Male	43.4 (8.0)	45.4 (6.8)	41.2 (6.3)
Female	40.4 (6.2)	40.1 (5.8)	40.7 (5.3)
Total	41.9 (7.2)	43.1 (6.7)	41.0 (5.8)
Race, No. (%)			
African American	1 (4)	1 (6)	2 (9)
American Indian or Alaskan Native	4 (1)	5 (28)	4 (18)
White	21 (81)	12 (67)	16 (73)

Figure 1. Examples of Magnetic Resonance Images (MRI) 1 and 2 in Participants With Fetal Alcohol Syndrome (FAS) and Healthy Controls

A MRI of female participants

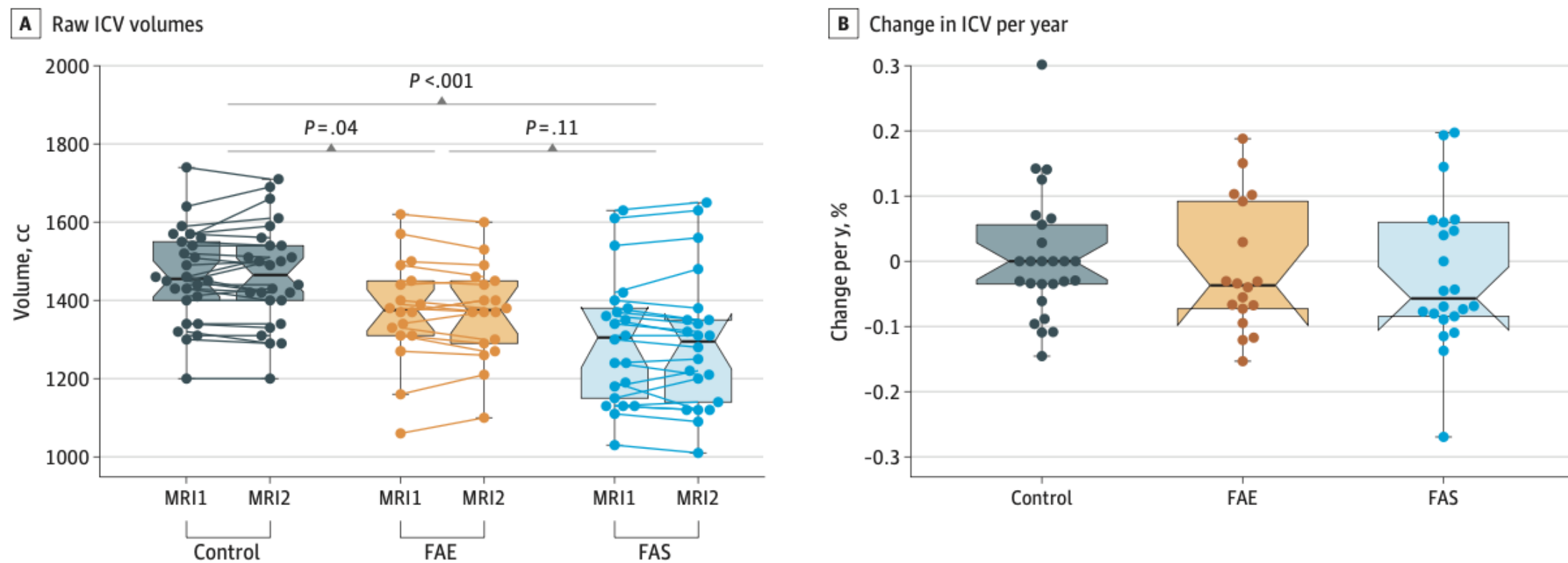


B MRI of male participants

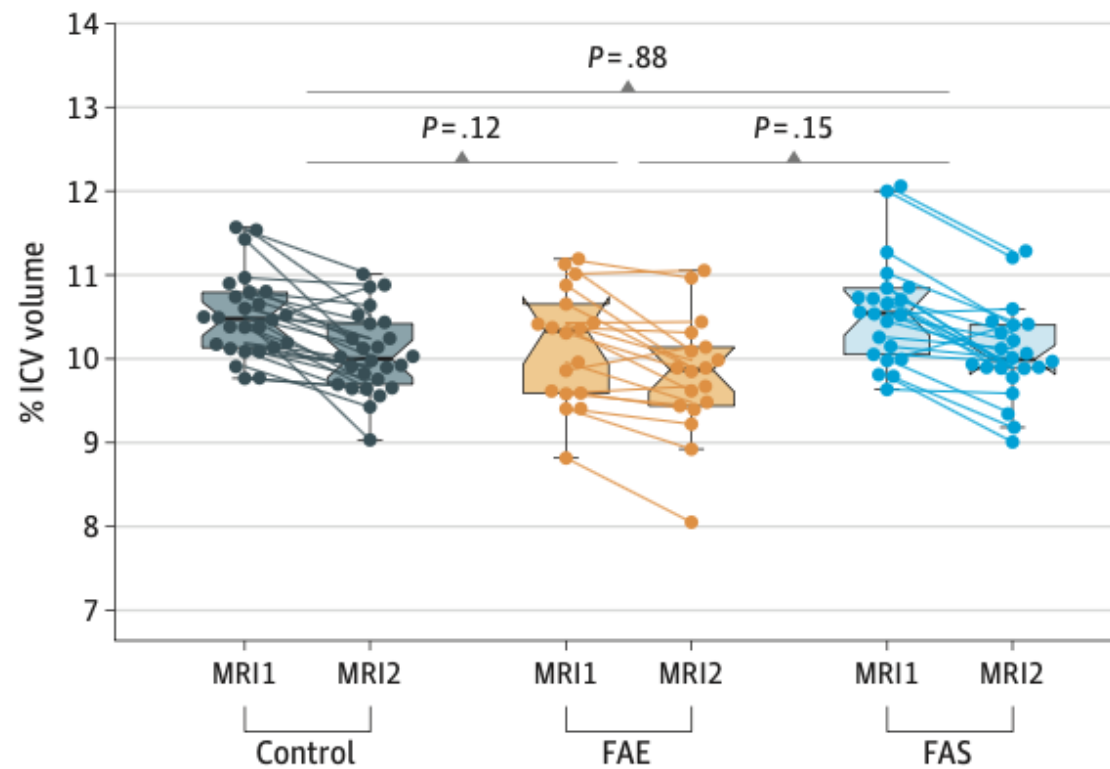


From top to bottom, axial, coronal, and sagittal views of exemplary MRIs of participants at their initial and follow-up sessions approximately 20 years later. Note the enlarging of the lateral ventricles in both participants with FAS.

