



State-of-Arts

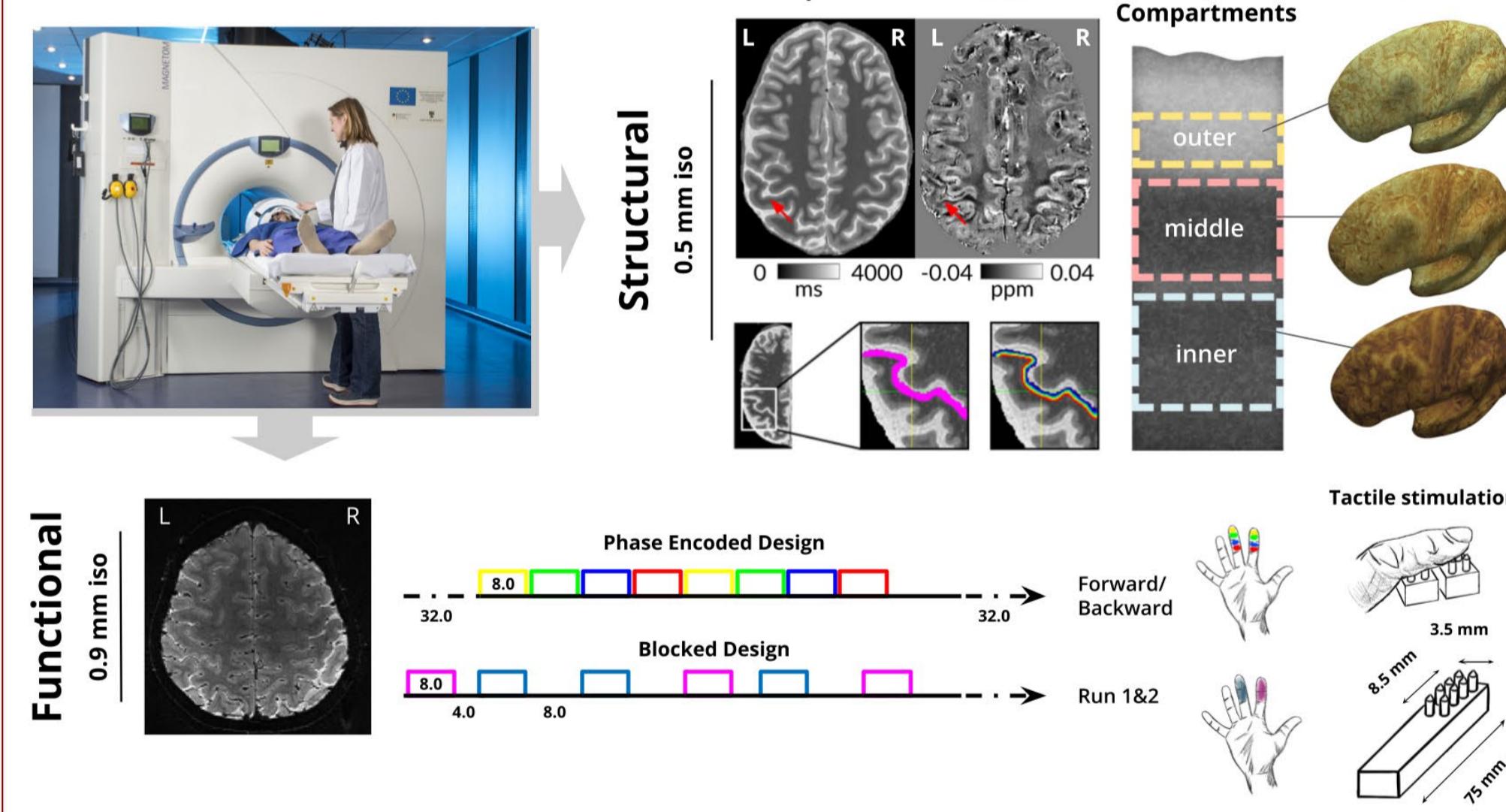
- The segregation of processes into cortical layers is a convergent feature in animal evolution.¹
- It still remains unclear how changes in the cortical layer architecture affect sensory system aging.
- 4 major hypotheses of how structural & functional alterations in the cortical layer architecture characterize cortical dysfunction:
 - Preserved layer hypothesis
 - Altered input channel hypothesis
 - Altered sensory modulation hypothesis
 - Degraded border hypothesis

