



# Preventing Loss of Independence through Exercise (PLIÉ) Improves Cognitive, Behavioral, and Neuroimaging Outcomes



Steven Martinez, BS;<sup>1,2</sup> Deborah E. Barnes, PhD, MPH;<sup>1,3-5</sup> Wolf Mehling, MD;<sup>3</sup> Margaret Chesney, PhD;<sup>3</sup> Jennifer Lee, GCFP;<sup>1,2</sup> Amanda Lee, MSBH;<sup>1,2</sup> Linda Chao, PhD;<sup>1,3,4</sup>

<sup>1</sup>San Francisco Veterans Affairs Health Care Center, San Francisco, CA, USA <sup>2</sup>NCIRE – The Veterans Health Research Institute, San Francisco, CA, USA <sup>3</sup>University of California San Francisco, San Francisco, CA, USA <sup>4</sup>Department of Psychiatry, University of California San Francisco, San Francisco, CA, USA <sup>5</sup>Department of Epidemiology & Biostatistics, University of California, San Francisco, CA, USA

## BACKGROUND

- Preventing Loss of Independence through Exercise (PLIÉ)
  - A multimodal group-movement program originally developed for people with mild-moderate dementia
- Based on neuroscience
  - Procedural memory
  - Mindful body awareness
  - Social/emotional connection
- Evidence for increased Default Mode Network (DMN) functional connectivity in adults with MCI participating in Mindfulness Based Stress-Reduction program (Wells, 2013).
- Underlying neural mechanisms for PLIÉ unknown

## OBJECTIVE

- To examine the impact of PLIÉ in people with mild cognitive impairment (MCI) on cognitive, behavioral, and neuroimaging outcomes:

## METHODS

- Pre-post pilot design
- Study participants recruited from the community
- MCI diagnoses or subjective memory complaints plus Montreal Cognitive Assessment (MoCA) scores  $\leq 26$
- PLIÉ classes were 1-hour, 2 days/week over 12 weeks with 8-12 participants per-class
- Cognitive and Behavioral Outcomes
  - Cognitive function- ADAS-cog
  - Physical function- SPPB
  - Social Isolation- PROMIS Social Isolation
  - Self-regulation- MAIA-2
- Neuroimaging Outcomes
  - DMN functional connectivity
- Analysis
  - Pre-Post comparisons: Paired t-tests
  - Seed-based connectivity: Anterior Cingulate Cortex (ACC) & Posterior Cingulate Cortex (PCC)

## WHAT WE LEARNED

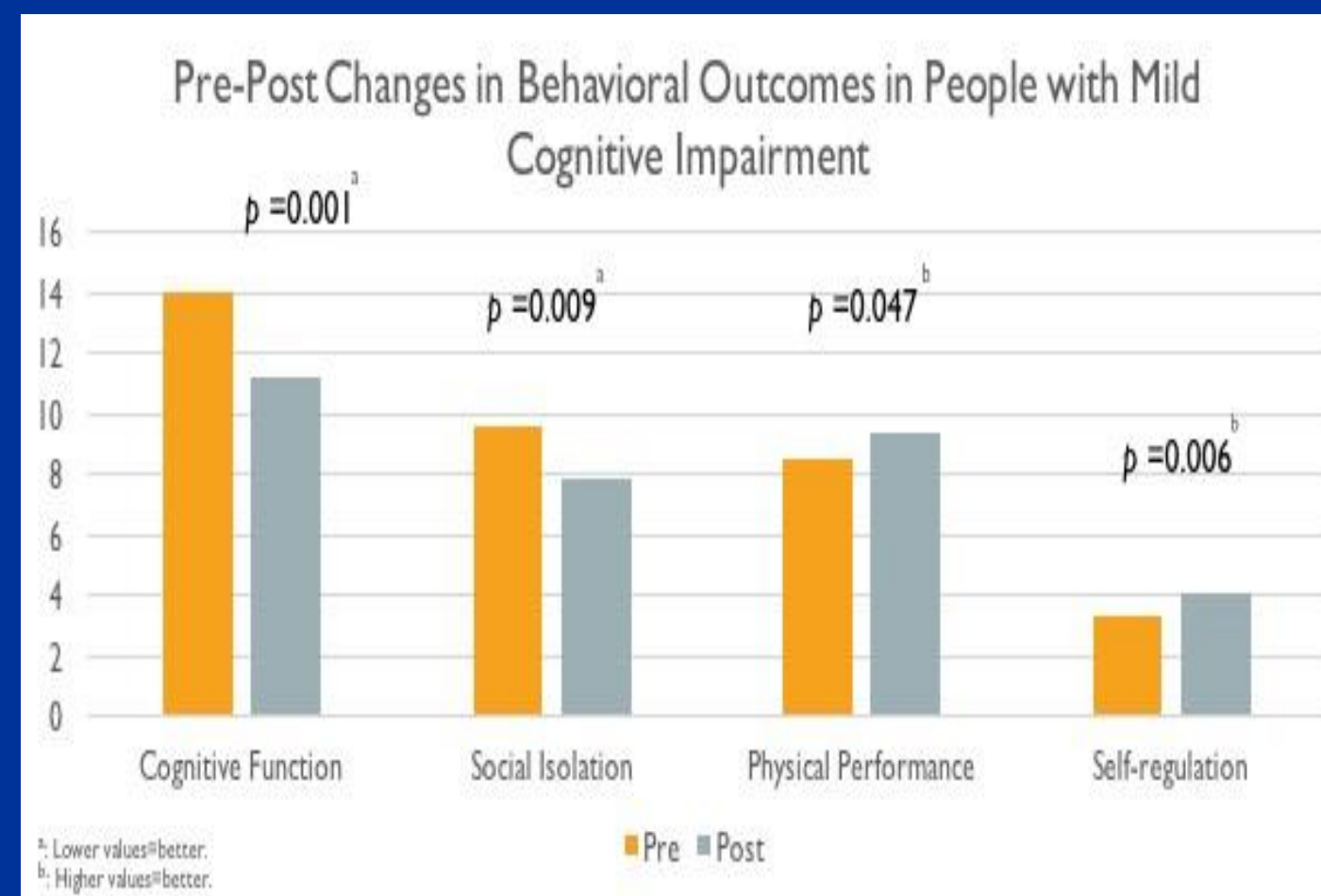
### PLIÉ significantly improved cognitive, physical, social, and emotional outcomes and increased DMN functional connectivity

