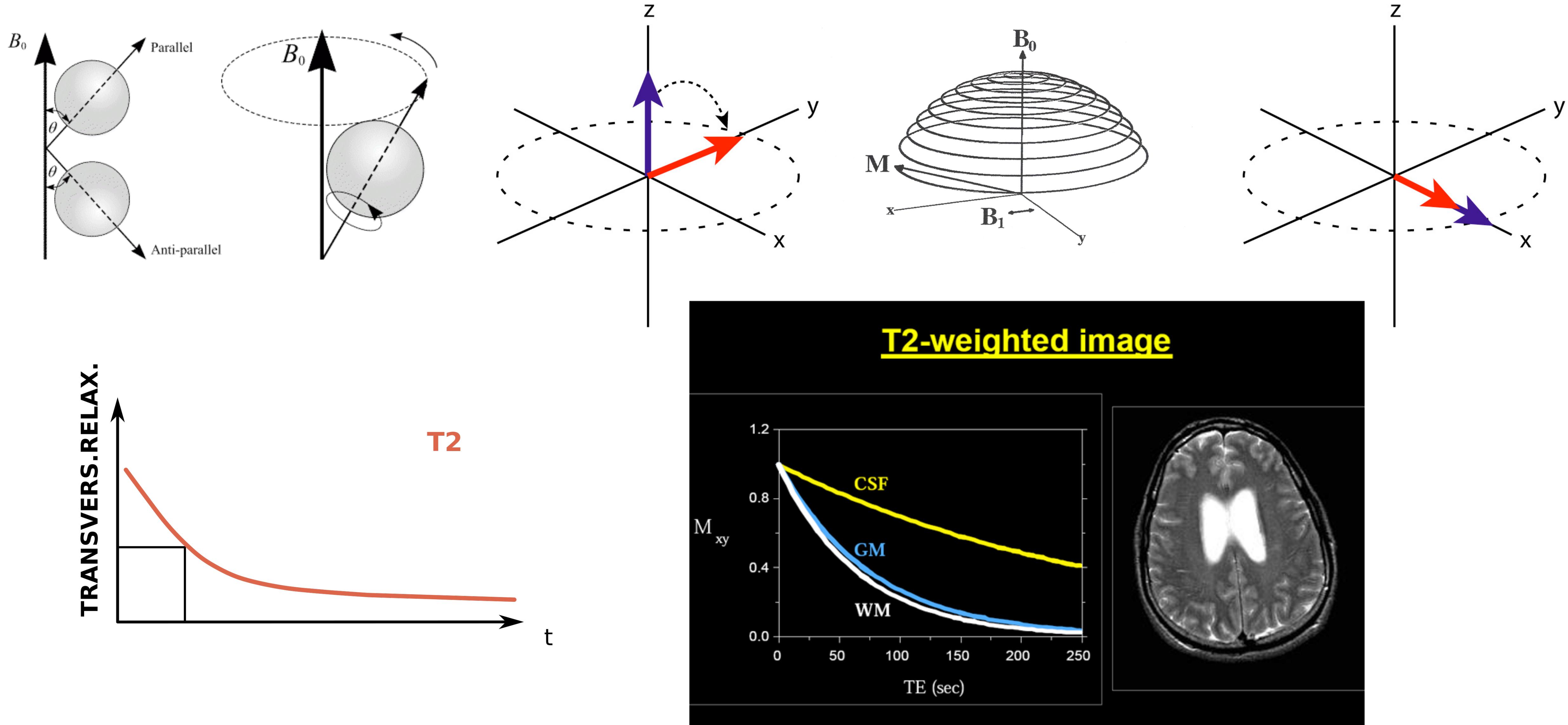


Module 13: Structural MRI Studies

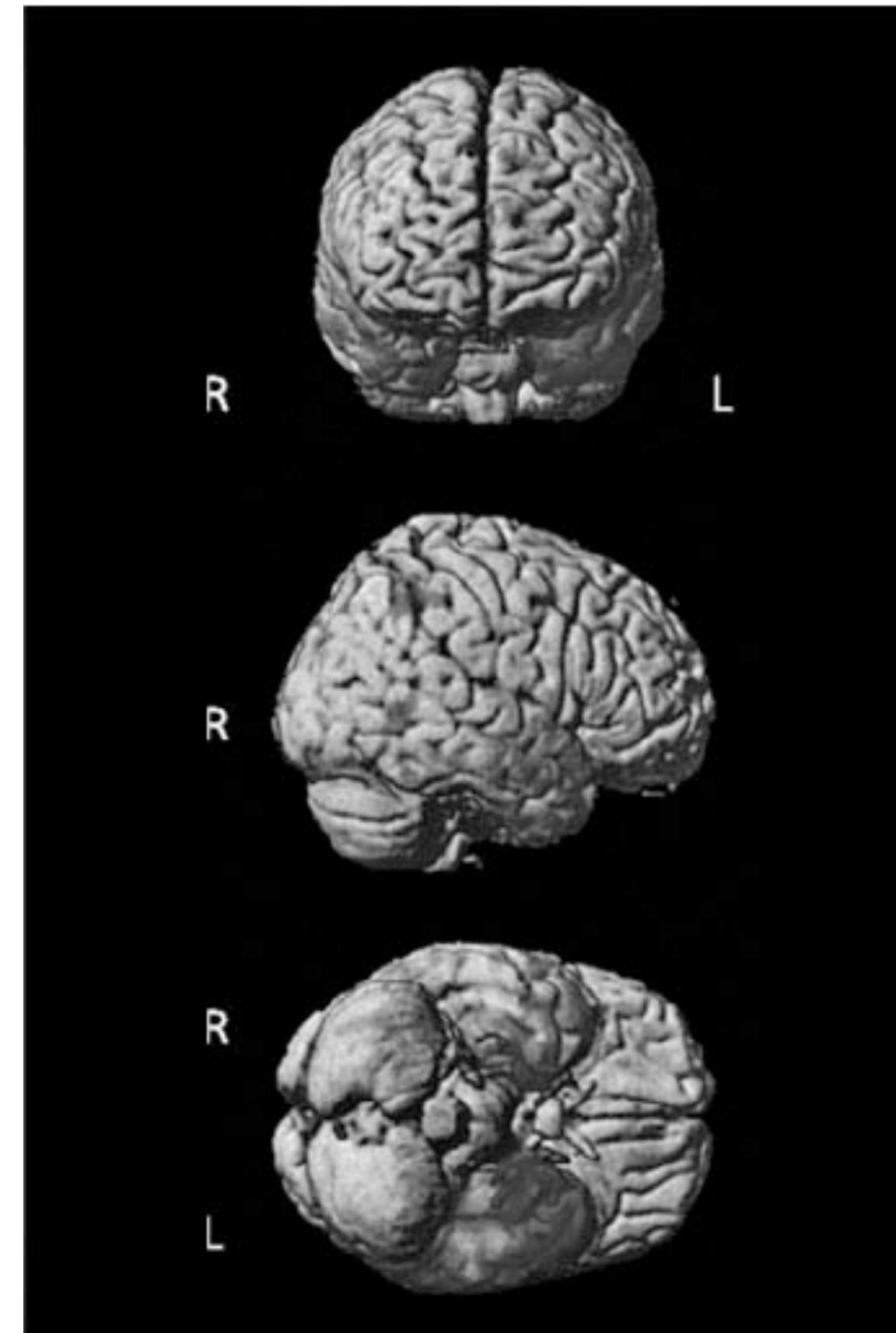
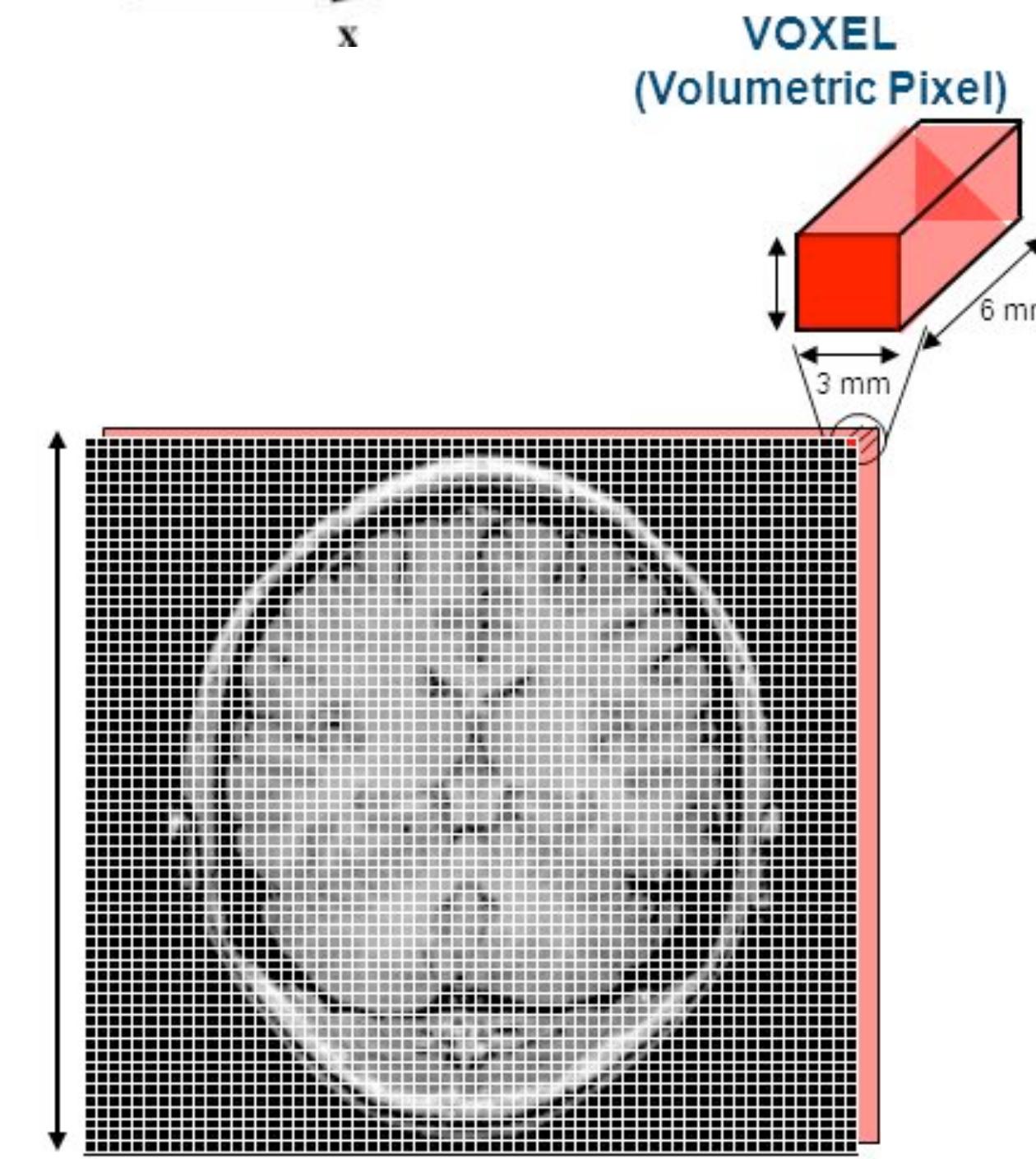
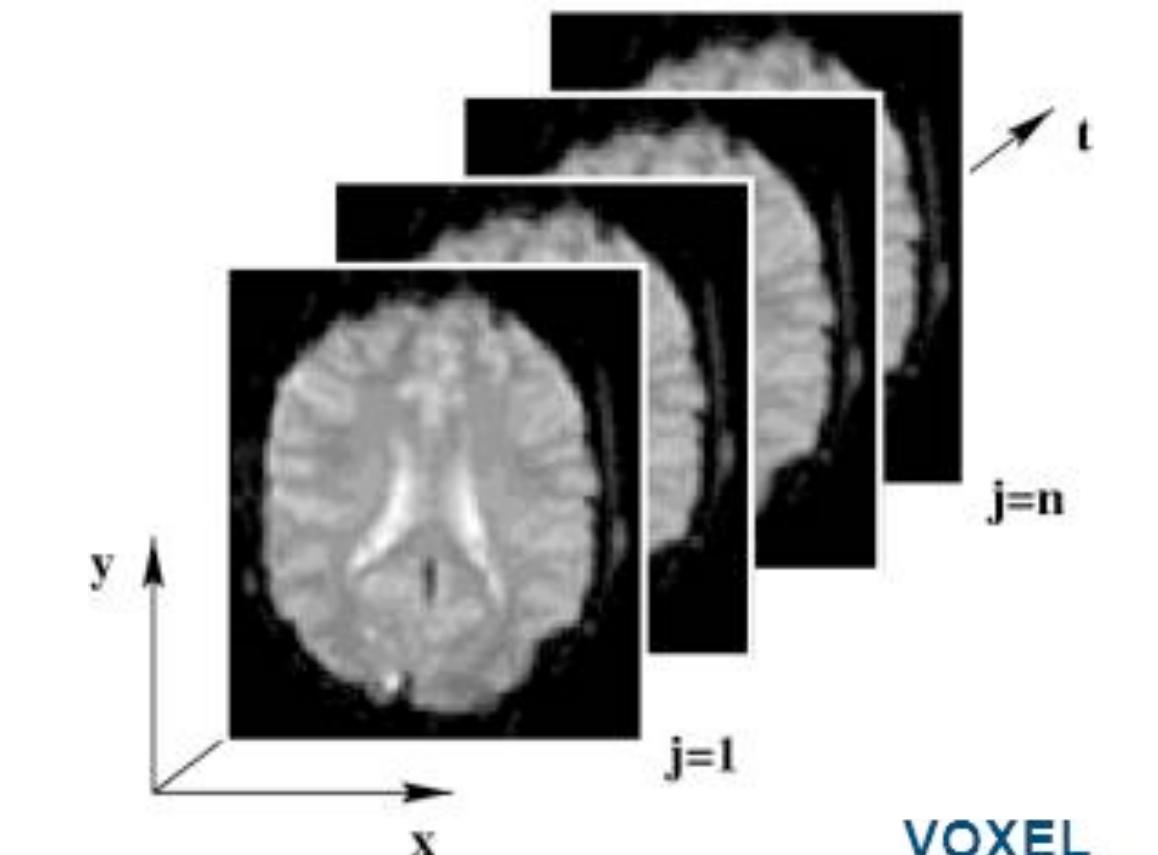
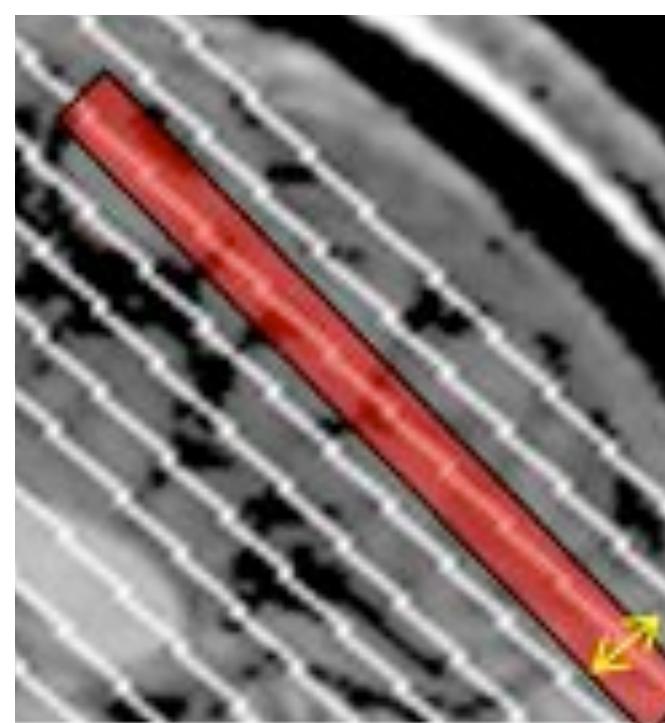
