

# Targeted transcranial magnetic stimulation to improve hippocampal-dependent declarative memory abilities

David E. Warren, Dept. of Neurological Sciences, University of Nebraska Medical Center

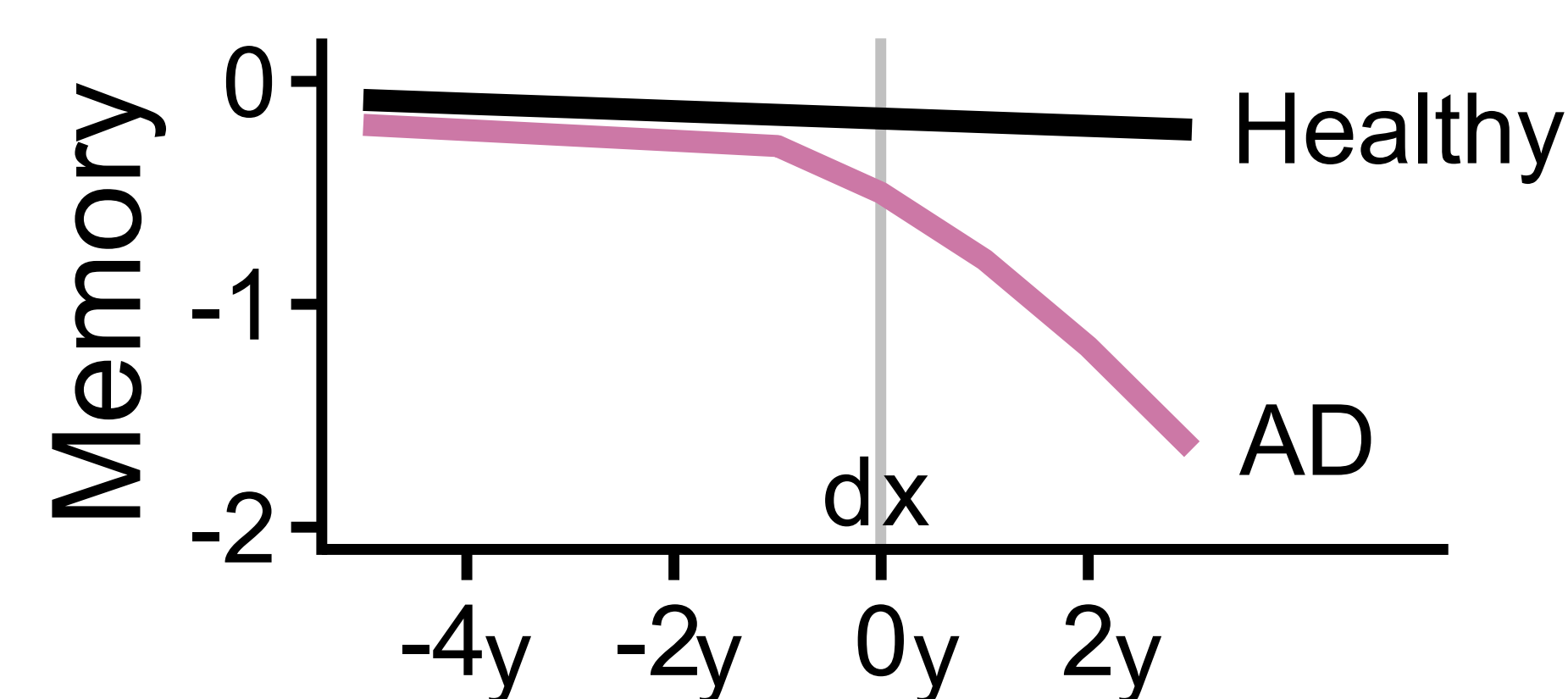
## Purpose

- Test method of non-invasive brain stimulation (**NBS**) — transcranial magnetic stimulation (**TMS**) — for enhancement or remediation of memory abilities