Methods

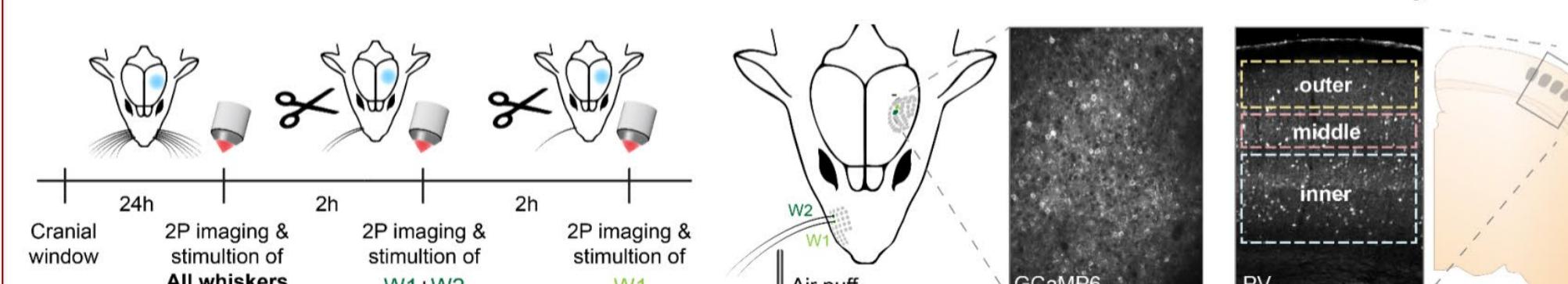
Human 7T MRI

Cohort 1 ● n = 20 Younger adults (21-29 years)
● n = 20 Older adults (63-77 years)

Cohort 2 ● n = 11 Younger adults (25-25 years)
● n = 10 Older adults (60-80 years)

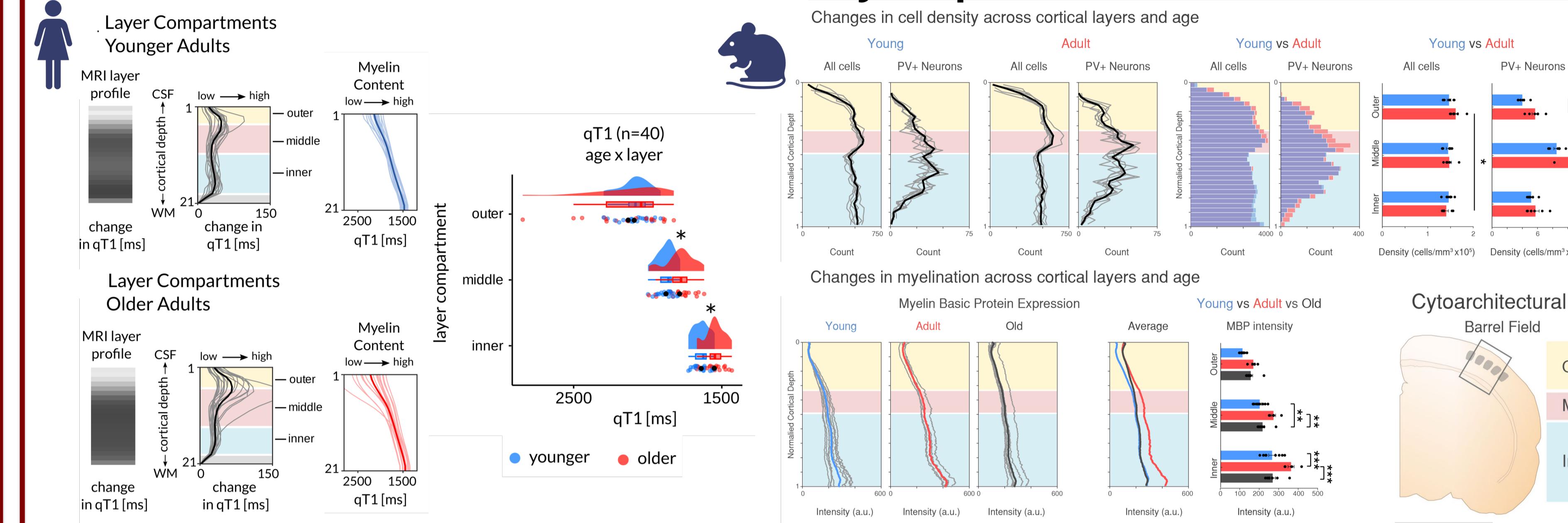

Mouse Calcium Imaging & Cytoarchitecture

● n = 8 Younger mice (4-5 months)
● n = 8 Older mice (14-20 months)