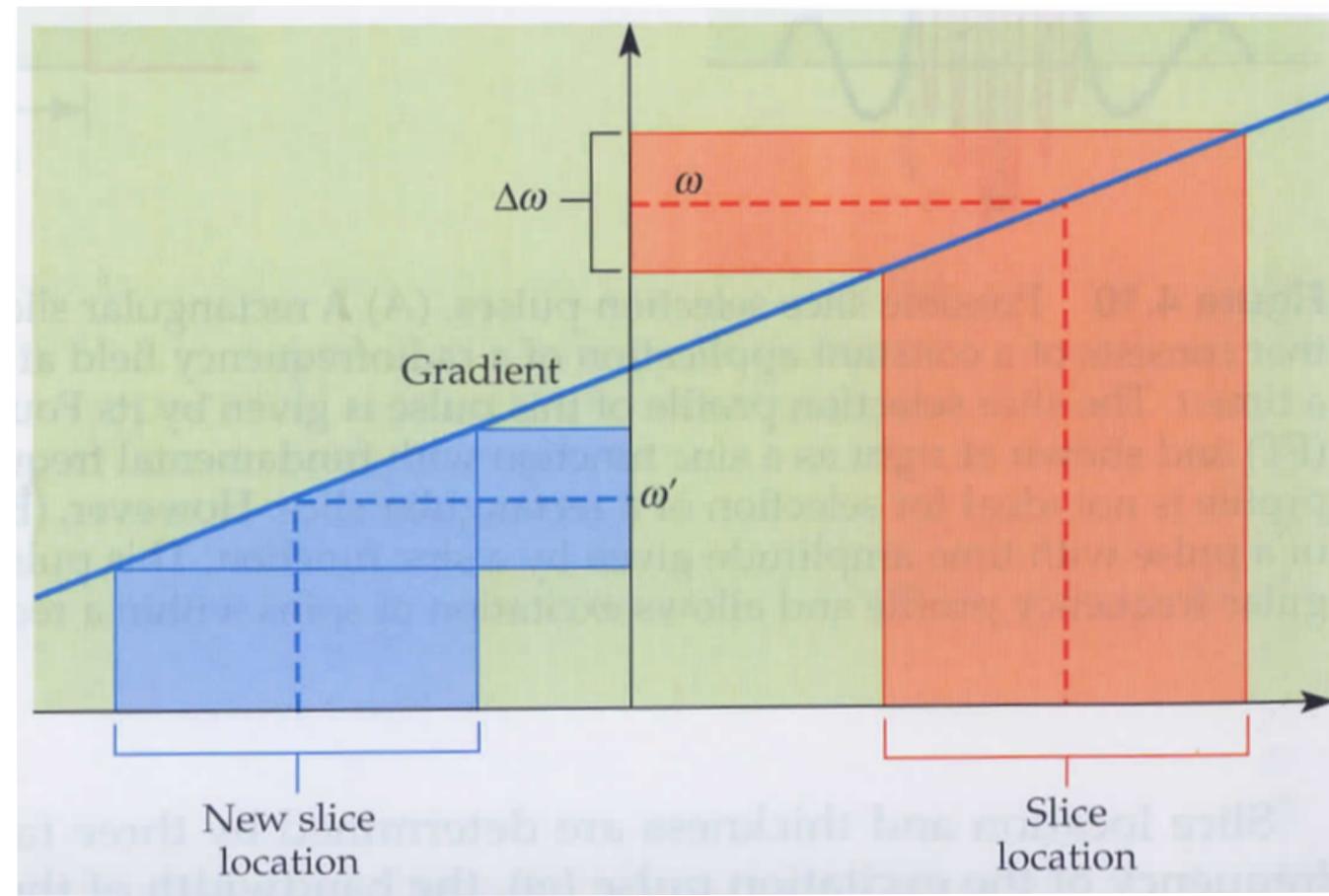
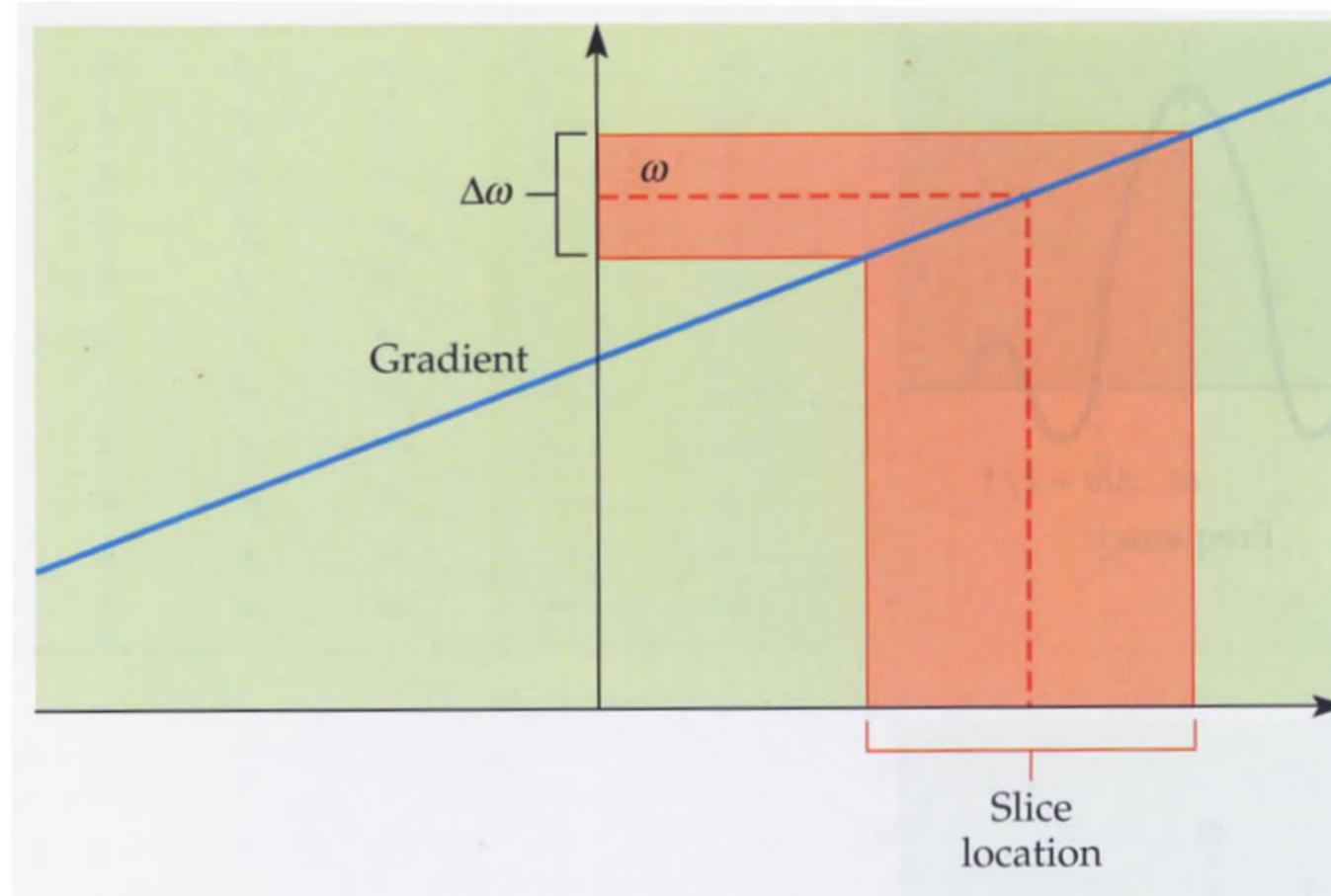
Arnold Bakker

Department of Psychiatry and Behavioral Sciences
Division of Psychiatric Neuroimaging
Johns Hopkins University School of Medicine