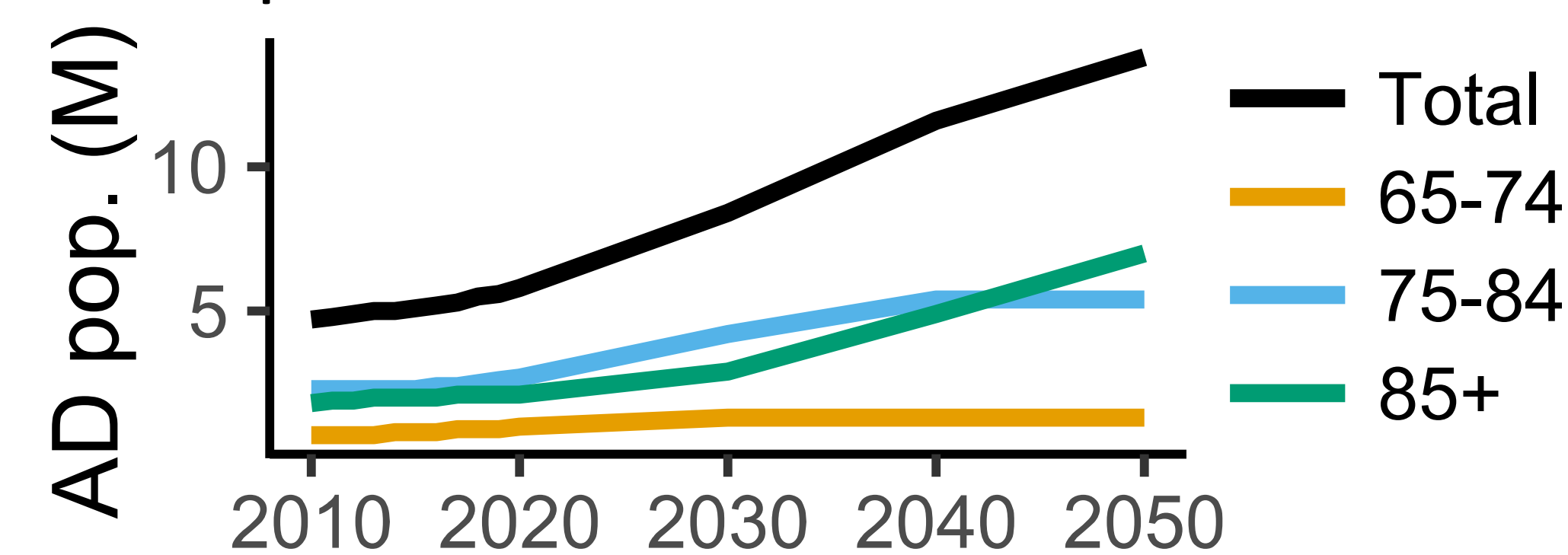
## Background

### Significance

- Memory changes with age (healthy & pathological)