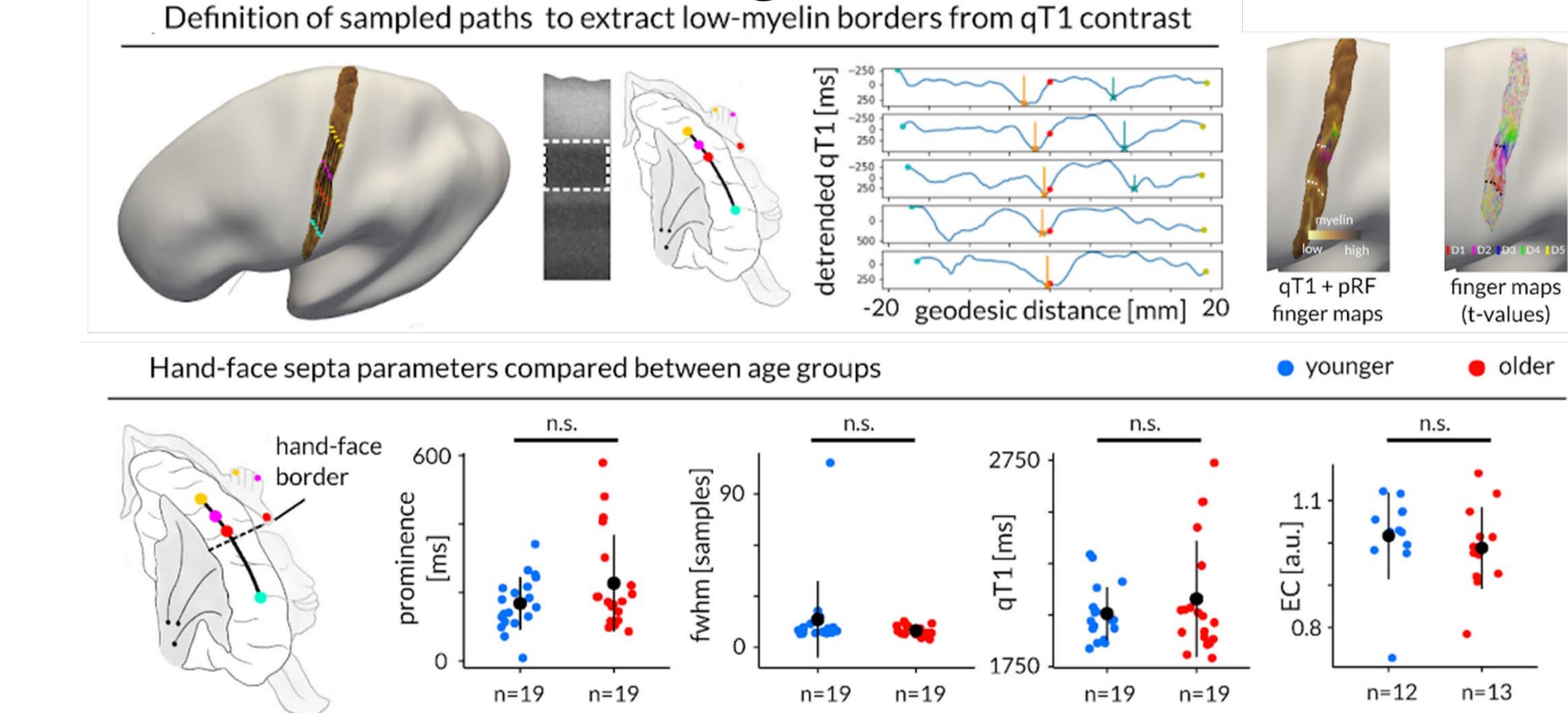
Experimental Timeline

References

- Stacho, M. et al. A cortex-like canonical circuit in the avian forebrain. *Science* 369, eabc5534 (2020).
- Liu, P., Doehter, J., Henschke, J. U., Northall, A., Serian, A., Schwarzkopf, D. S., ... & Kuehn, E. (2023). A layer-specific model of cortical sensory aging. *bioRxiv*, 2023-12.