Structural MRI Study



Structural MRI Study

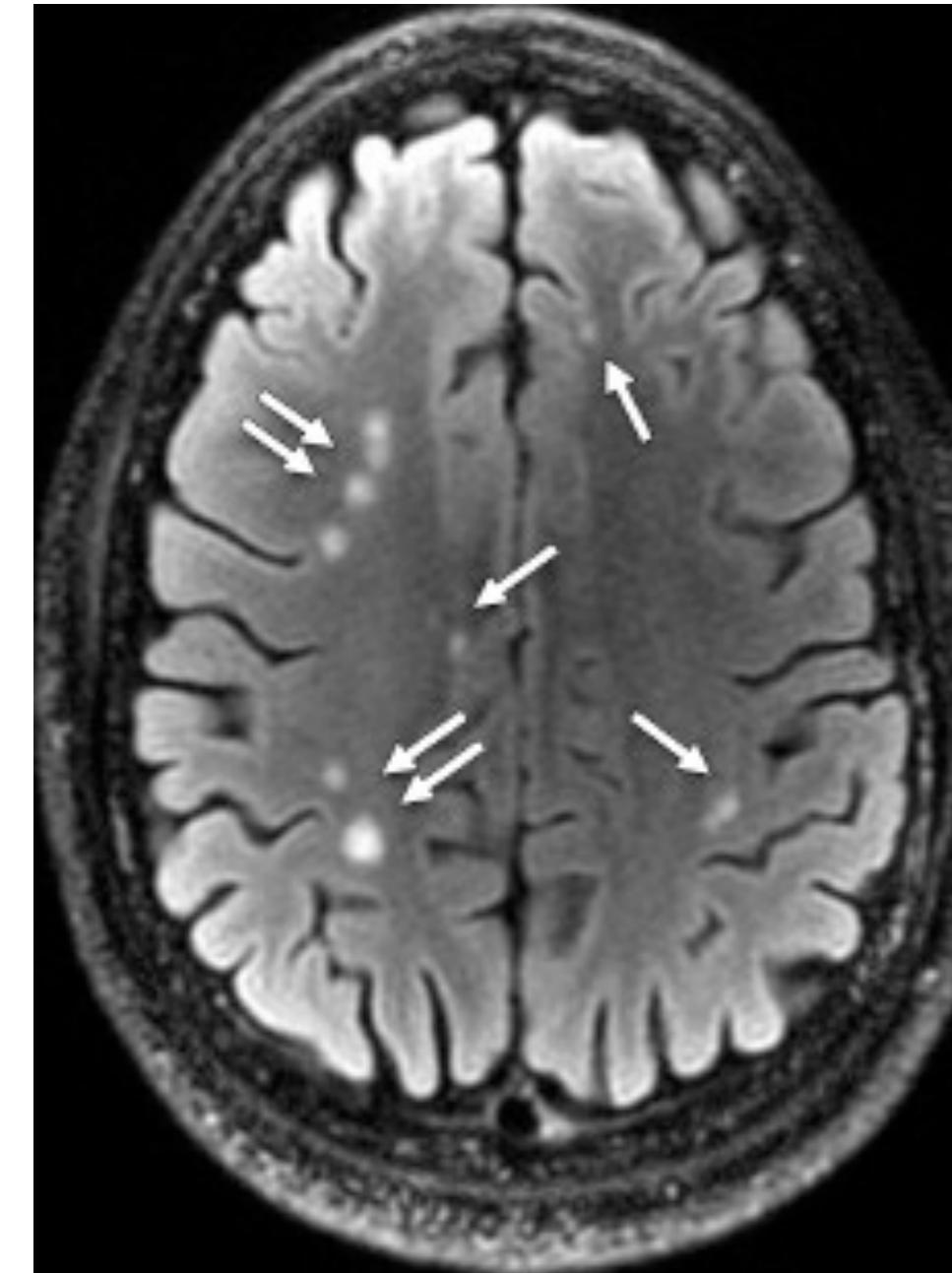


Structural MRI Study

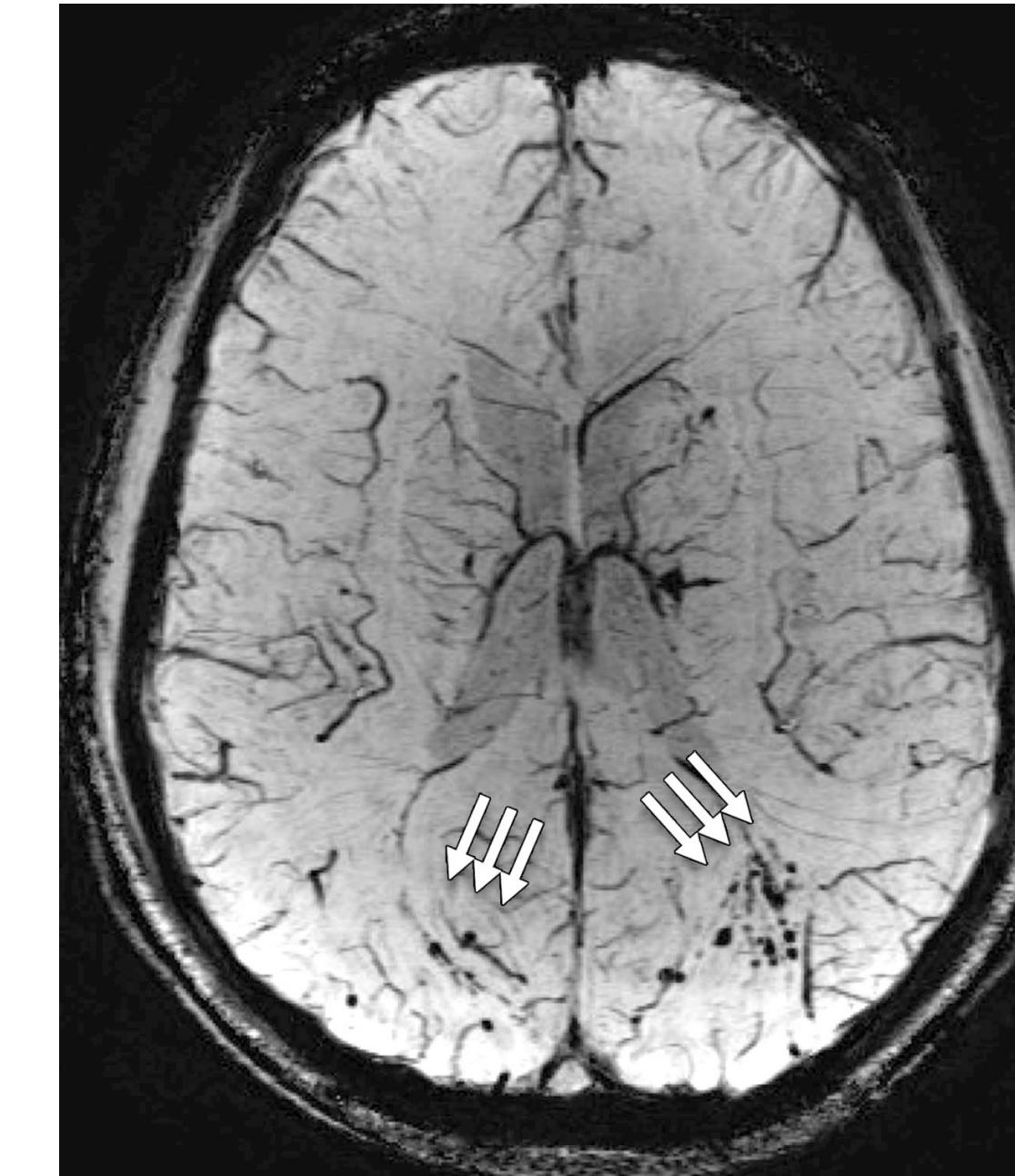
Qualitative evaluation



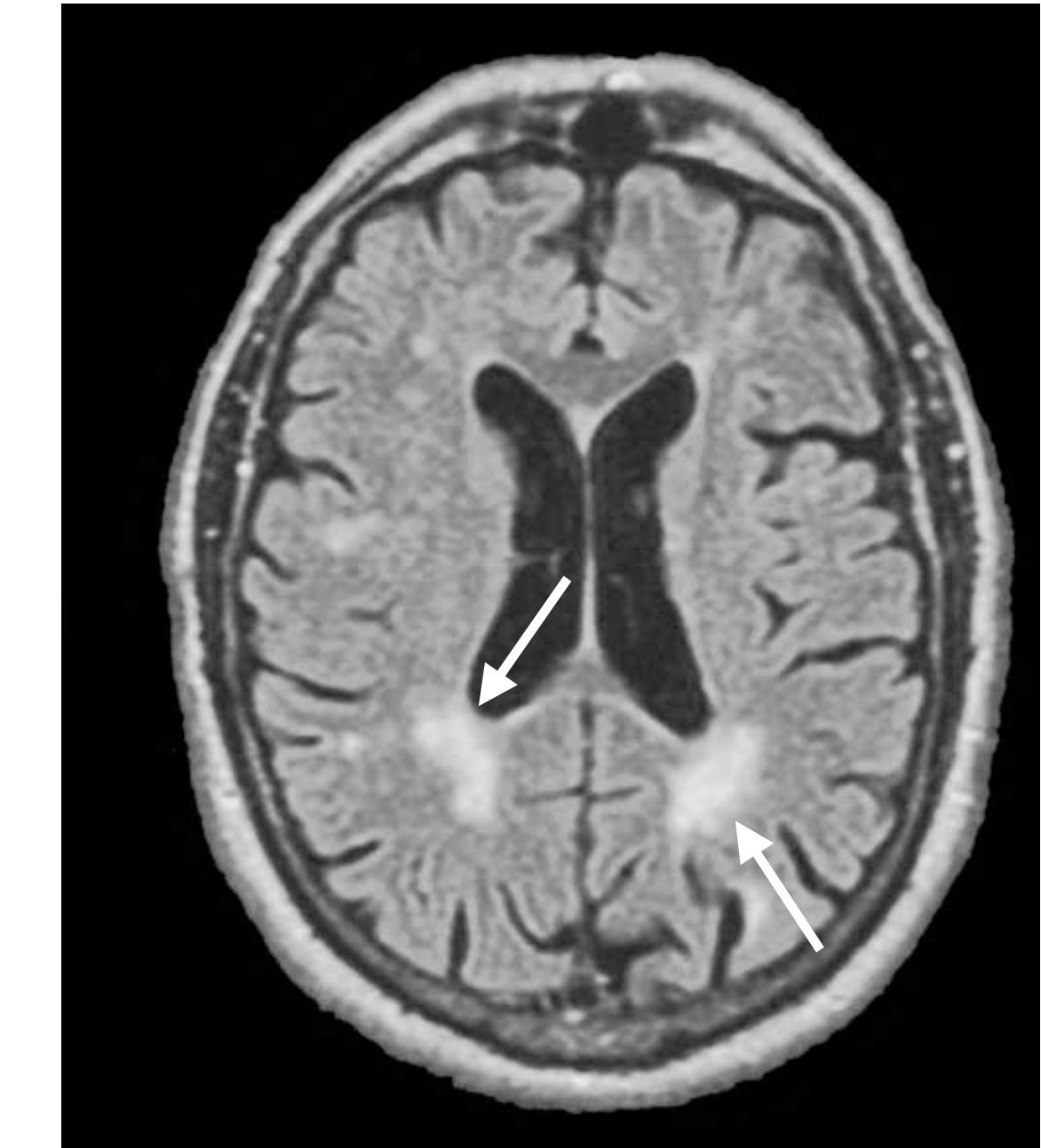
Cortical infarction



White matter hyperintensities



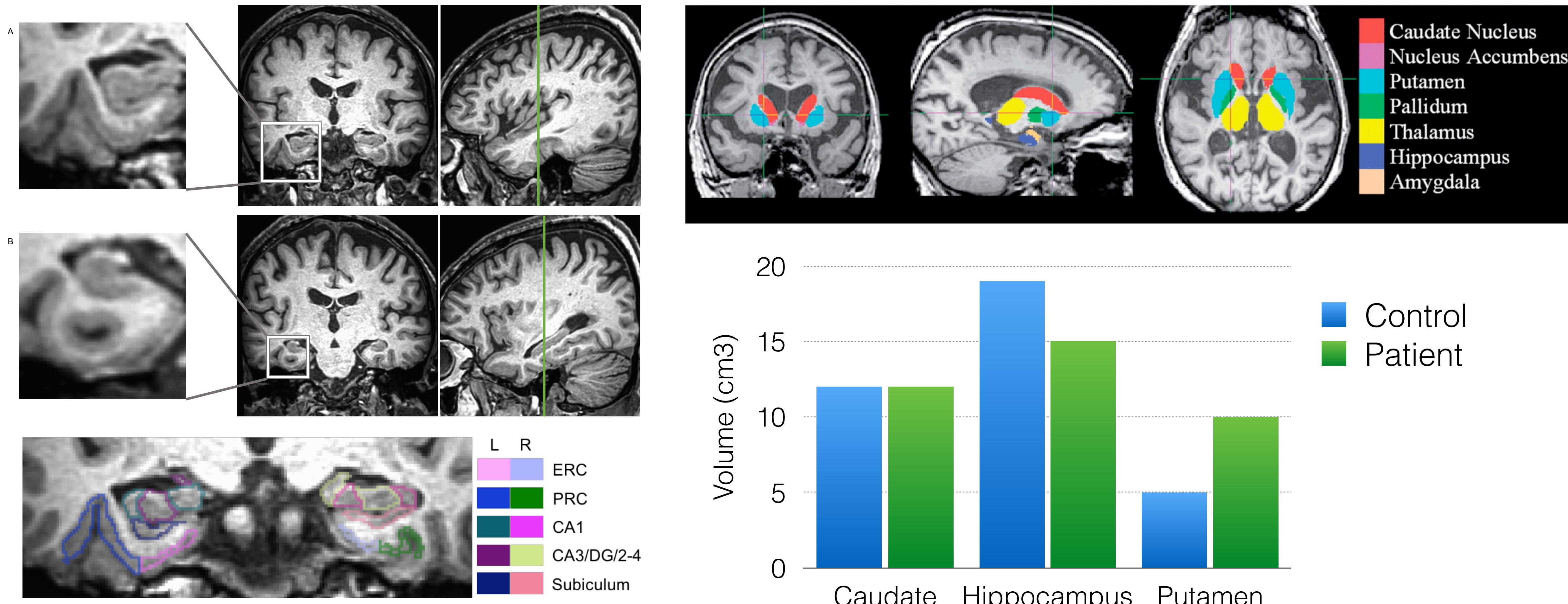
Traumatic brain injury



Periventricular white matter lesions

Structural MRI Study

Volumetric analysis

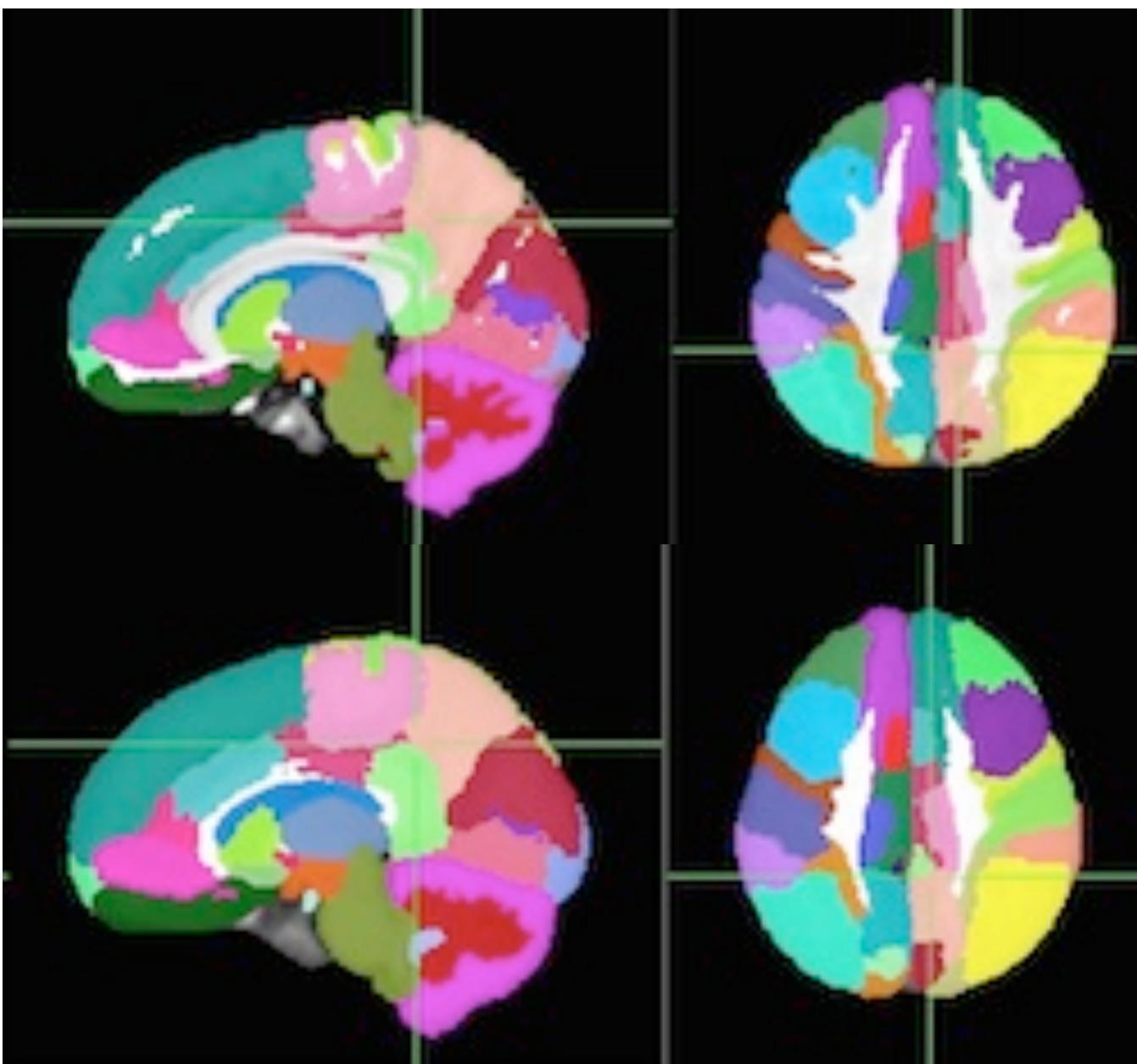
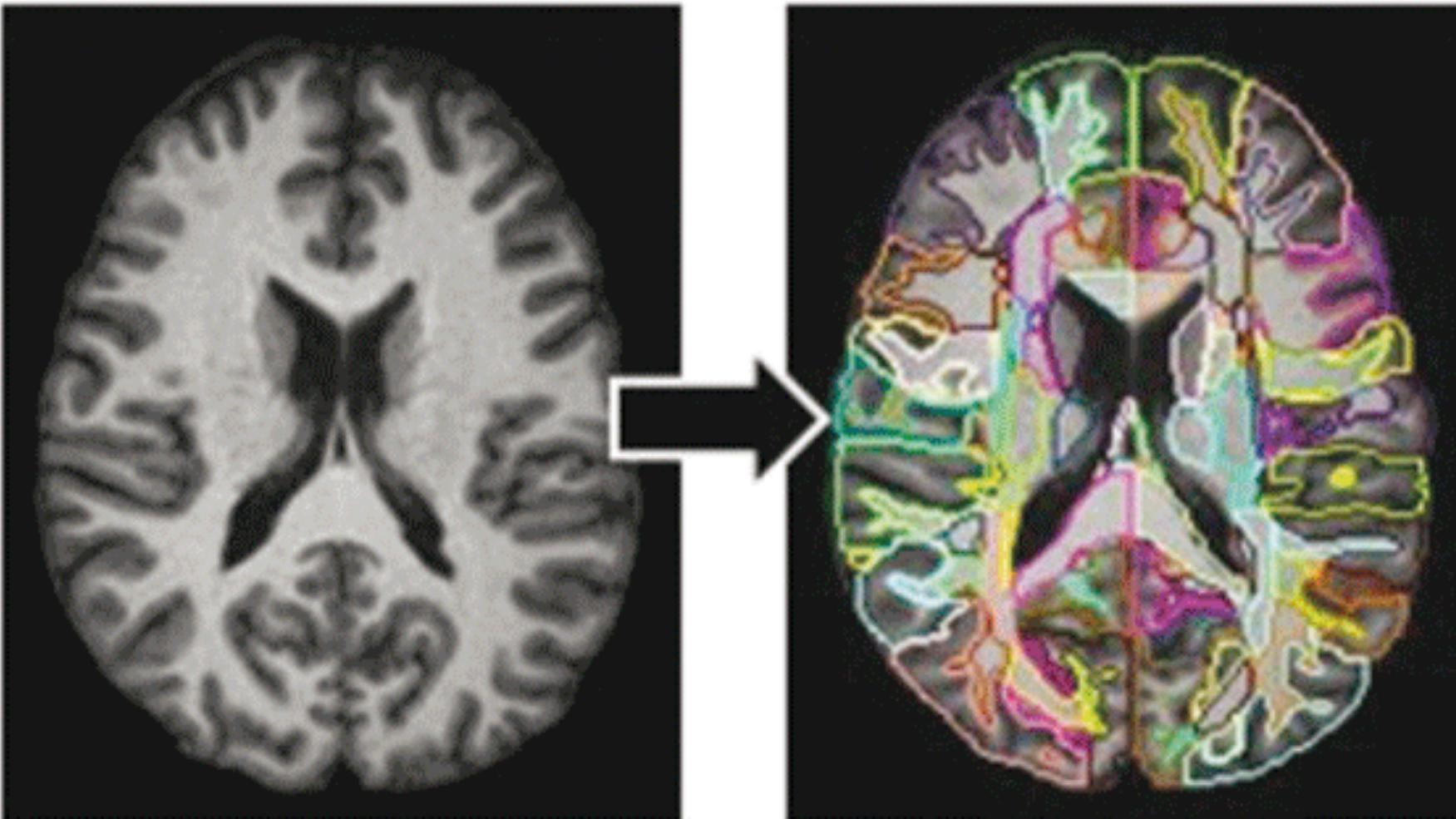