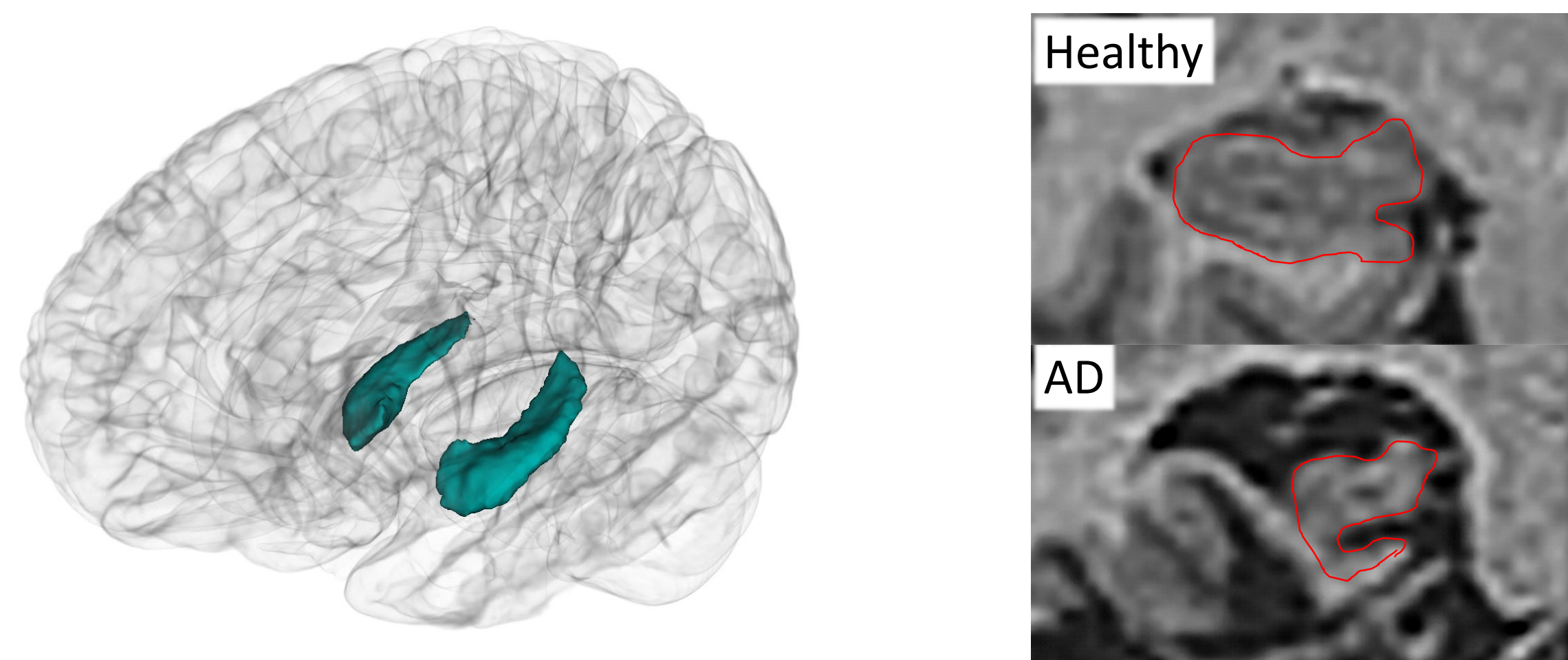


- Alzheimer's disease (AD) degrades memory and may become epidemic in near future