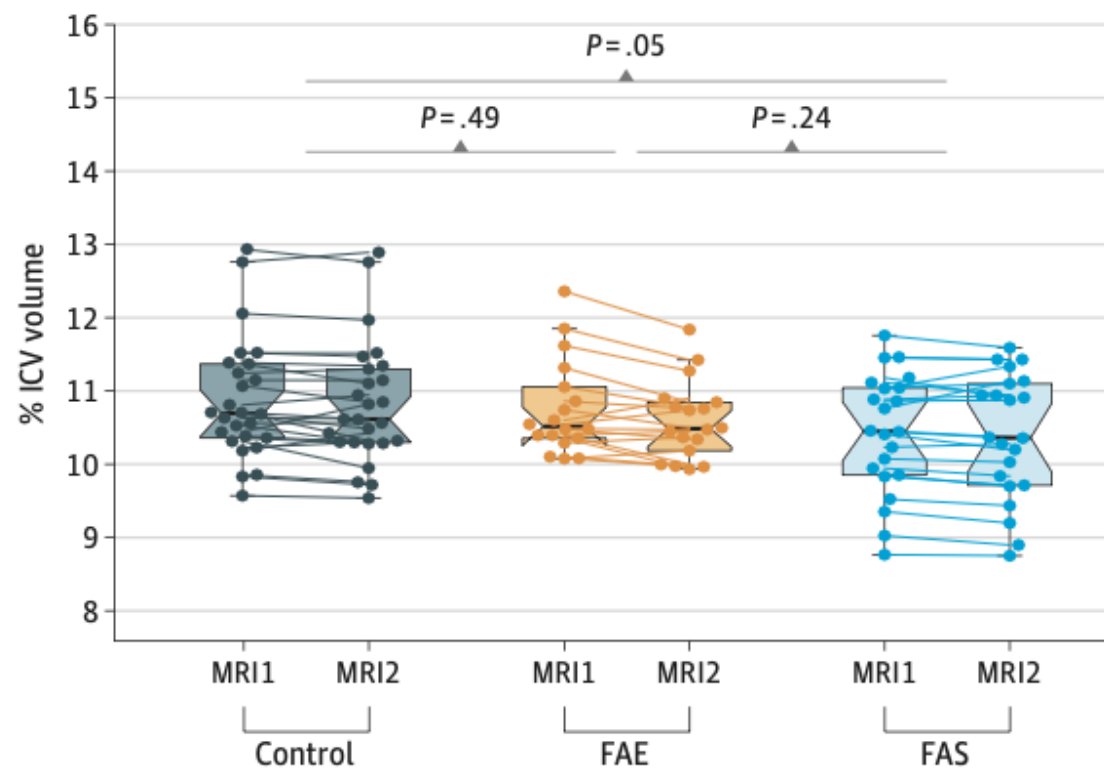
Figure 2. Raw Intracranial Volumes (ICV) and Percentage Change of Each Participant in Each Group



B Frontal volume as a percentage of ICV



F Total cerebellum volume as a percentage of ICV

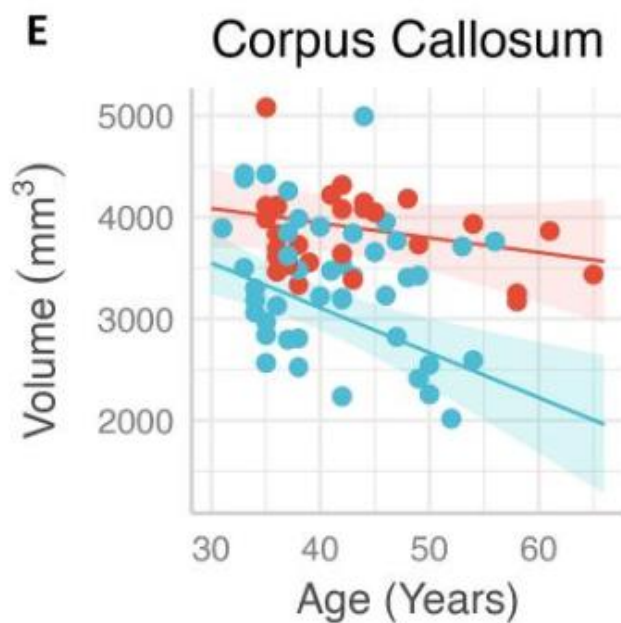
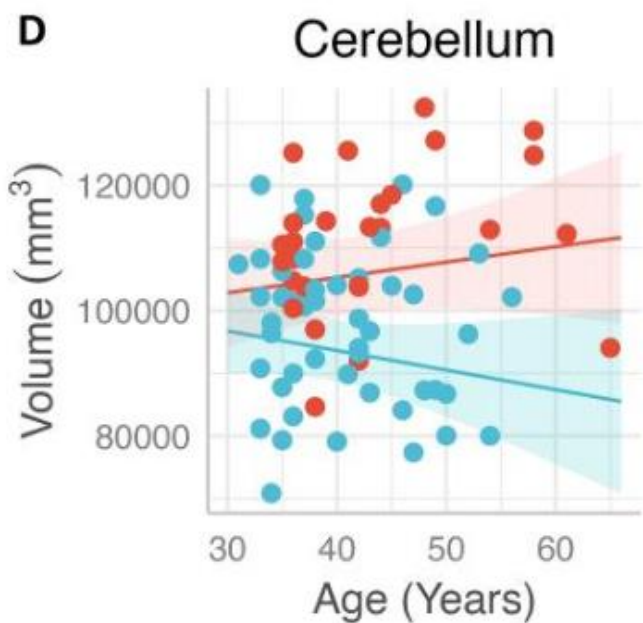
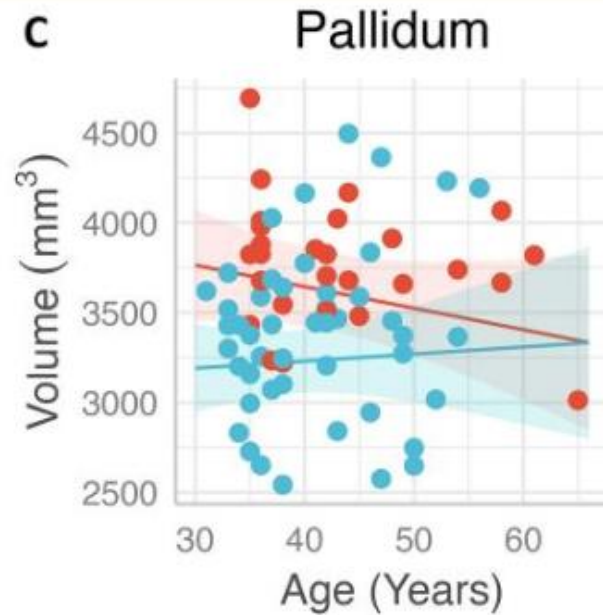
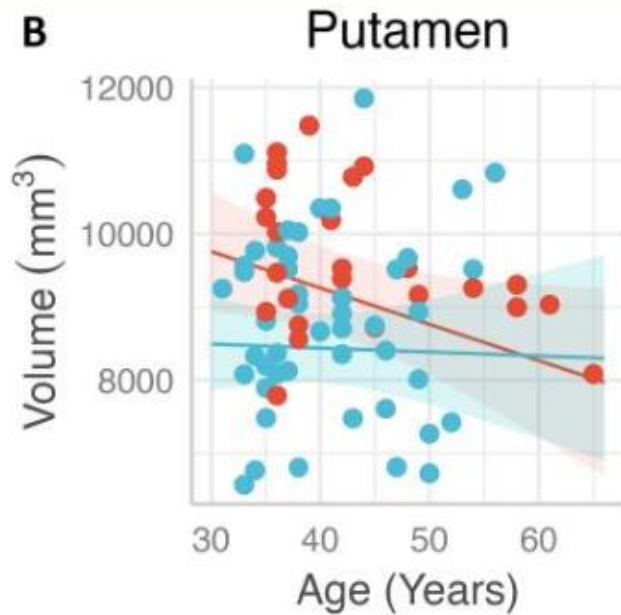
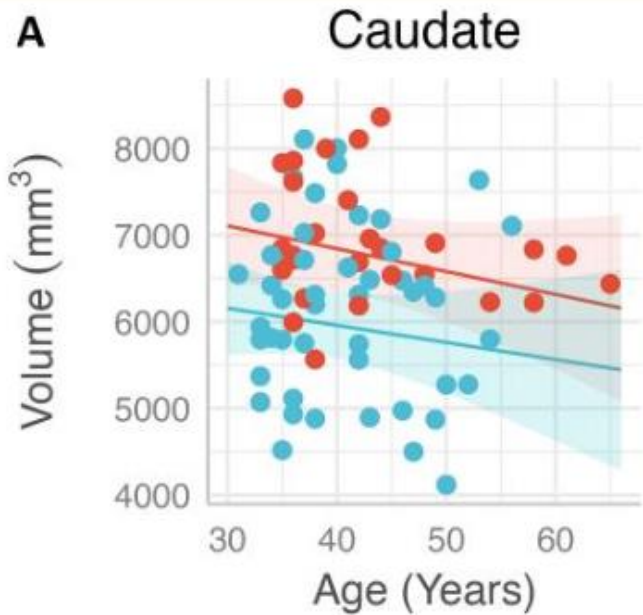