Structural MRI Study

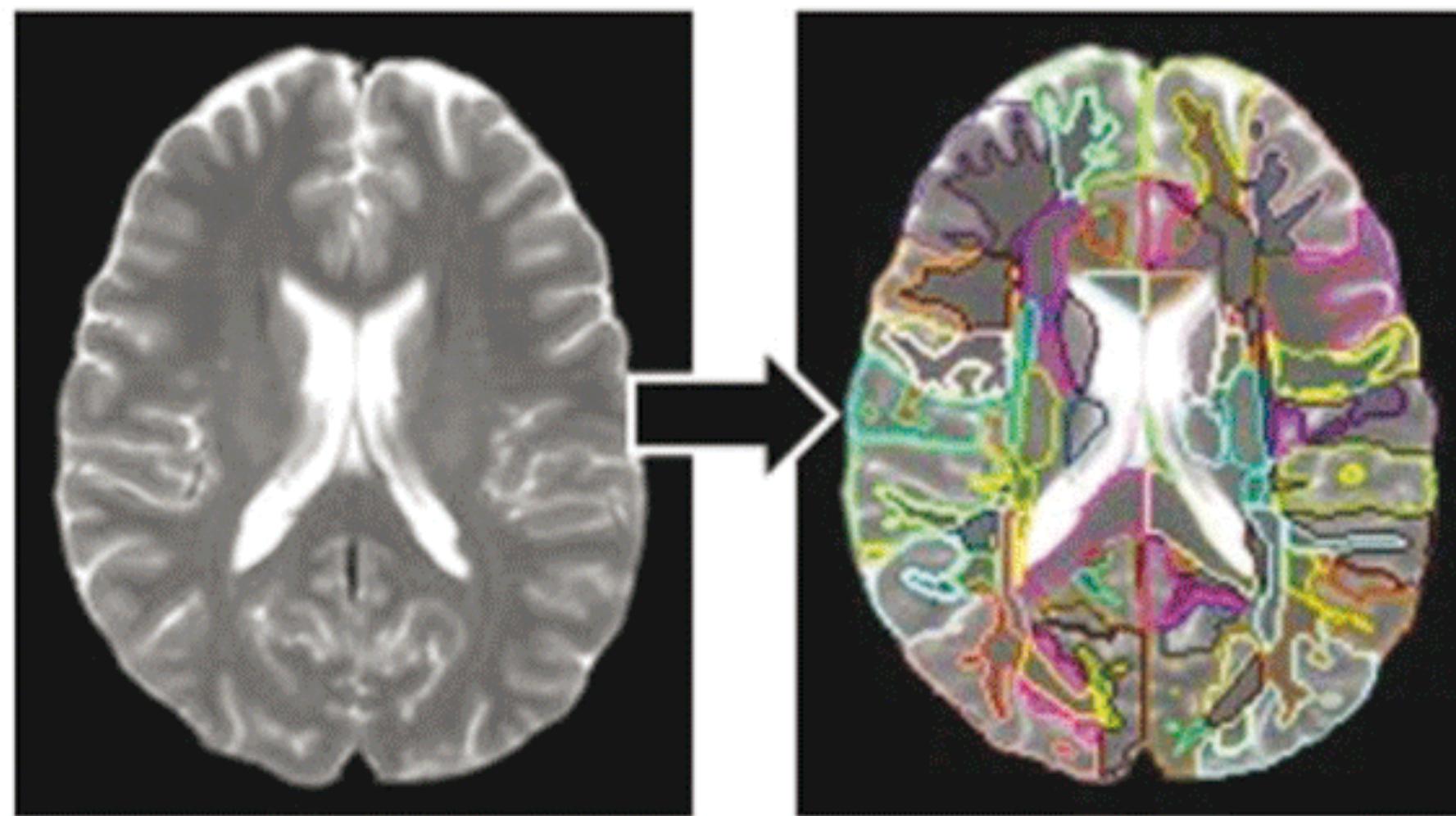
Volumetric analysis



T1-weighted
MRI

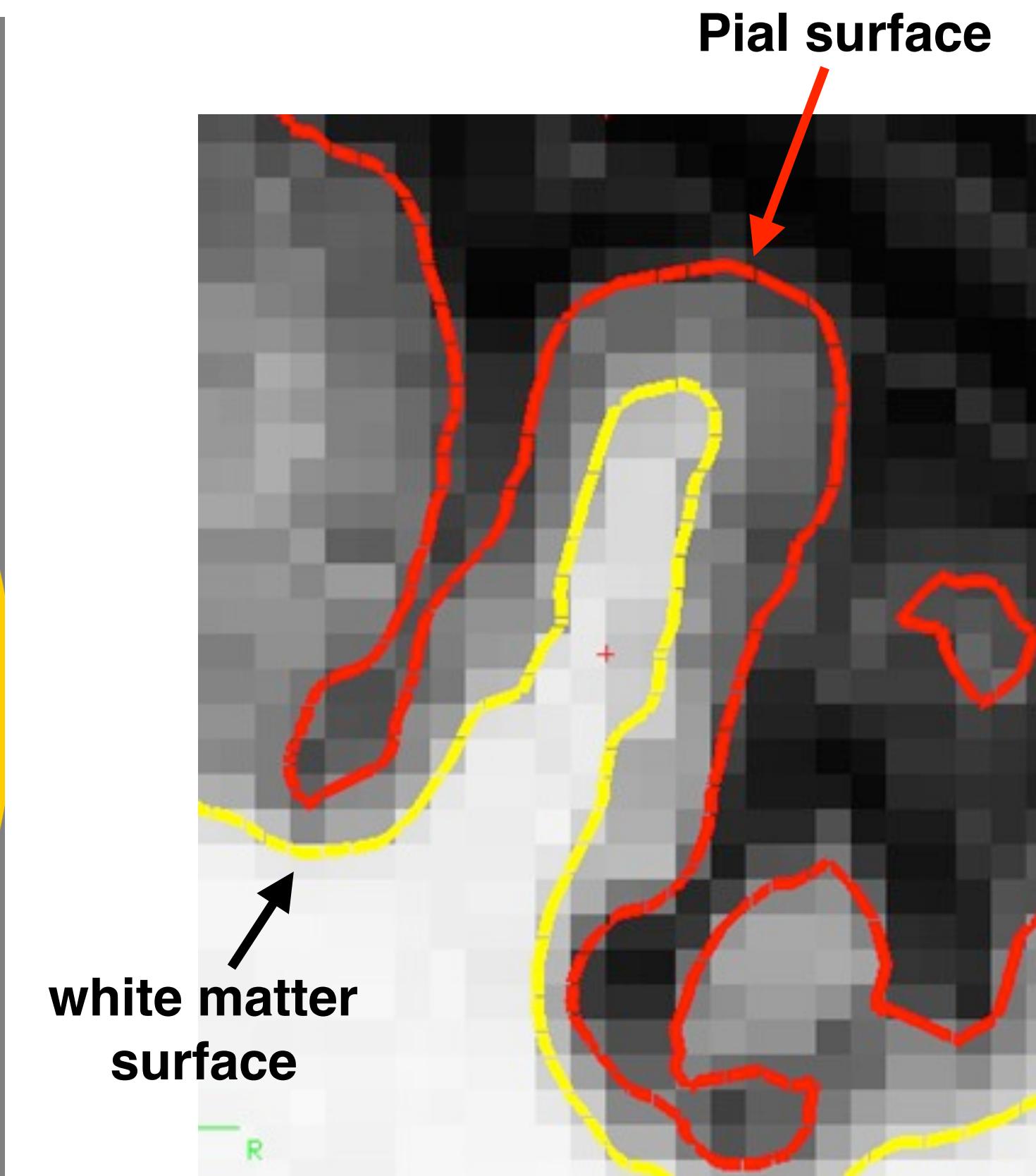
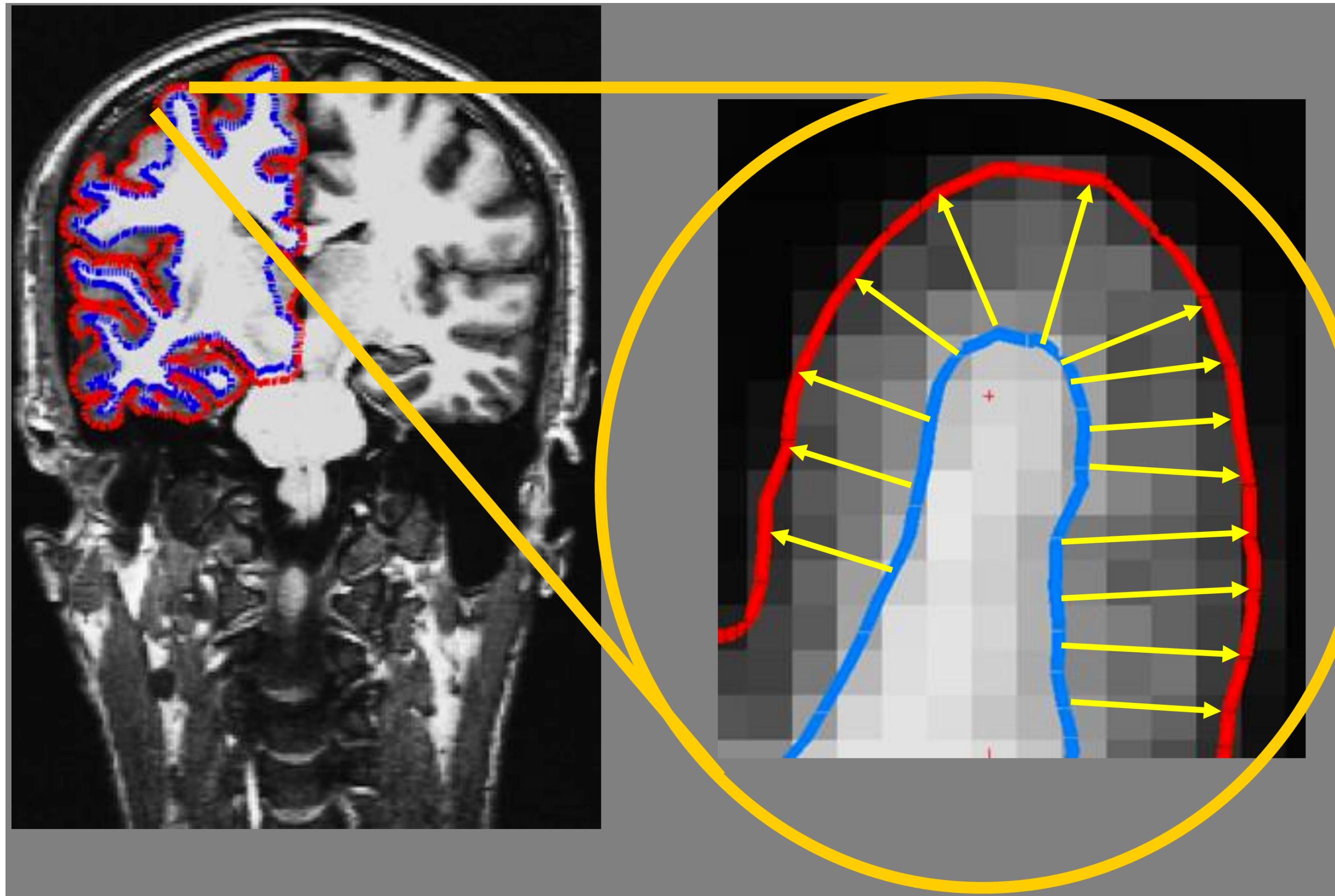