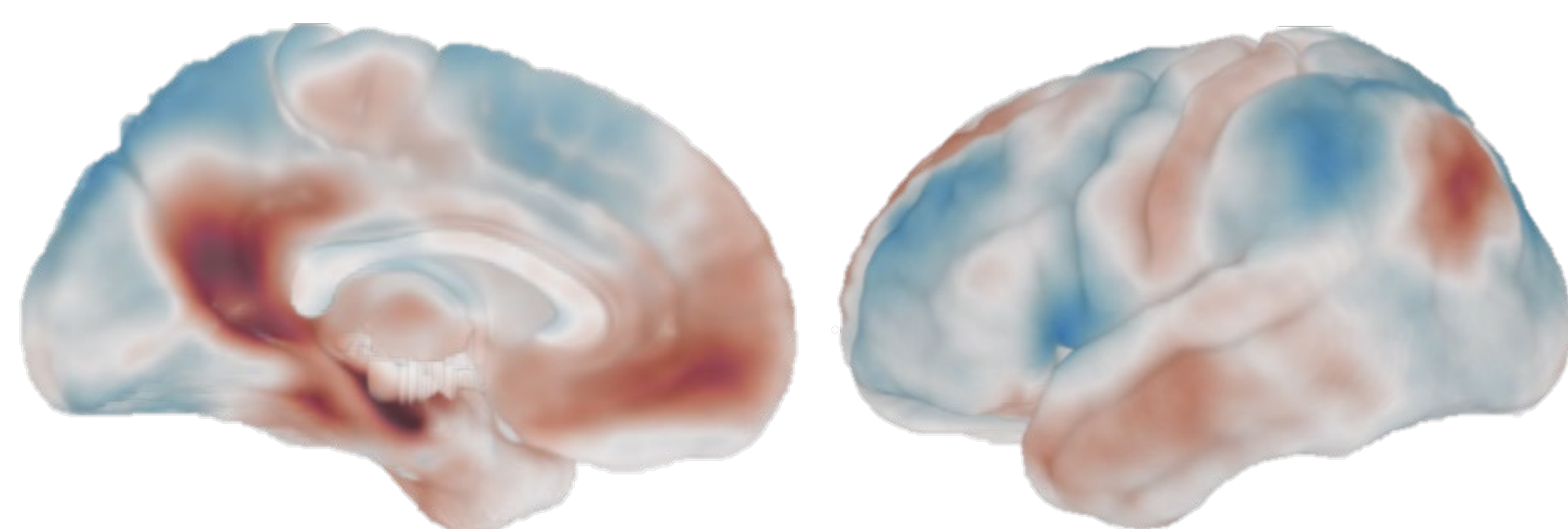


### Brain bases of memory and changes w/AD

- Hippocampus (Hc):** binds memories together



- Memory network:** brain regions co-active with Hc



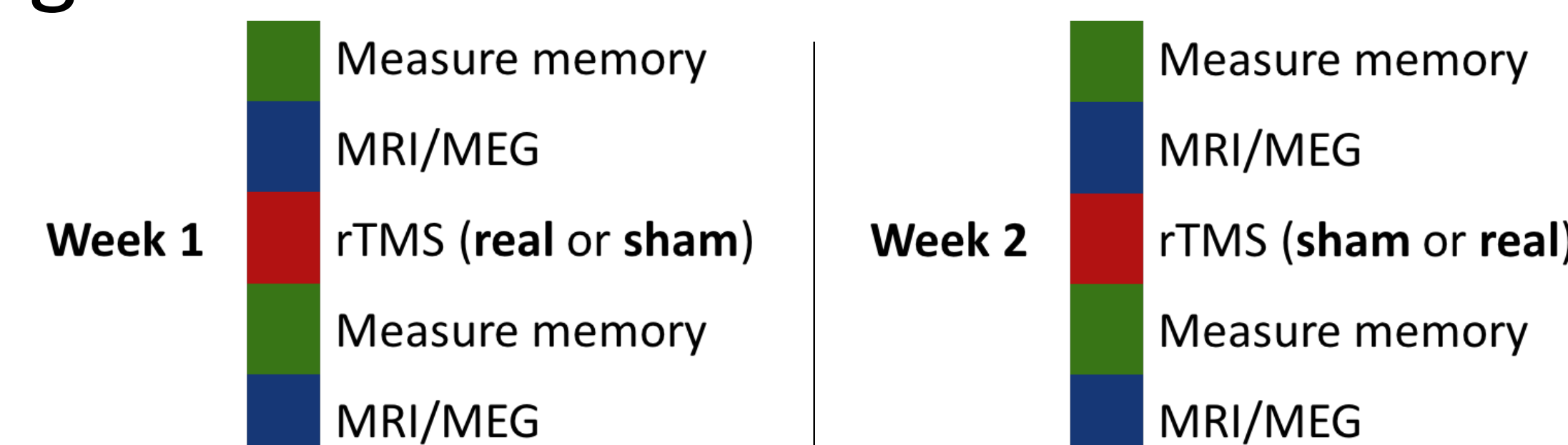
## Project Aims

Test whether **TMS** can improve or remediate memory abilities in adults (young, older, & aMCI)

- 1) Measure changes in declarative memory performance after treatment with targeted TMS
- 2) Measure modulation of functional brain networks after treatment with targeted TMS