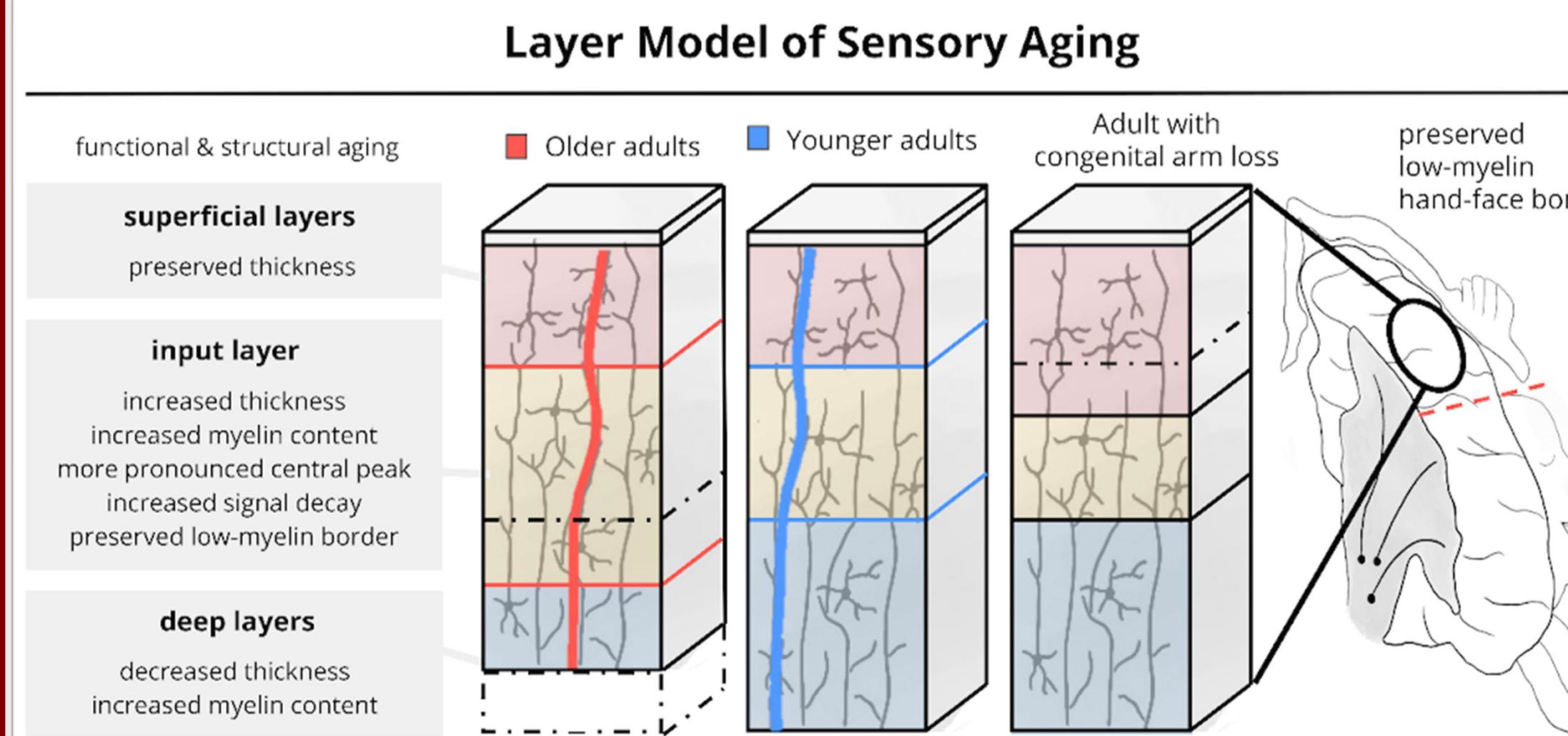
Result: Age-related difference in cortex architecture between younger and older adults is layer-specific



Result: Low-myelin borders remain stable both with age and with congenital arm loss