T2-weighted
MRI



Structural MRI Study

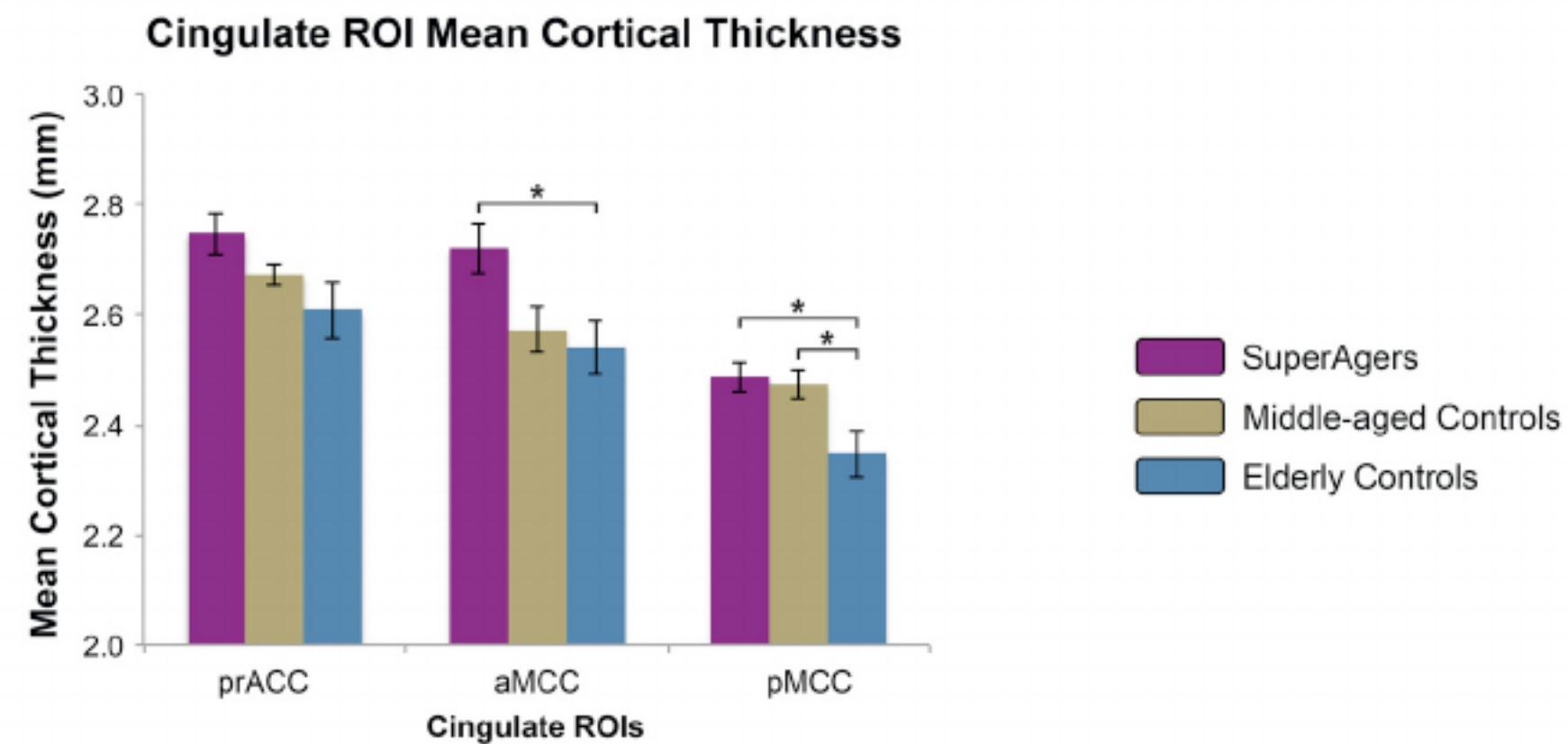
Cortical Thickness



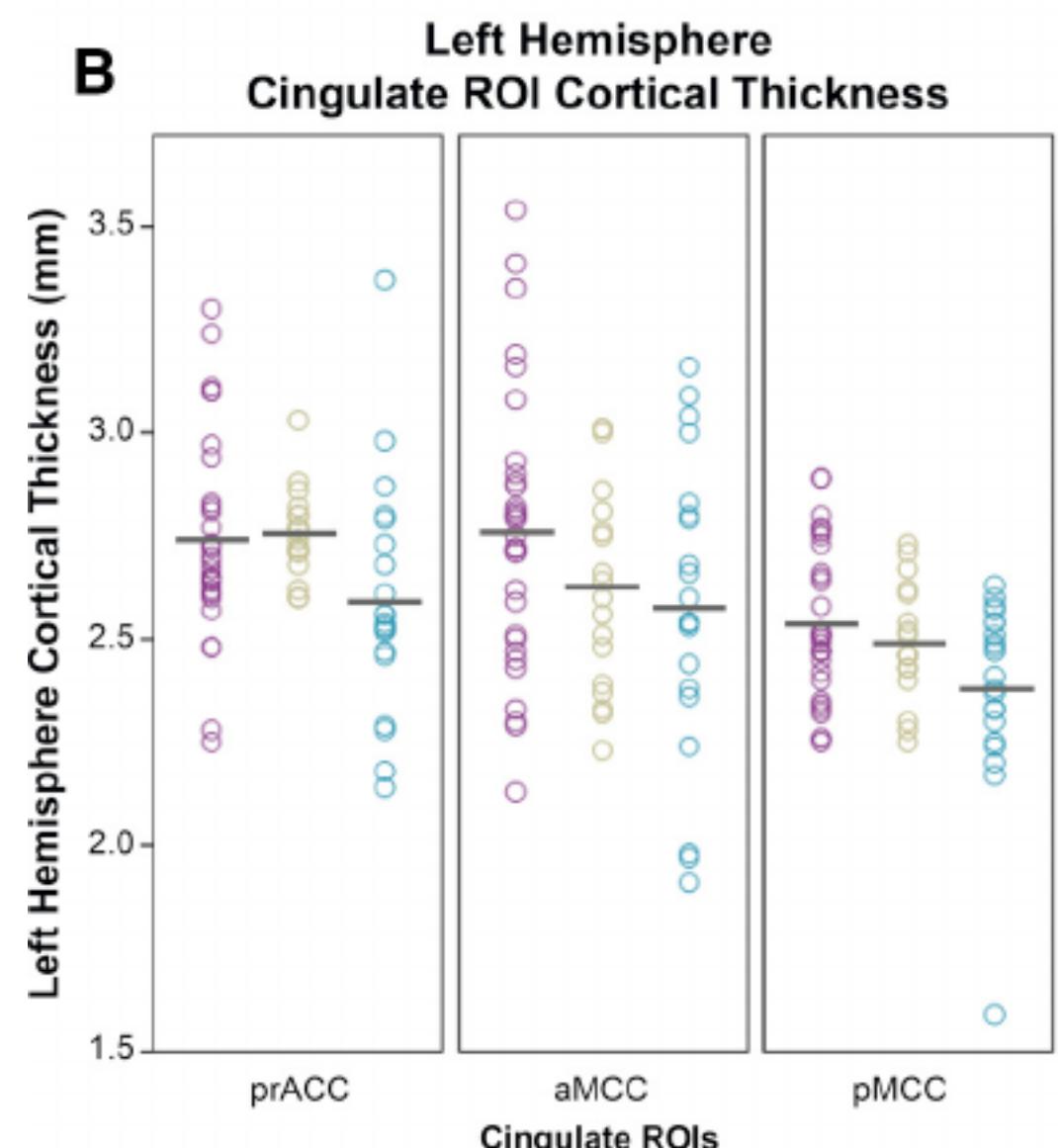
Structural MRI Study

Cortical Thickness