PARTICIPANTS	
Enrolled: N=32	
Completed PLIÉ: N=18	
Age: Mean $\pm$ SD	75 $\pm$ 9.04
% Men   % Women	61.1 %   38.9 %
Education Mean $\pm$ SD	14.8 $\pm$ 2.5
% Veterans   Non-Veterans	50 %   50%
Non-Hispanic White	83.3 %

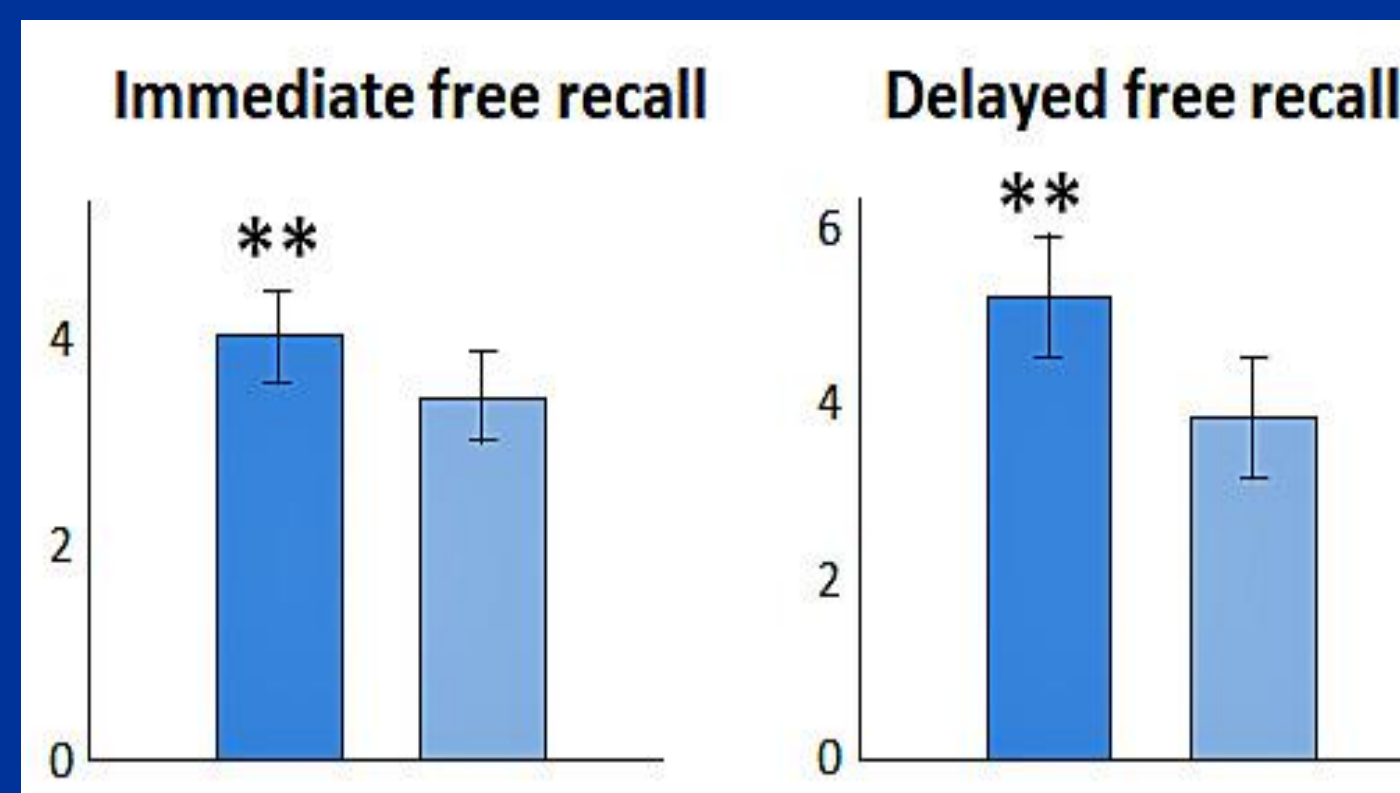