Conclusion



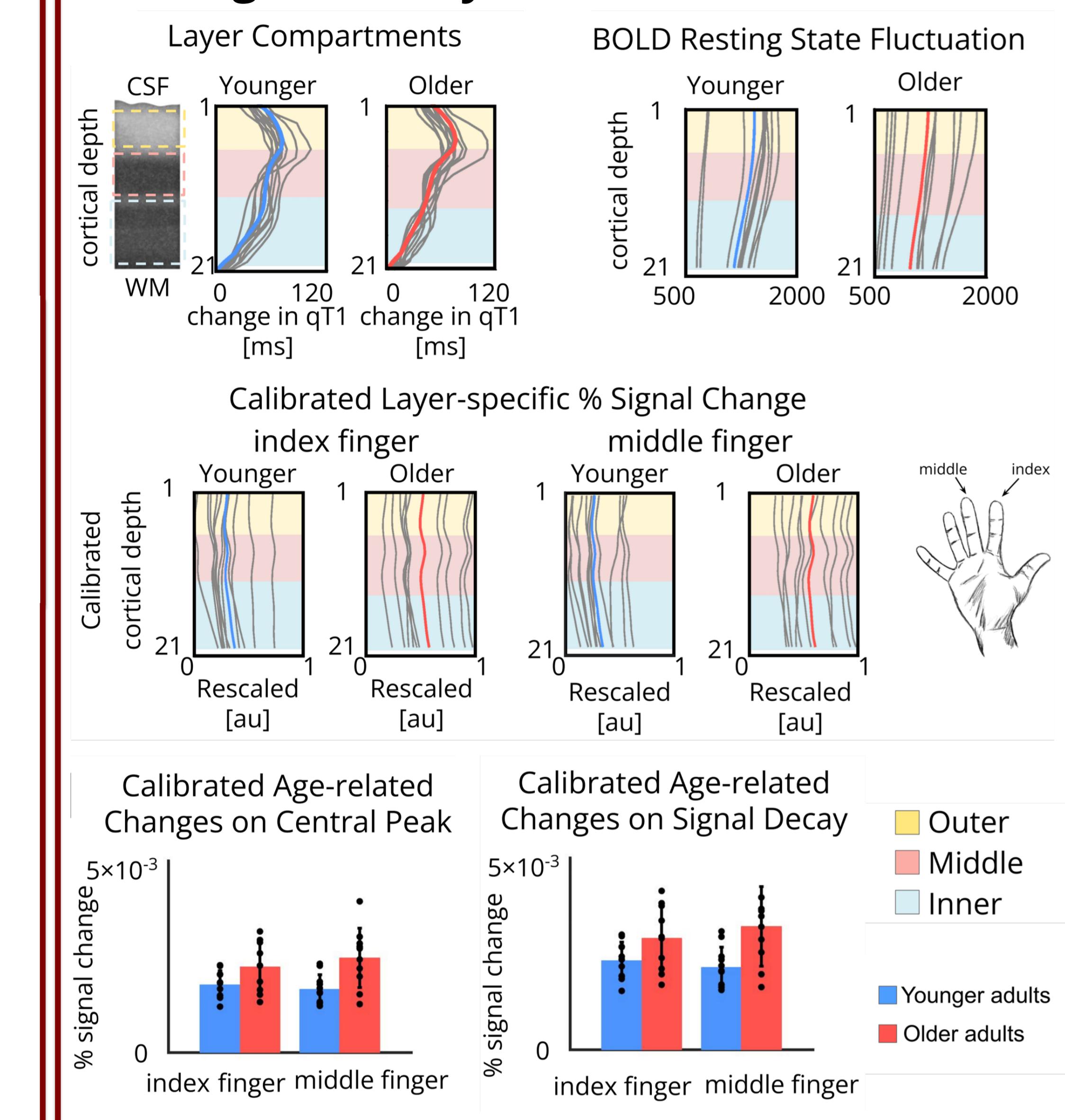
- ✗ 1. Preserved layer hypothesis ✓ Hypothesis accepted
- ✓ 2. Altered input channel hypothesis ✗ Hypothesis rejected
- ✓ 3. Altered sensory modulation hypothesis
- ✗ 4. Degraded border hypothesis

The novel model of layer-specific sensory aging presents with the following critical characteristics:

- a widened sensory input channel, layer-specific cortical thinning
- altered modulatory influences from deep layers on functional representations.

This prompts novel research on layer-specific alterations in the cortex in health and disease.

Result: More pronounced sensory input signals in layer IV in older adults



Result: Greater PV+ cell densities in older mice associated with the lack of reduced inhibition in SI aging