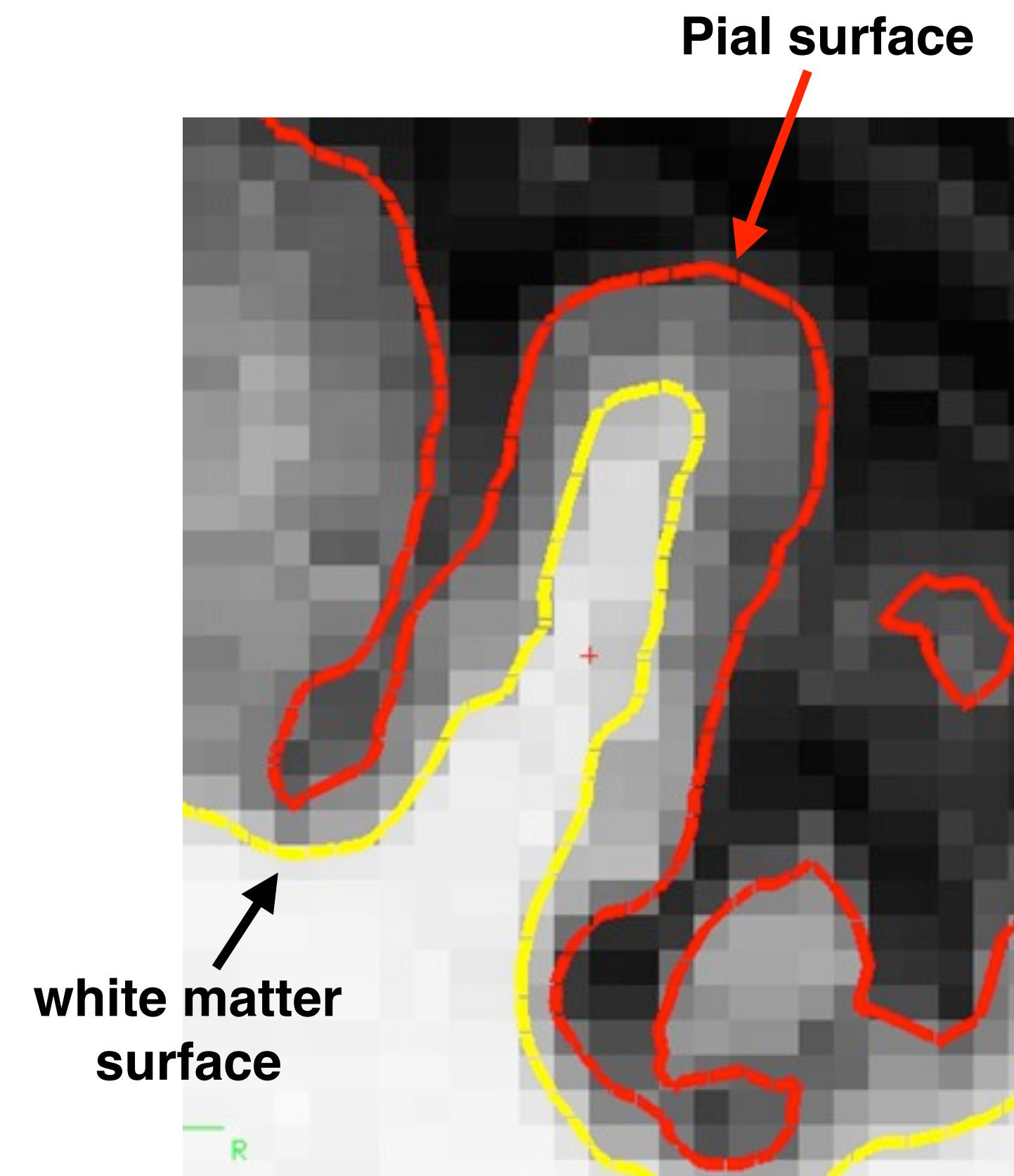
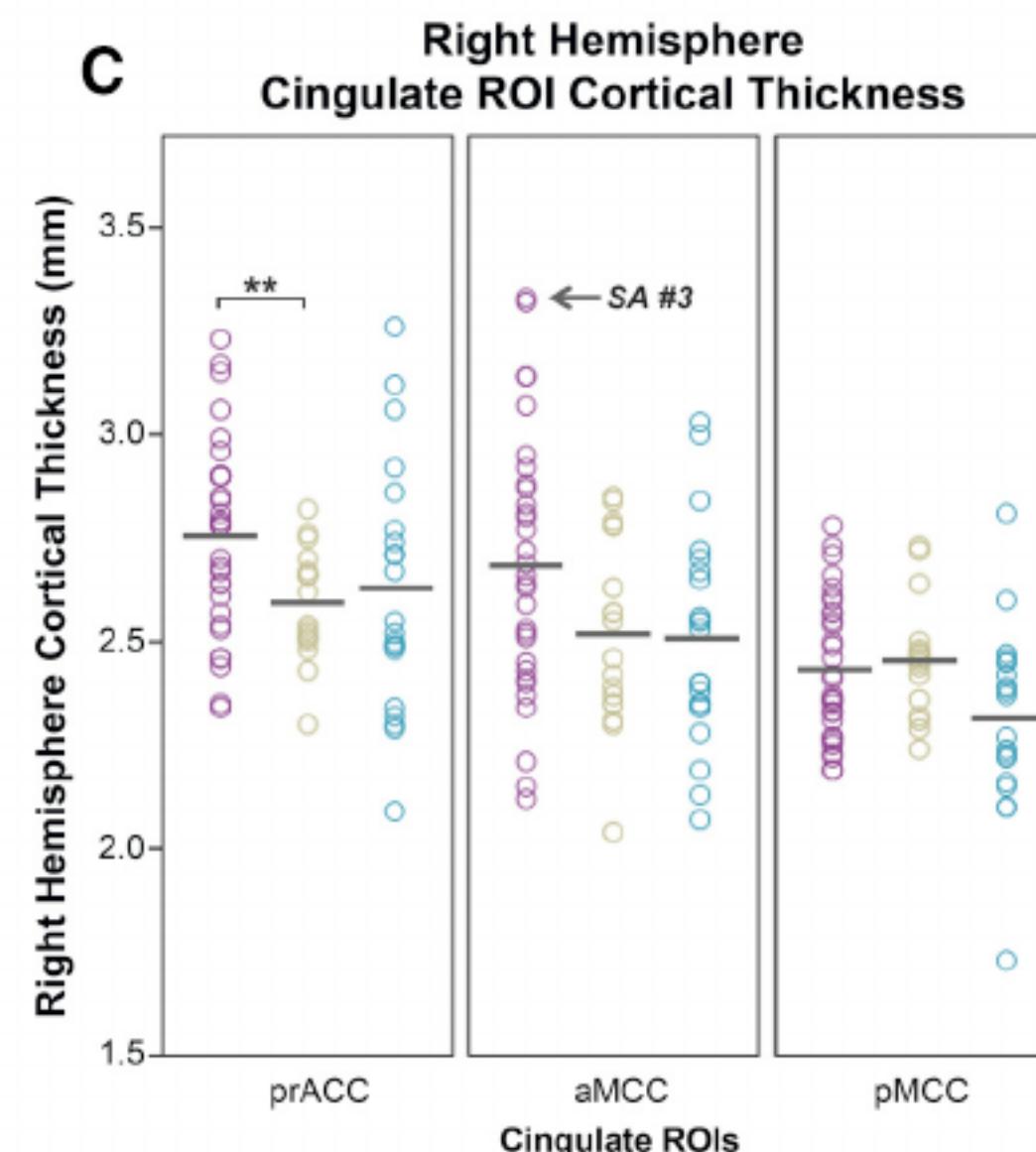
A



B



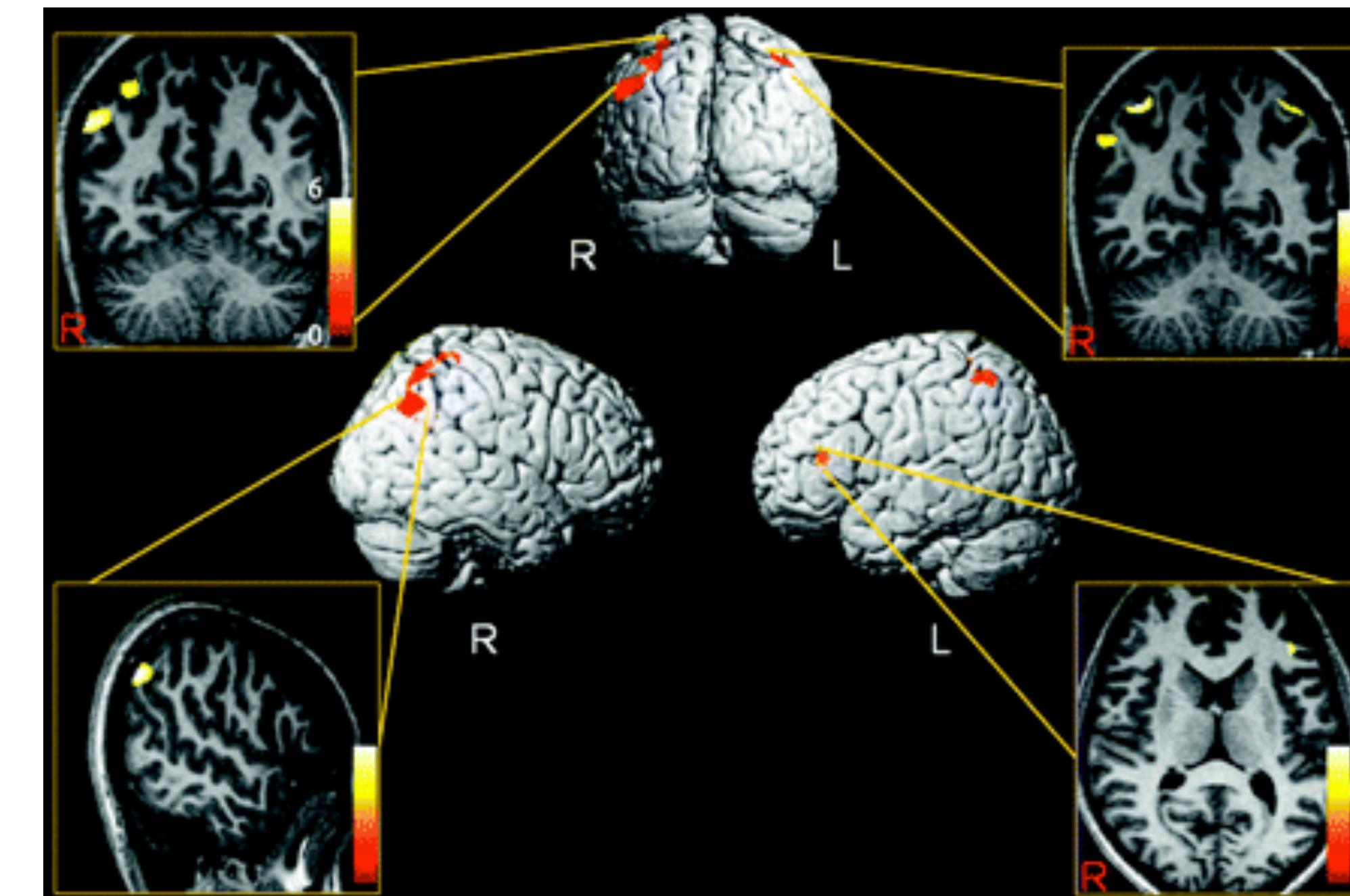
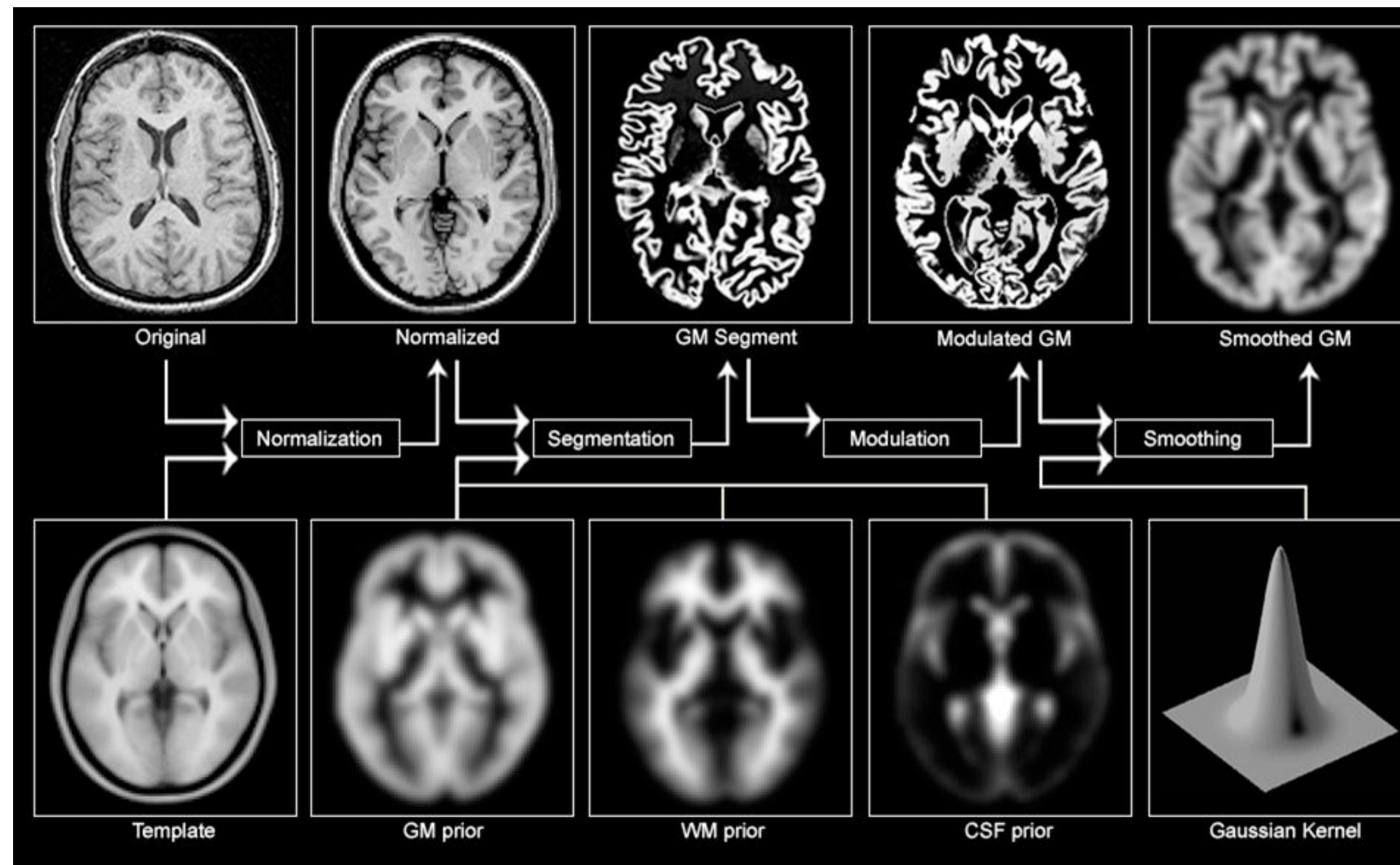
C