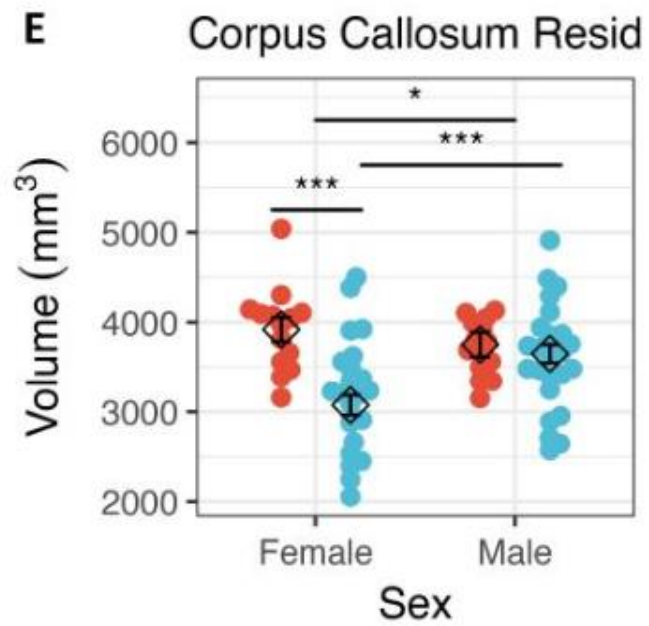
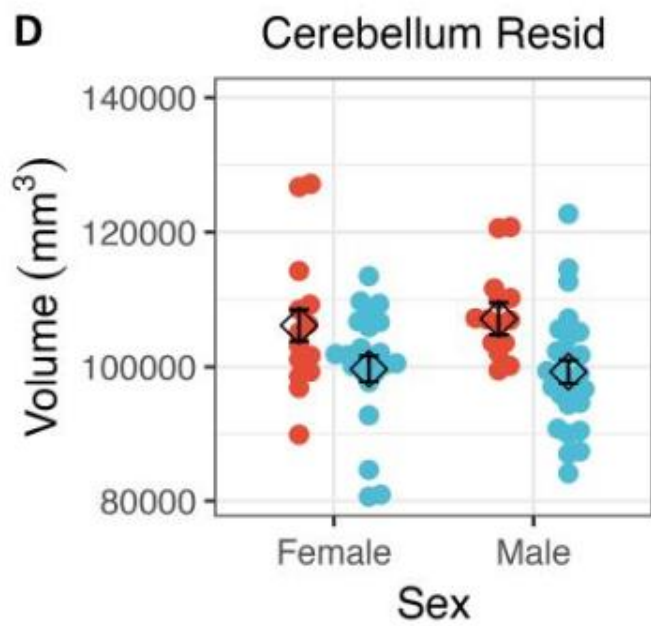
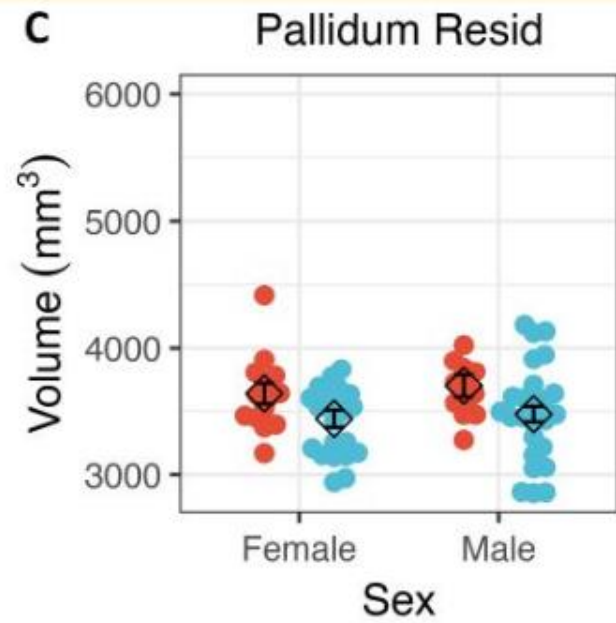
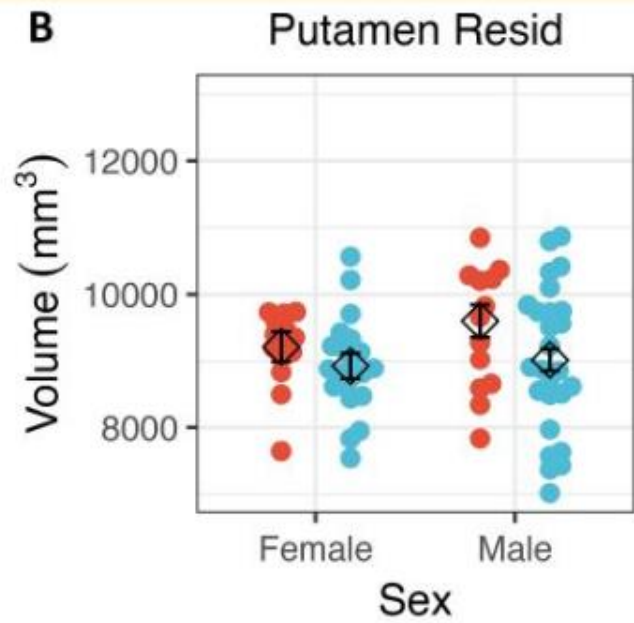
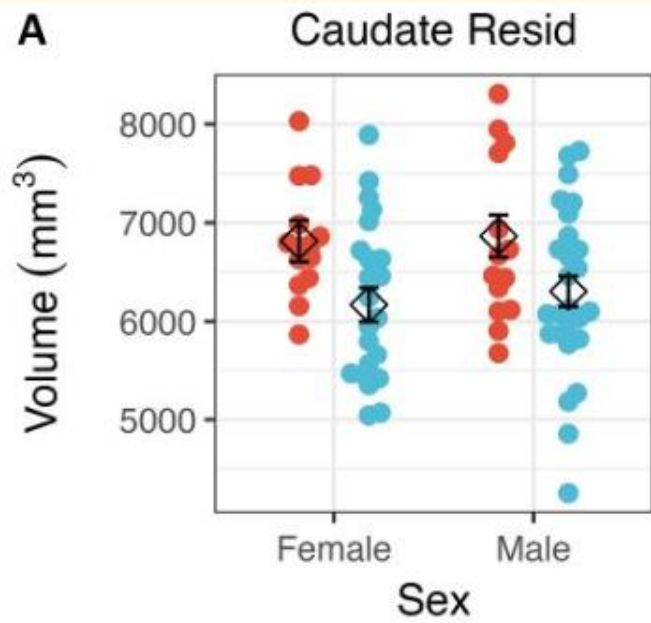
Subcortical volume in middle-aged adults with fetal alcohol spectrum disorders