## Approach

### Design



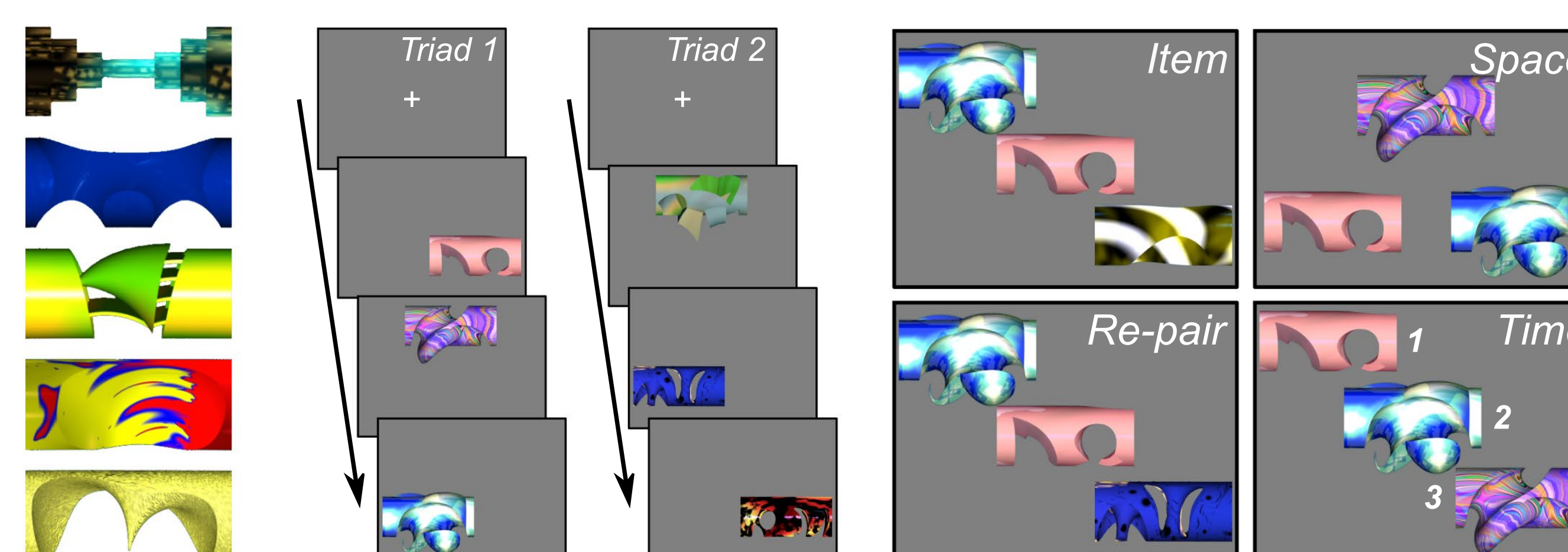
### Neurostimulation: retune target brain networks