Structural MRI Study

Voxel Based Morphometry

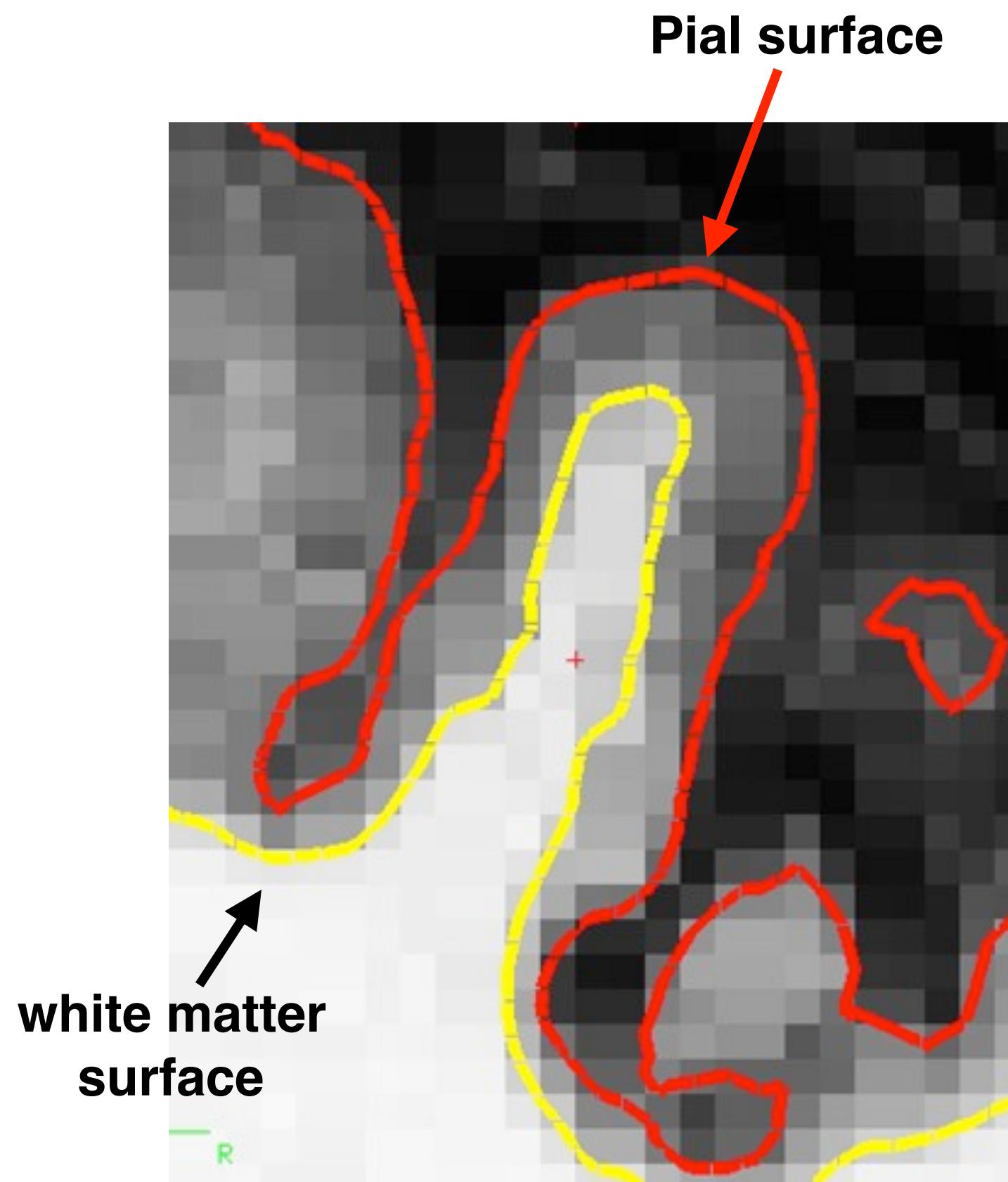
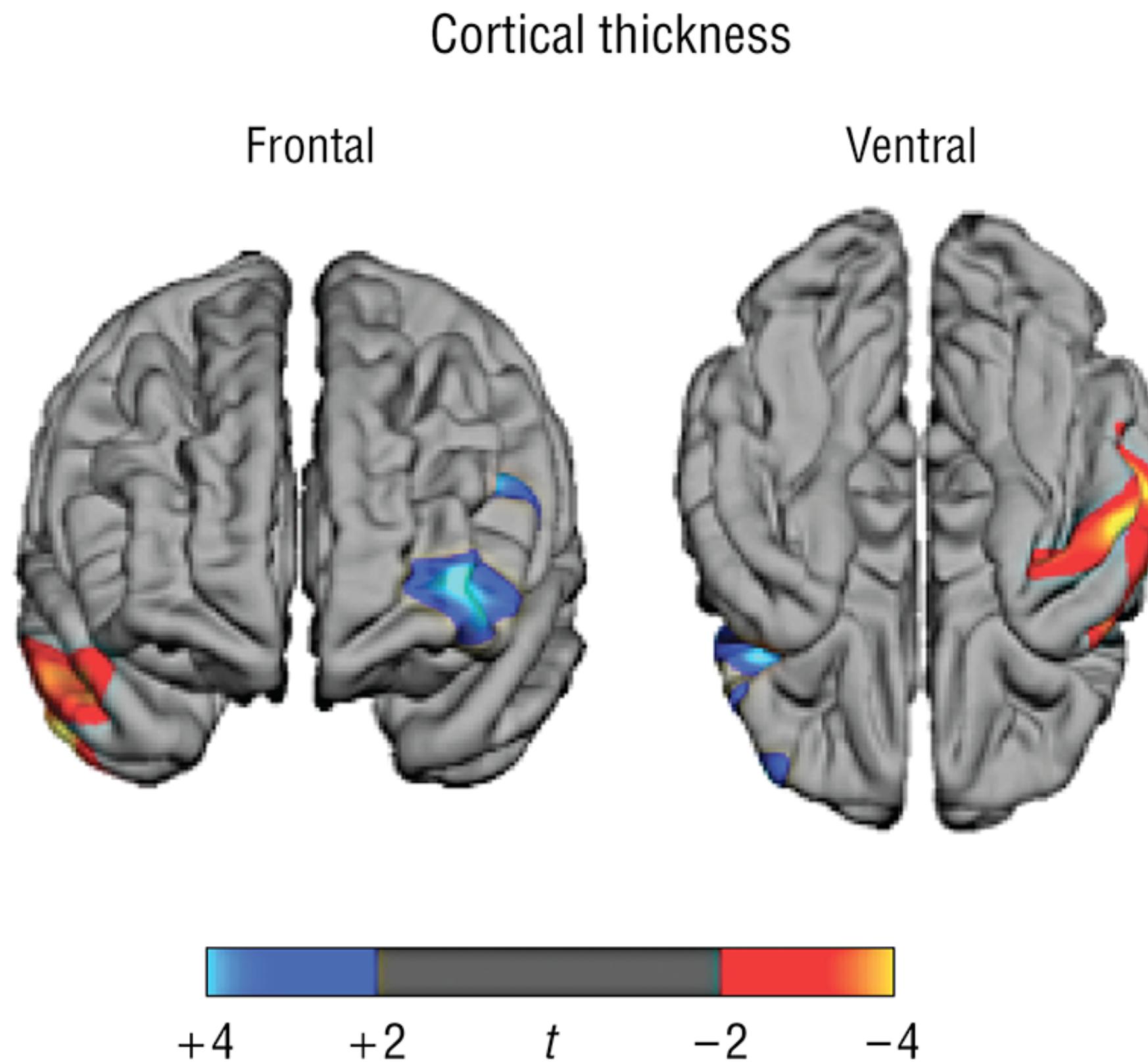
- Whole brain analysis method to compare grey and white matter density between groups of subjects



Structural MRI Study

Cortical Thickness

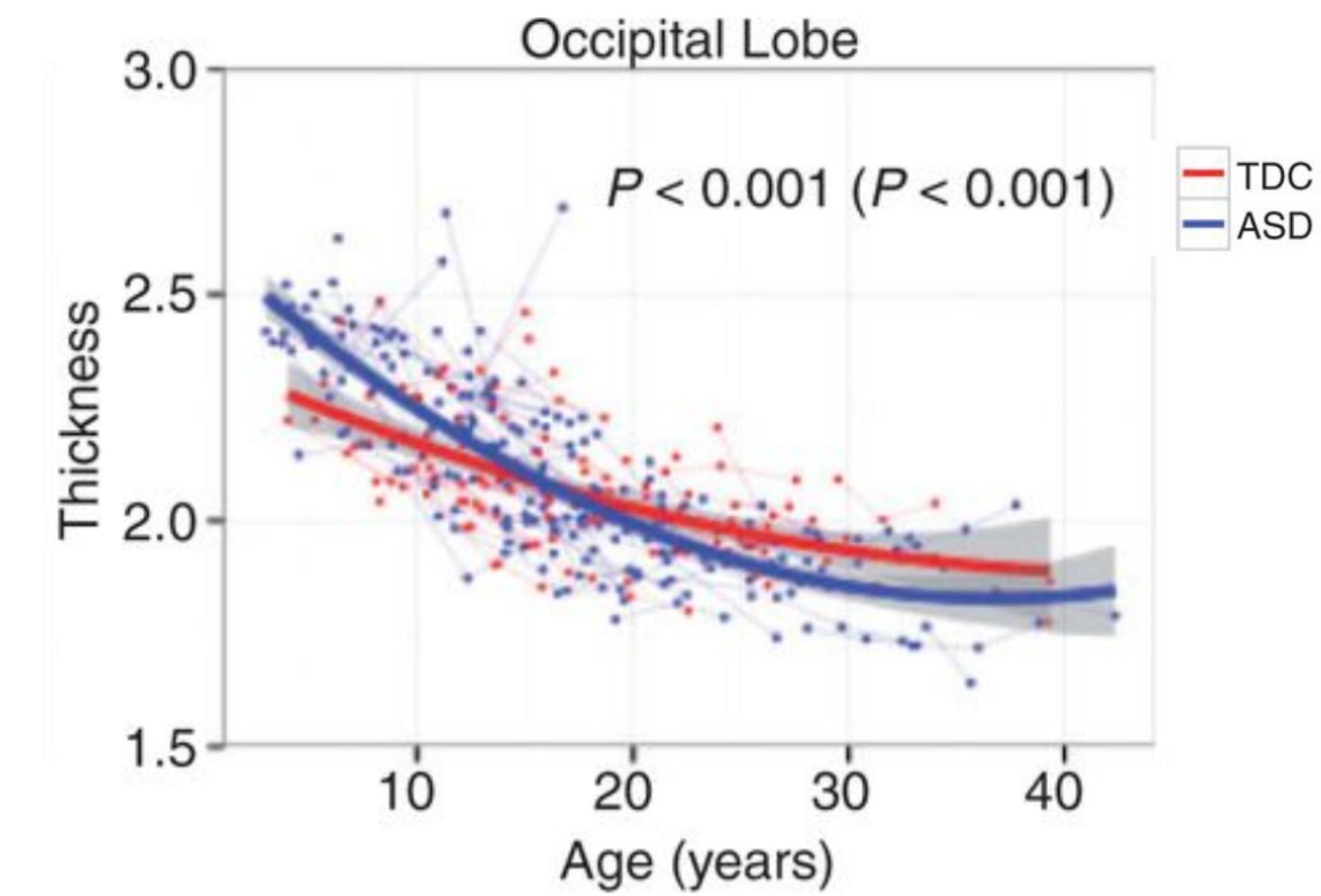
- Whole brain analysis method to compare location of cortical thickness differences between groups of subjects