 **Amanda Bischoff-Grethe,¹ Susan A. Stoner,² Edward P. Riley³ and Eileen M. Moore³**

Studies of youth and young adults with prenatal alcohol exposure (PAE) have most consistently reported reduced volumes of the corpus callosum, cerebellum and subcortical structures. However, it is unknown whether this continues into middle adulthood or if individuals with PAE may experience premature volumetric decline with aging. Forty-eight individuals with fetal alcohol spectrum disorders (FASD) and 28 healthy comparison participants aged 30 to 65 participated in a 3T MRI session that resulted in usable T₁-weighted and T₂-weighted structural images. Primary analyses included volumetric measurements of the caudate, putamen, pallidum, cerebellum and corpus callosum using FreeSurfer software. Analyses were conducted examining both raw volumetric measure-



Group  HC  FASD



Group  HC  FASD

Archival Report

Thalamic Nuclear Volumes in Fetal Alcohol Spectrum Disorders: From Adolescence to Middle-Age Twenty Years Later



Adolf Pfefferbaum, Edith V. Sullivan, Manojkumar Saranathan, Kilian M. Pohl, Amanda Bischoff-Grethe, Susan A. Stoner, and Edward P. Riley

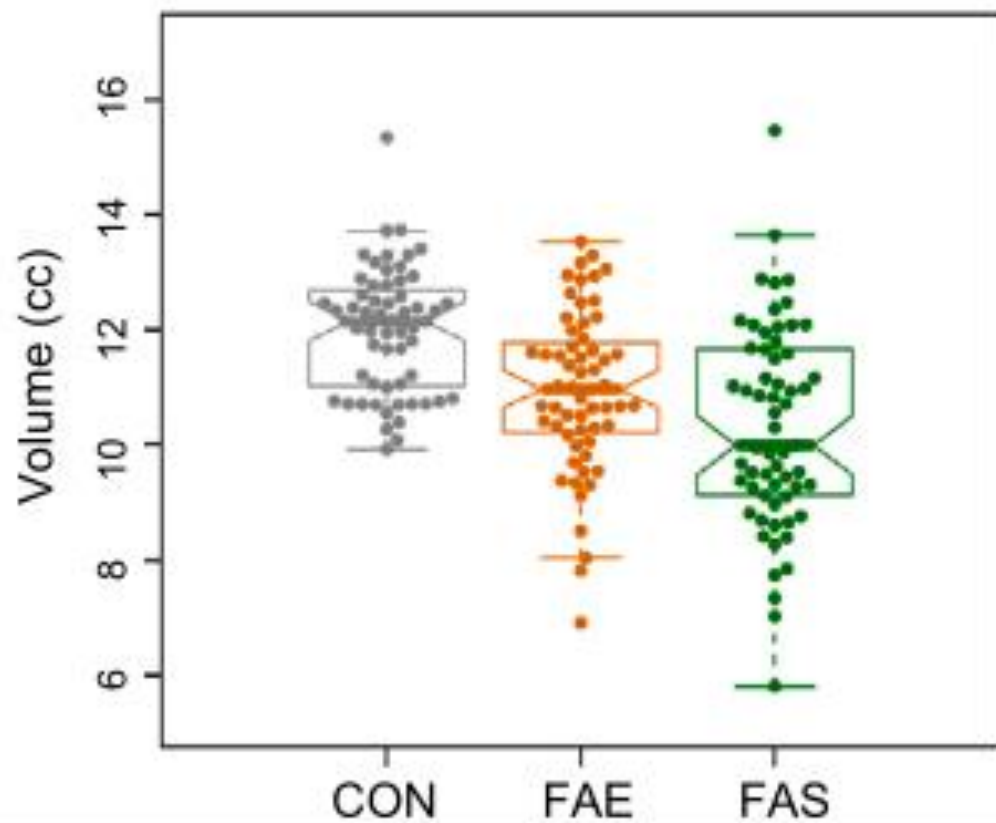
ABSTRACT

BACKGROUND: Midline orofacial and brain structures, including the multinucleated thalamus, may be differentially sensitive to prenatal alcohol exposure and vulnerable to accelerated aging.

METHODS: Two sets of magnetic resonance imaging (MRI) data separated by 20 years are reported for control individuals, individuals with fetal alcohol syndrome (FAS), and nondysmorphic individuals with heavy fetal alcohol exposure (FAE). MRI1 included 179 participants, with 69 participants reassessed at MRI2. Segmentation produced