- TMS: non-invasive stimulation of target brain region



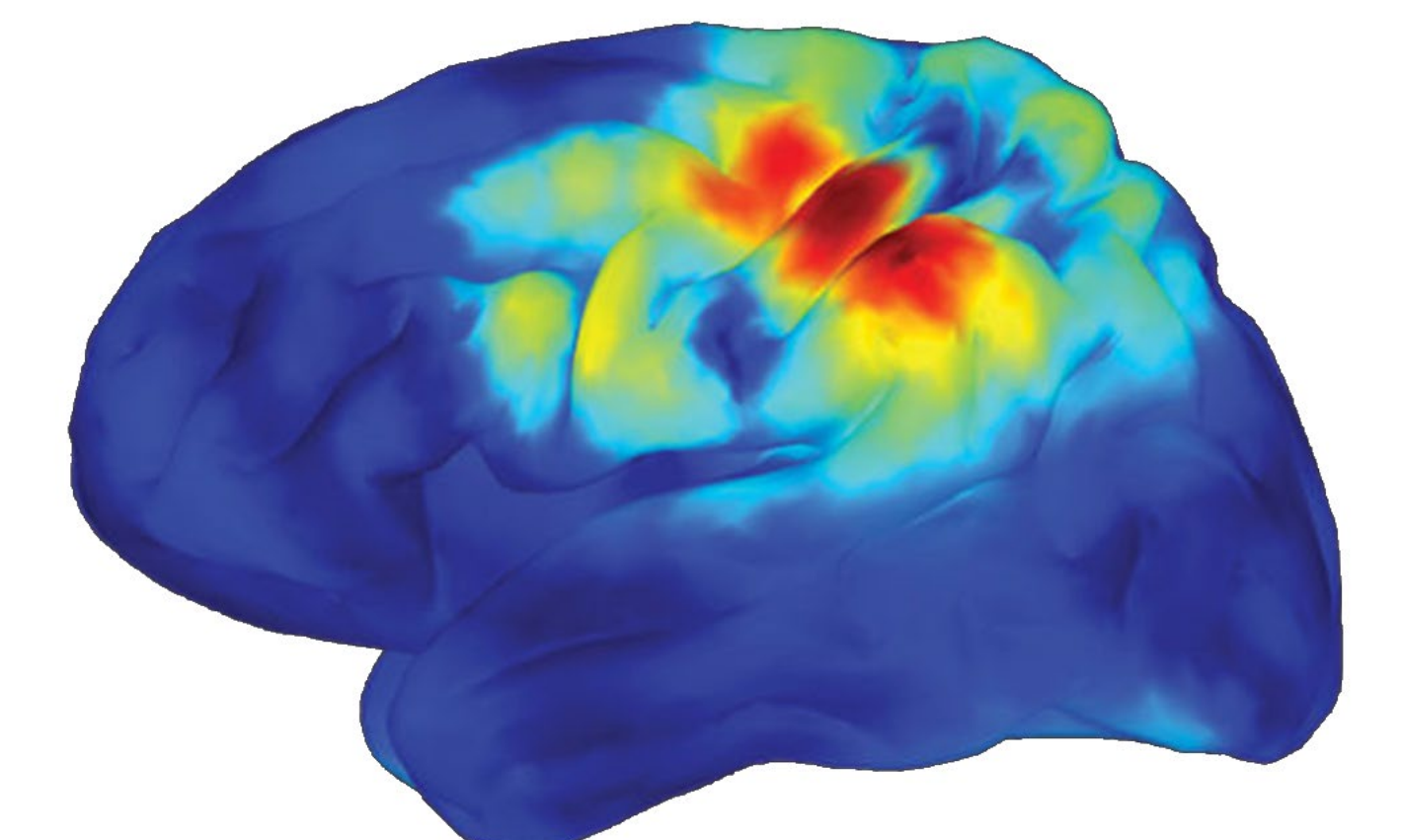
### Neuropsychology: measure cognitive benefits

- Standardized instruments to assess cognitive function (MoCA, MMSE, etc..)
- Laboratory tasks to assess cognitive abilities