Structural MRI Study

Longitudinal Structural Studies

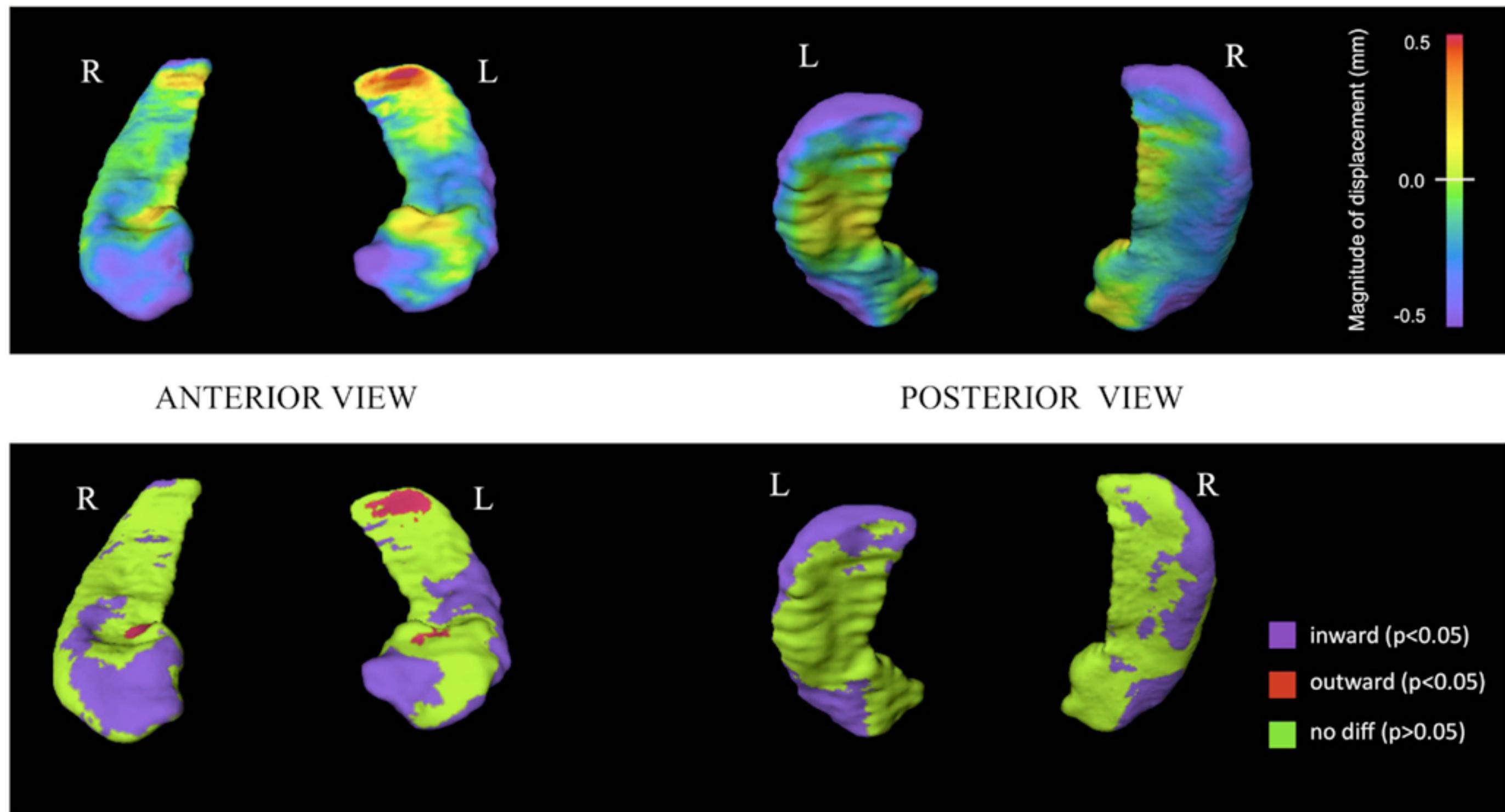
- Longitudinal assessment of cortical and subcortical structure volumes
- Longitudinal assessment of cortical thickness
- Longitudinal assessment of tissue class
- Longitudinal assessment of structural atrophy
- Assessment of structural morphology



Structural MRI Study

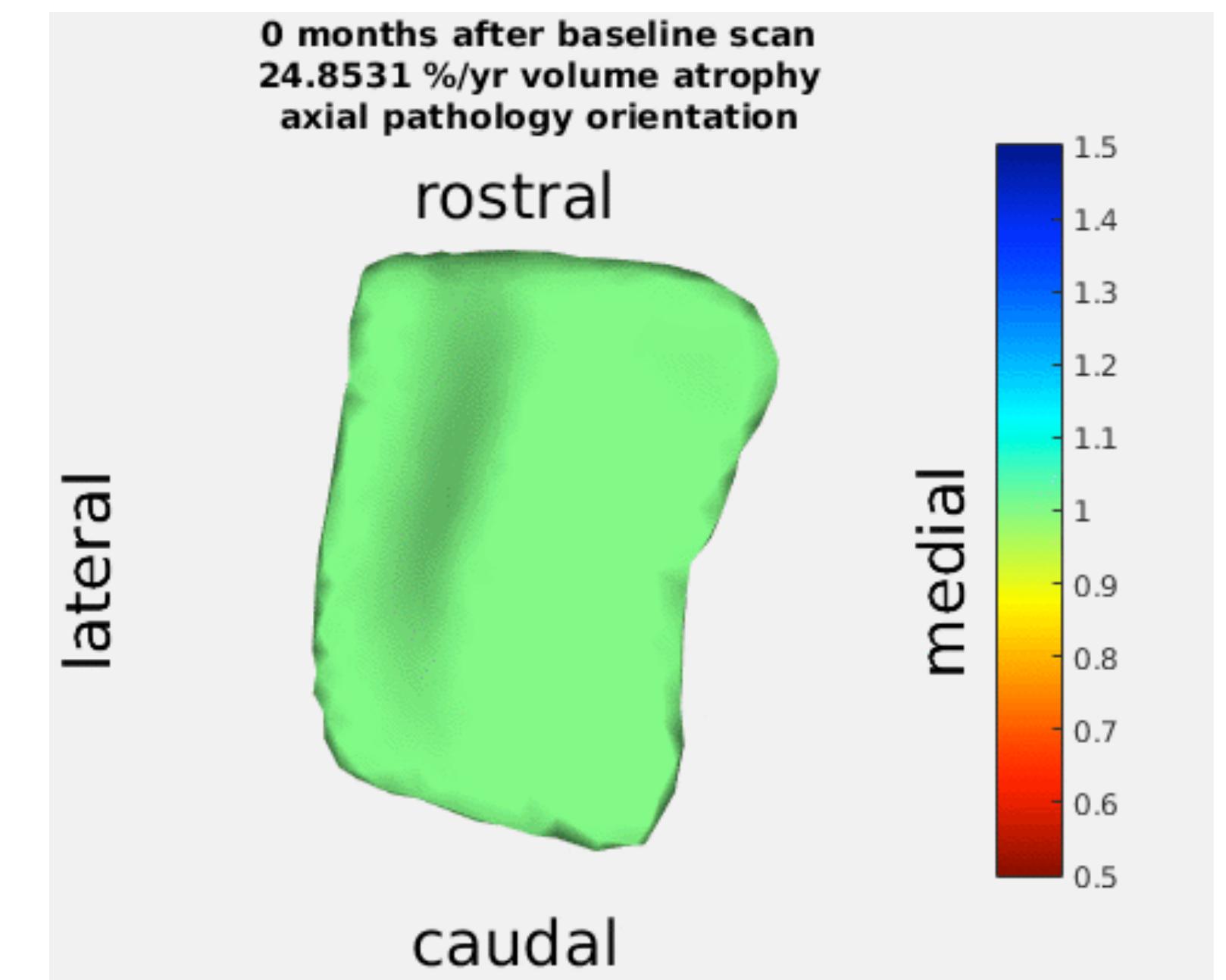
Structural Morphology

Analysis method to compare shape differences between groups of subjects or shape changes over time.



Shape differences between psychotic patients and controls

Mamah, et al., Front Psych, 2012



Shape change of the entorhinal cortex
over time in patients with early
Alzheimer's disease

Structural MRI Study

Behavioral correlates of structural measures

- Qualitative structural analysis
- Volumetric analysis
- Cortical thickness
- Voxel based morphometry
- Longitudinal analysis
- Structural morphology



Behavior:

- Task performance
- Pathologic vulnerability
- Intervention outcome

Structural MRI Study

Behavioral correlates of structural measures

Brain Structures Differ between Musicians and Non-Musicians

Christian Gaser^{1,2} and Gottfried Schlaug¹

¹Department of Neurology, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts 02215, and ²Department of Psychiatry, University of Jena, D-07743 Jena, Germany

The Journal of Neuroscience, October 8, 2003 • 23(27):9240–9245

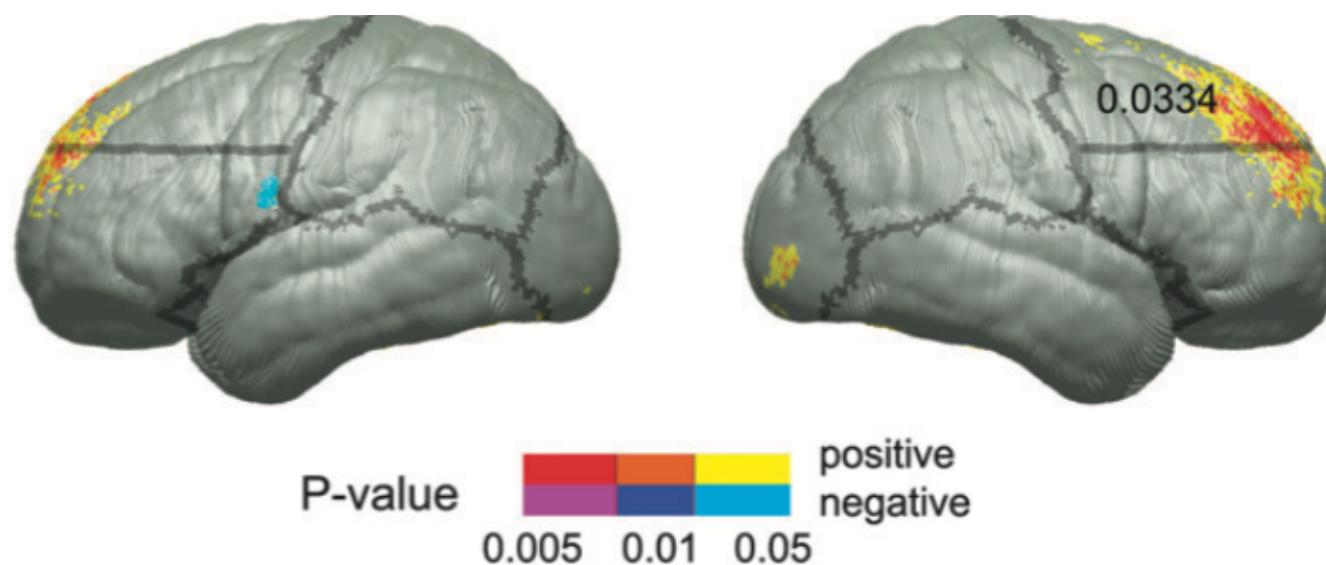
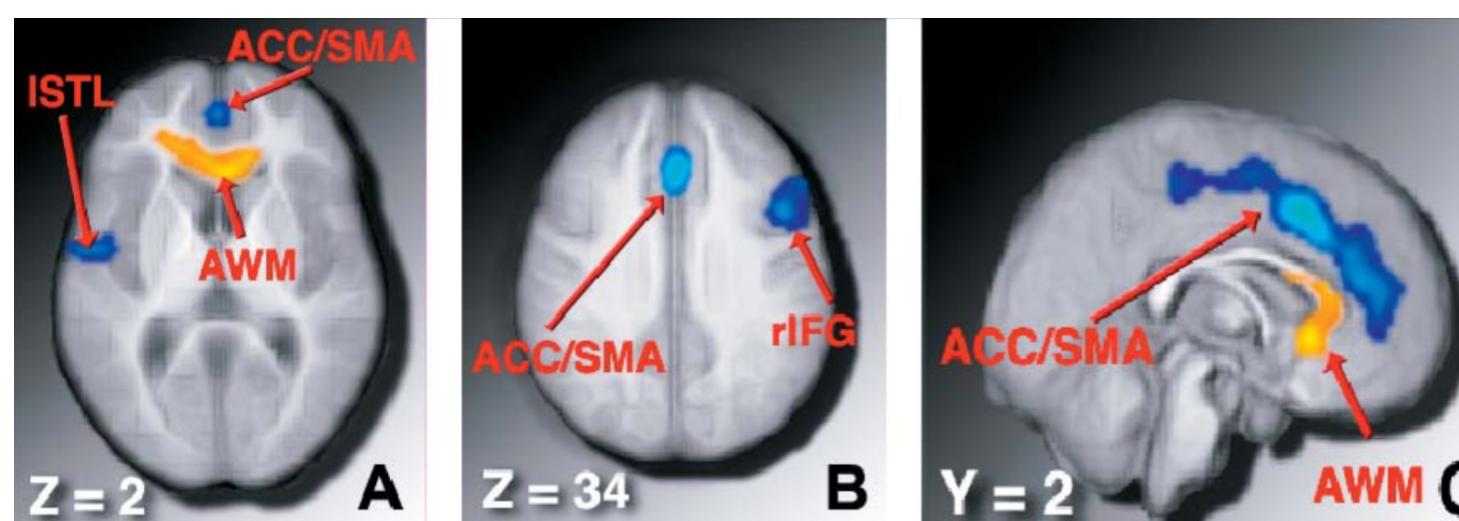
Cerebral Cortex January 2008;18:136-144
doi:10.1093/cercor/bhm039
Advance Access publication April 18, 2007

Abnormal Cortical Thickness and Brain-Behavior Correlation Patterns in Individuals with Heavy Prenatal Alcohol Exposure

Aerobic Exercise Training Increases Brain Volume in Aging Humans

Stanley J. Colcombe,¹ Kirk I. Erickson,¹ Paige E. Scalf,¹ Jenny S. Kim,¹ Ruchika Prakash,¹ Edward McAuley,² Steriani Elavsky,² David X. Marquez,² Liang Hu,² and Arthur F. Kramer¹

Journal of Gerontology: MEDICAL SCIENCES
2006, Vol. 61A, No. 11, 1166–1170



Structural MRI Study

Limitations of structural MRI Studies

Many reasons for structural brain changes:

- Development
- Atrophy
- Neurodegeneration
- Exercise
- Substance use
- Inflammation / edema
- Gliosis