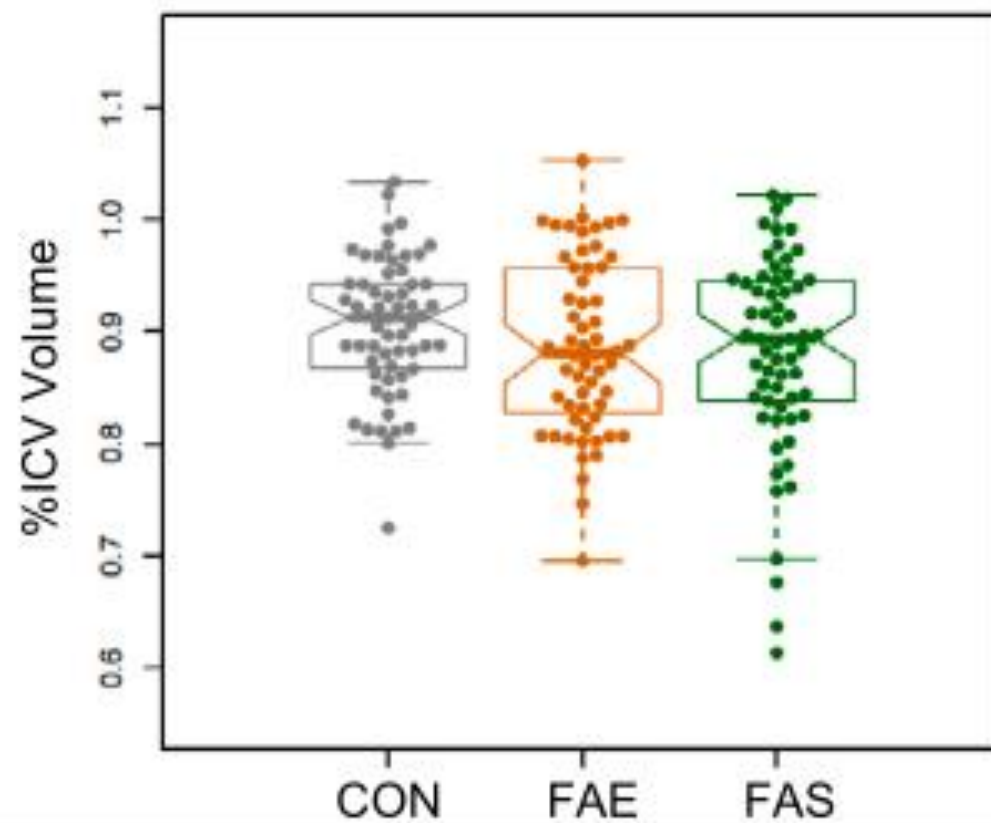
Native Volumes

Total Thalamus

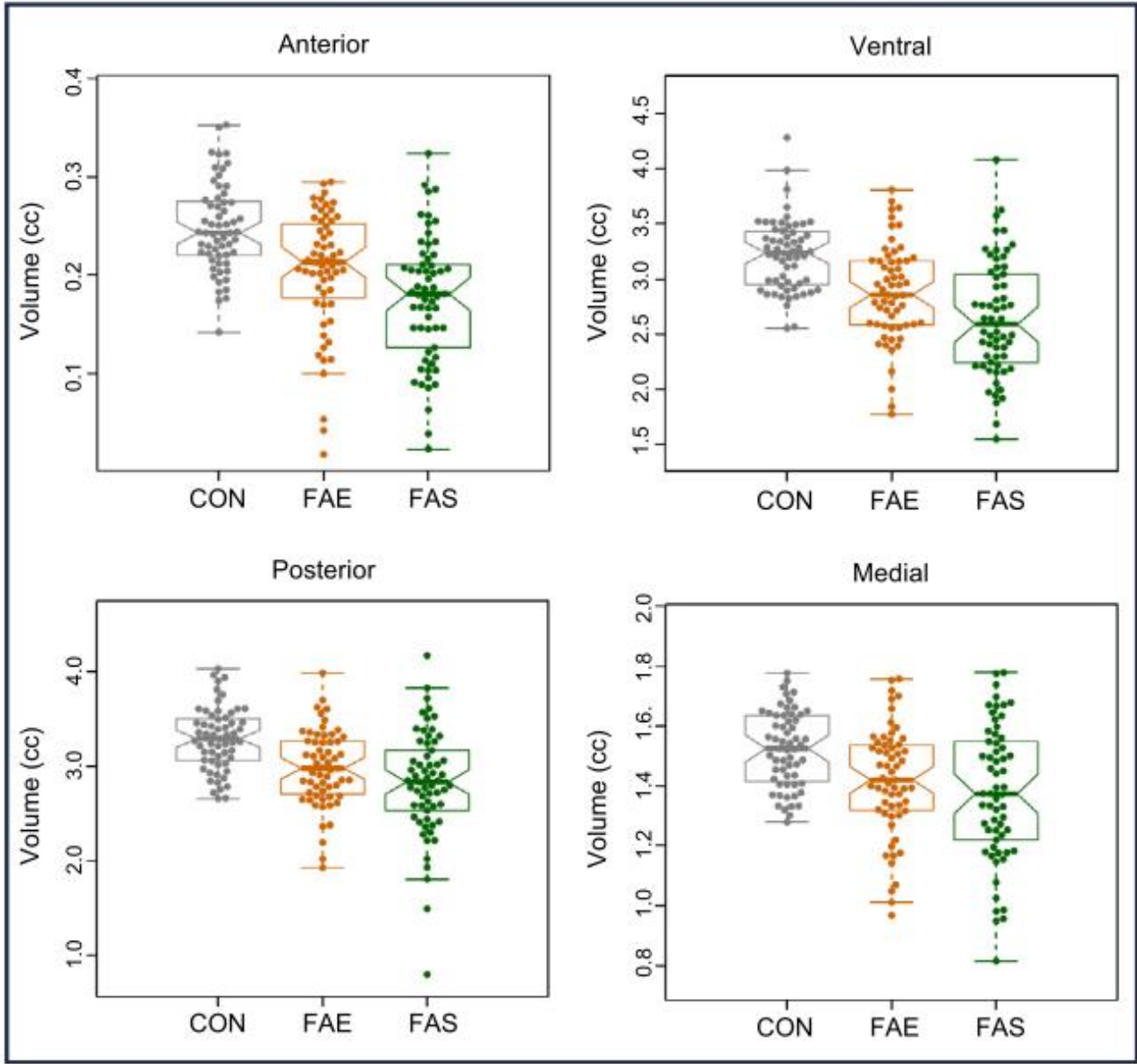
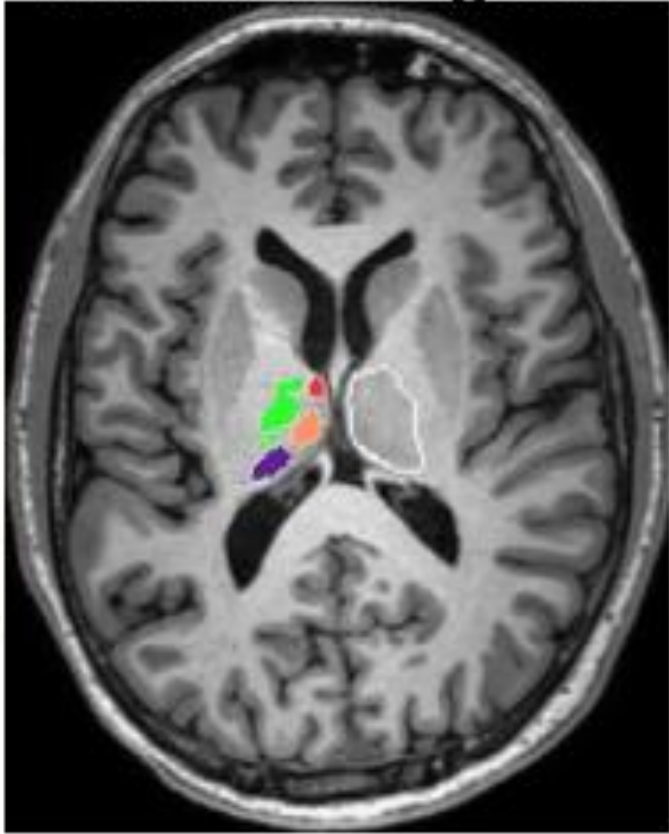