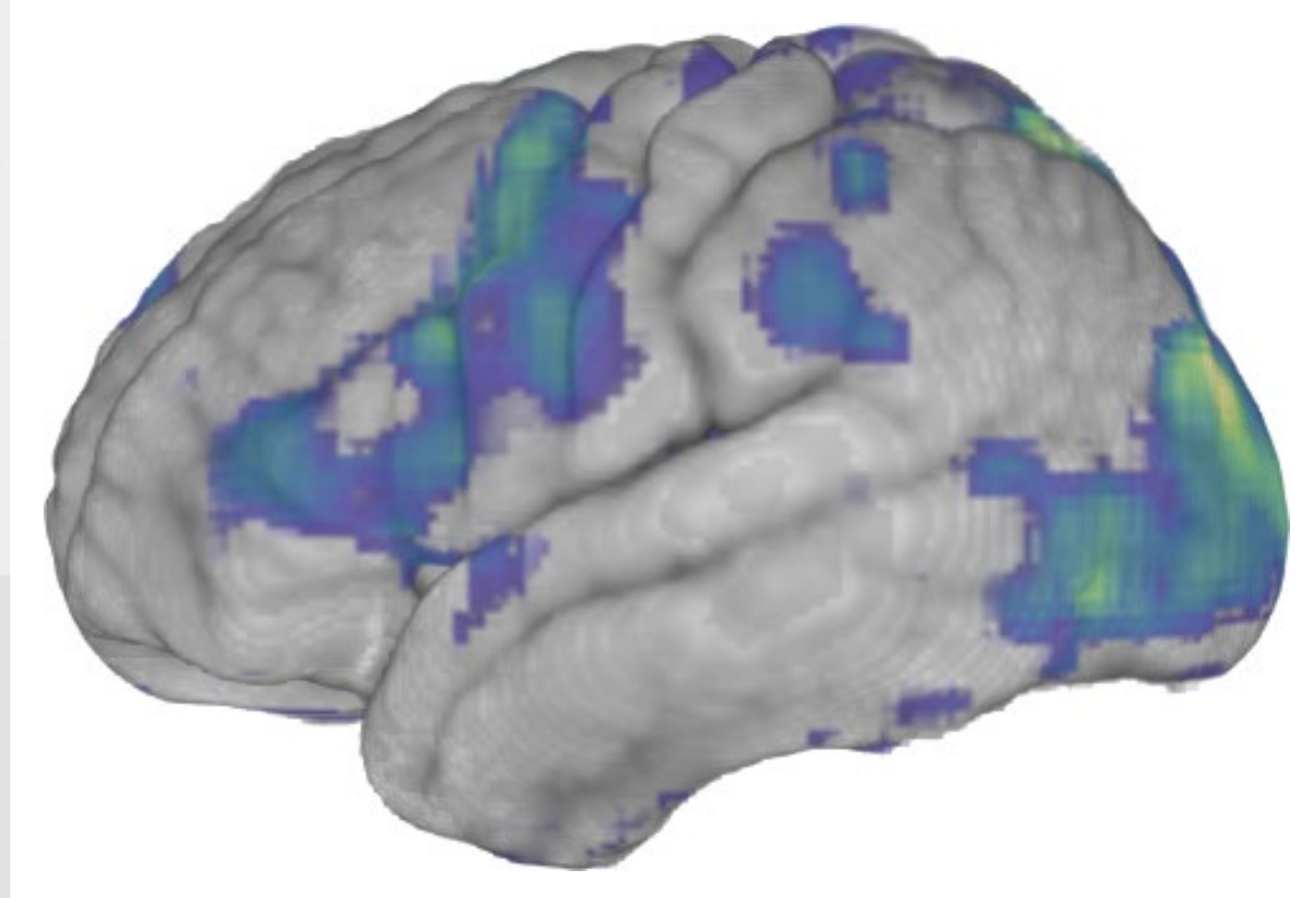


### Neuroimaging: measure brain structure/function

- MEG** measures magnetic fields from brain activity



- MRI** measures blood flow related to brain activity



## Next Steps & Deliverables

### Current status

- UNMC IRB and ClinicalTrials.gov approved
- TMS, MRI, and neuropsych. protocols finalized
- Collecting preliminary data w/young adults

### Next steps

- Enroll more younger adults, healthy older adults, and patients with aMCI
- Complete current study and report results

### Deliverables

- Test memory enhancement effect for each group
- Measure brain network changes in each group

### References

- Alzheimer's Association. (2018). 2018 AD facts and figures (pp. 459–509).
- Wang, J. X., & Voss, J. L. (2014). Neuron, 82(5), 1171–1182.
- Koch, G. et al. (2018). NeuroImage, 169, 302–311.