%ICV Volumes

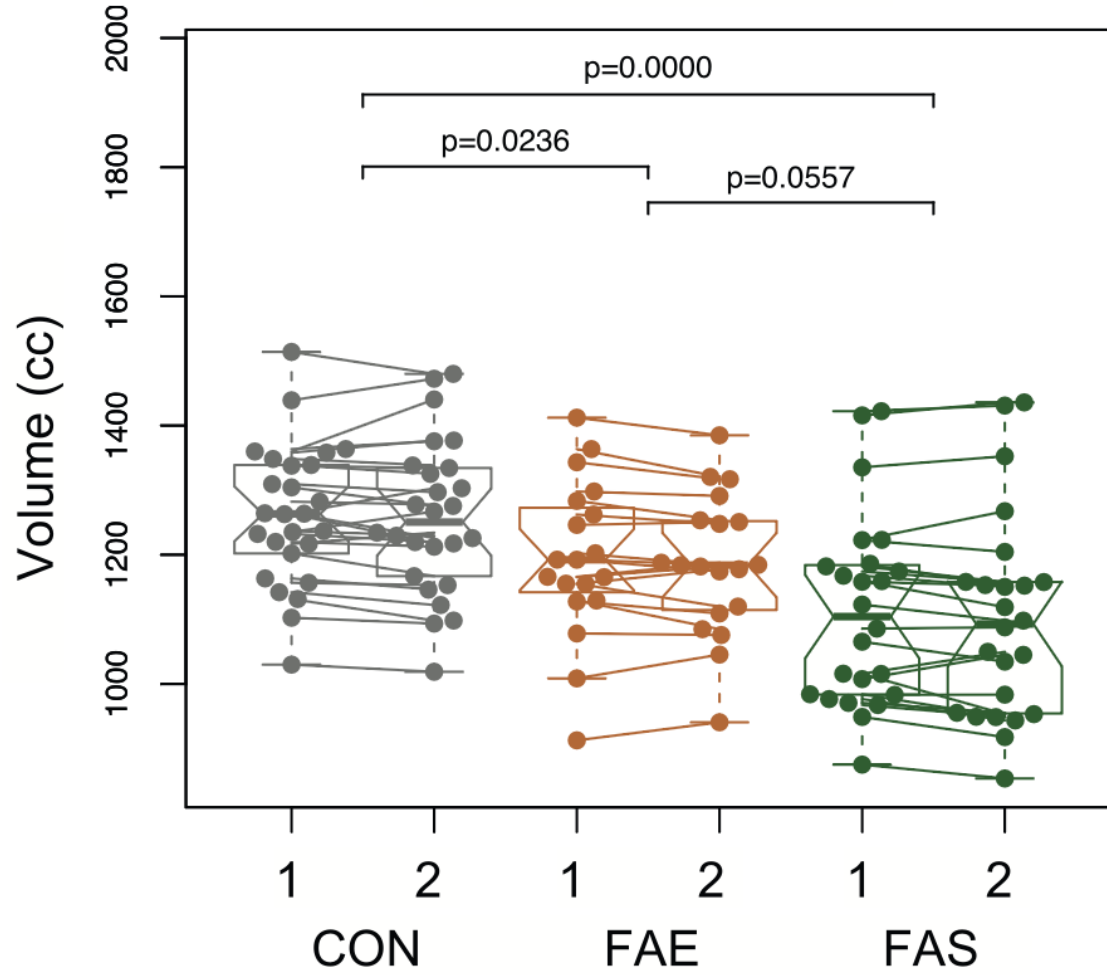
Total Thalamus



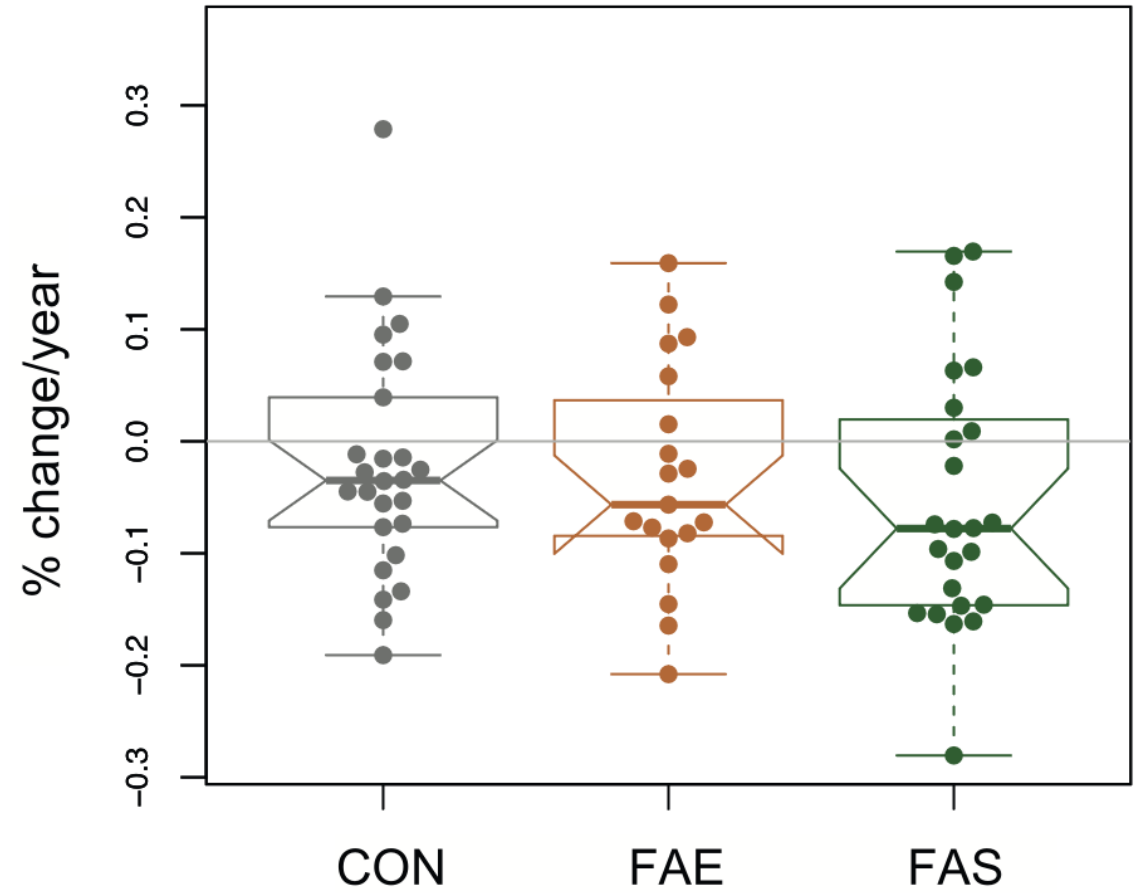
Thalamic Regions



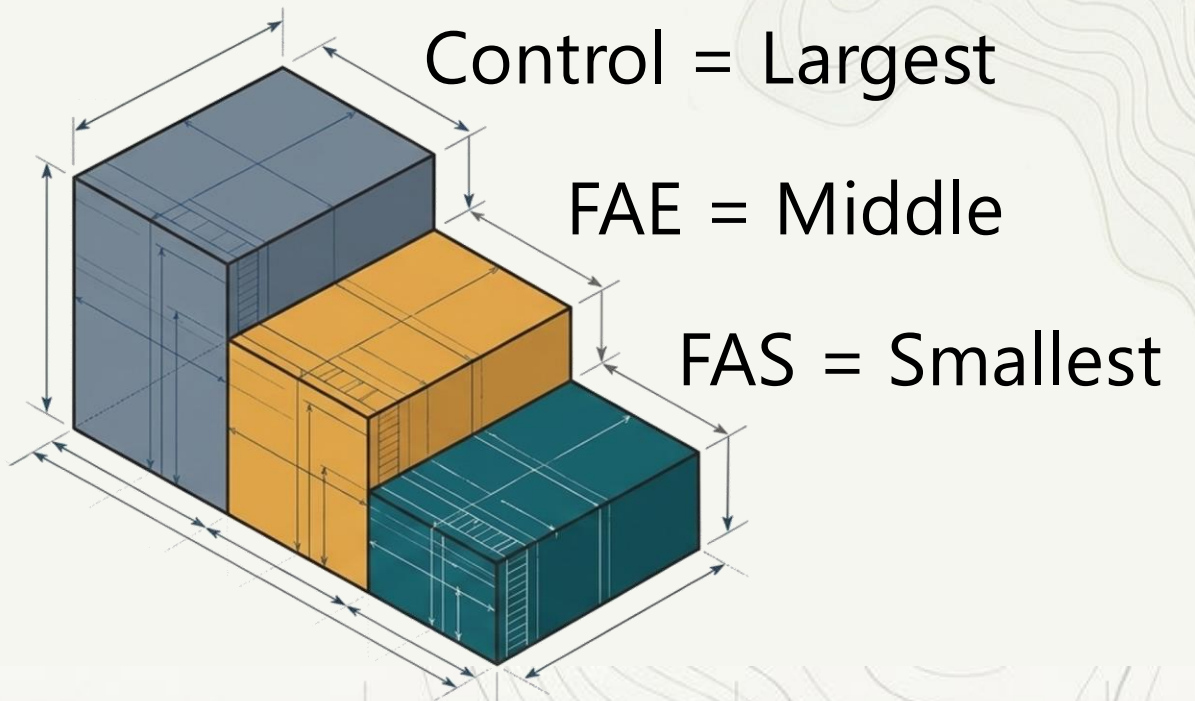
Native ICV



% Change/year of Native ICV



Key Takeaway: Enduring Brain Size Differences in Multiple Areas





What does this mean for people with FASD?



Reassurance

Brain differences present in childhood do not appear to worsen over time, at least through middle age



Reorientation

Instead of *"what can I do about my brain as a person with FASD"* consider *"what can I do about my brain as an aging person"*



Resolve

Simply follow emerging guidance that is applicable to all people regarding how to promote brain health as we age

The Way Forward

The Next Frontier

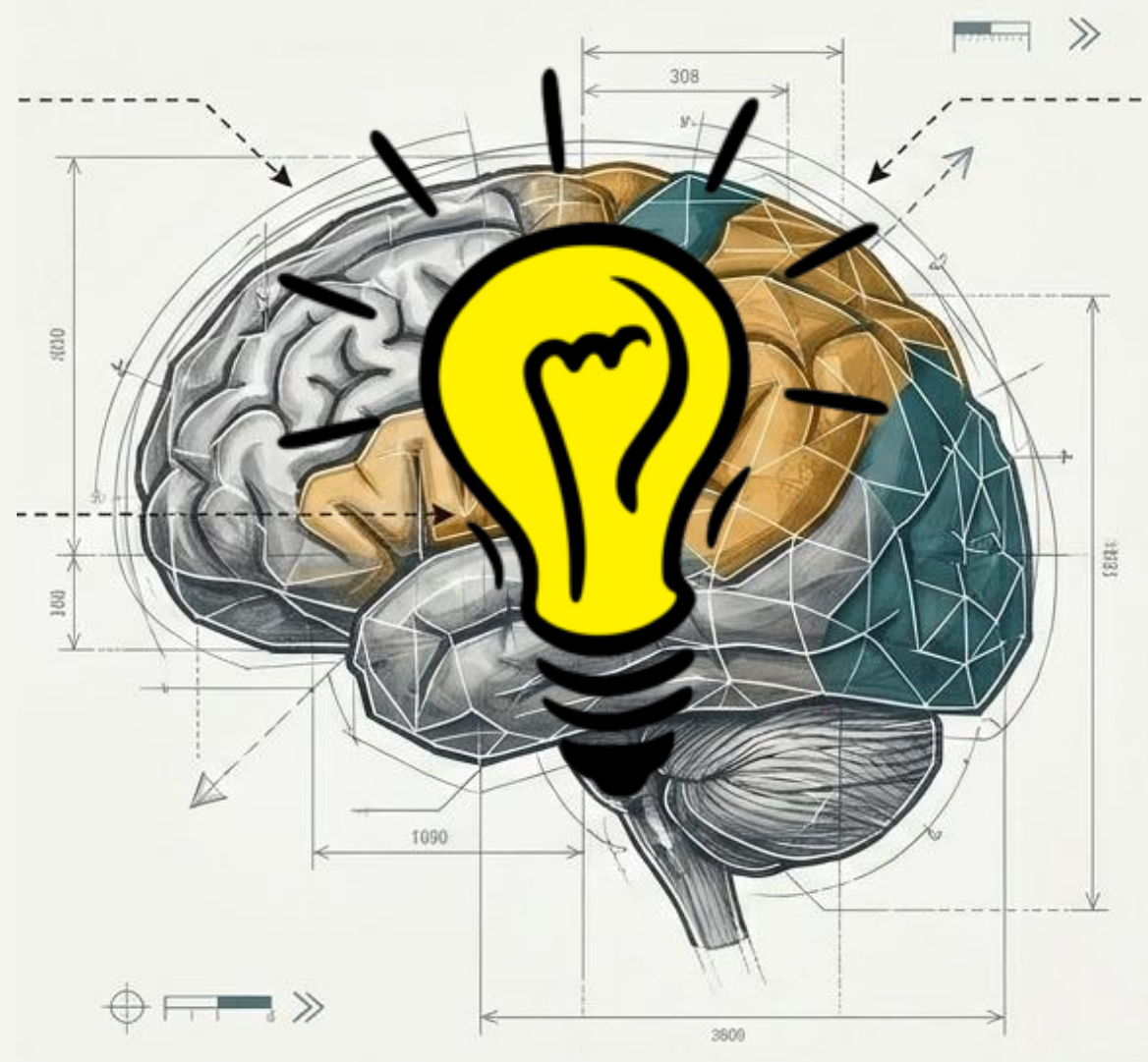
- This research points to normal brain aging in those with FASD up to age 65
- Future studies are needed to examine the transition into late-life senior years

Final Thought

- If the brain does not prematurely age in people with FASD, we can rest assured that FASD does not present additional complications beyond normal brain aging
- People living with FASD can benefit from broader research on brain health that applies to the general population



1. Exercise regularly
2. Attend to sleep
3. Eat healthfully
4. Work your brain
5. Interact socially
6. Limit substances



Acknowledgements



Amanda Bischoff-Grethe, Ph.D.
University of California, San Diego



Eileen Moore, Ph.D.
San Diego State University



Adolf Pfefferbaum, M.D., Ph.D.
SRI International
Stanford University



Kilian M. Pohl, Ph.D.
Stanford University



Edward P. Riley, Ph.D.
San Diego State University



Manojkumar Saranathan, Ph.D.
UMass Chan Medical School



Edith V. Sullivan, Ph.D.
Stanford University

Acknowledgements

- Funded by the National Institute on Alcohol Abuse and Alcoholism (AA005965, AA010723, AA021697, AA014811, AA026994) and National Institute on Drug Abuse (DA057567)
- Research operations supported by the Ann P. Streissguth, Ph.D., Endowed Professorship of Fetal Alcohol Spectrum Disorders
- The original research supporting participant recruitment and imaging was conducted at the University of Washington Fetal Alcohol and Drug Unit (FADU), under the direction of Ann P. Streissguth, Ph.D., in collaboration with Fred L. Bookstein, Ph.D., Paul D. Sampson, Ph.D., and Paul D. Connor, Ph.D., funded by NIH grants to Dr. Streissguth (AA010836) and Dr. Bookstein (GM03725)
- UW FADU Research Staff: Emmy Smith-Stewart, Kay Kelly, Kristina Rowlett, and Sandra Radin



Study 1



Study 2



Study 3





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