## BEHAVIORAL OUTCOMES

### Preliminary behavioral results



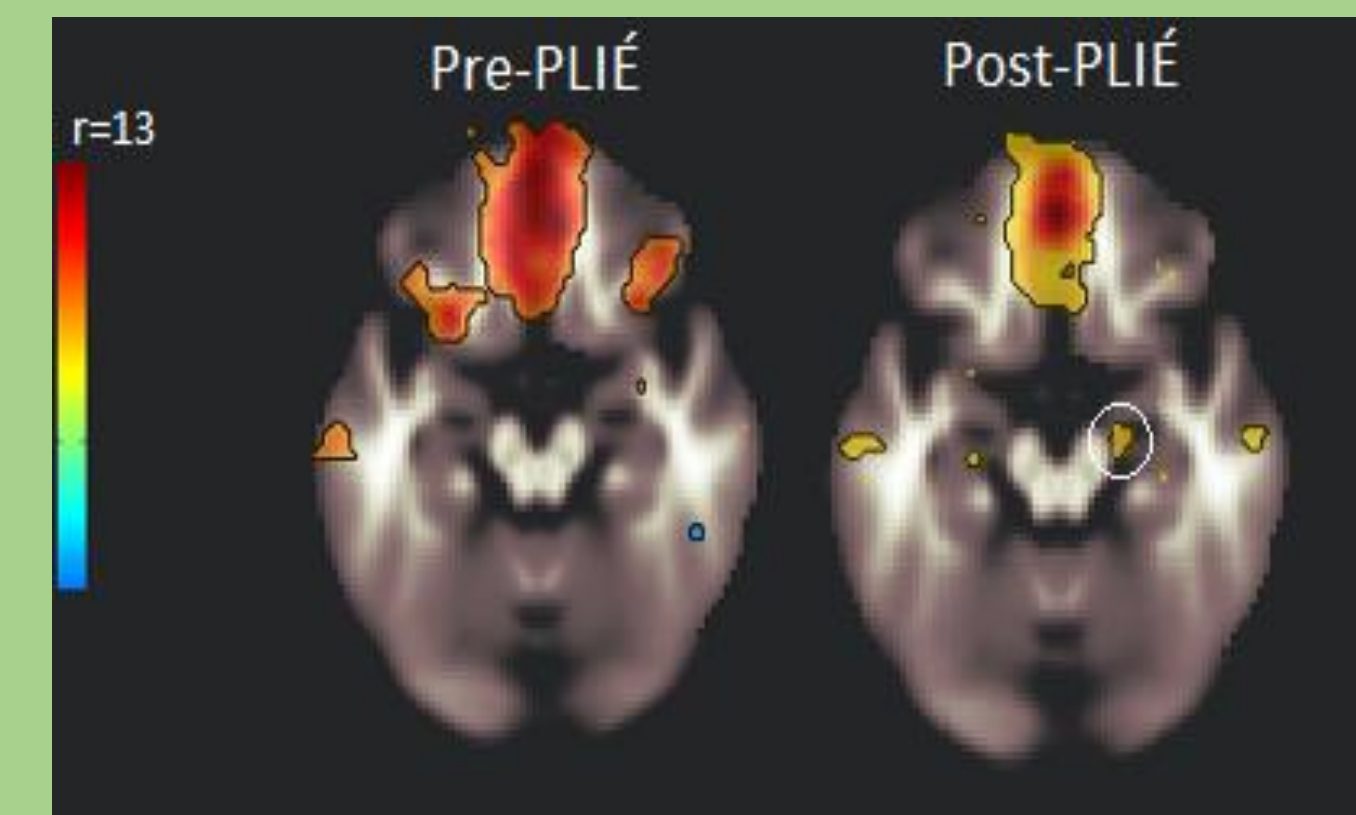
Effect on ADAS-cog was driven primarily by improvement in the verbal memory portion of the test



## NEUROIMAGING OUTCOMES

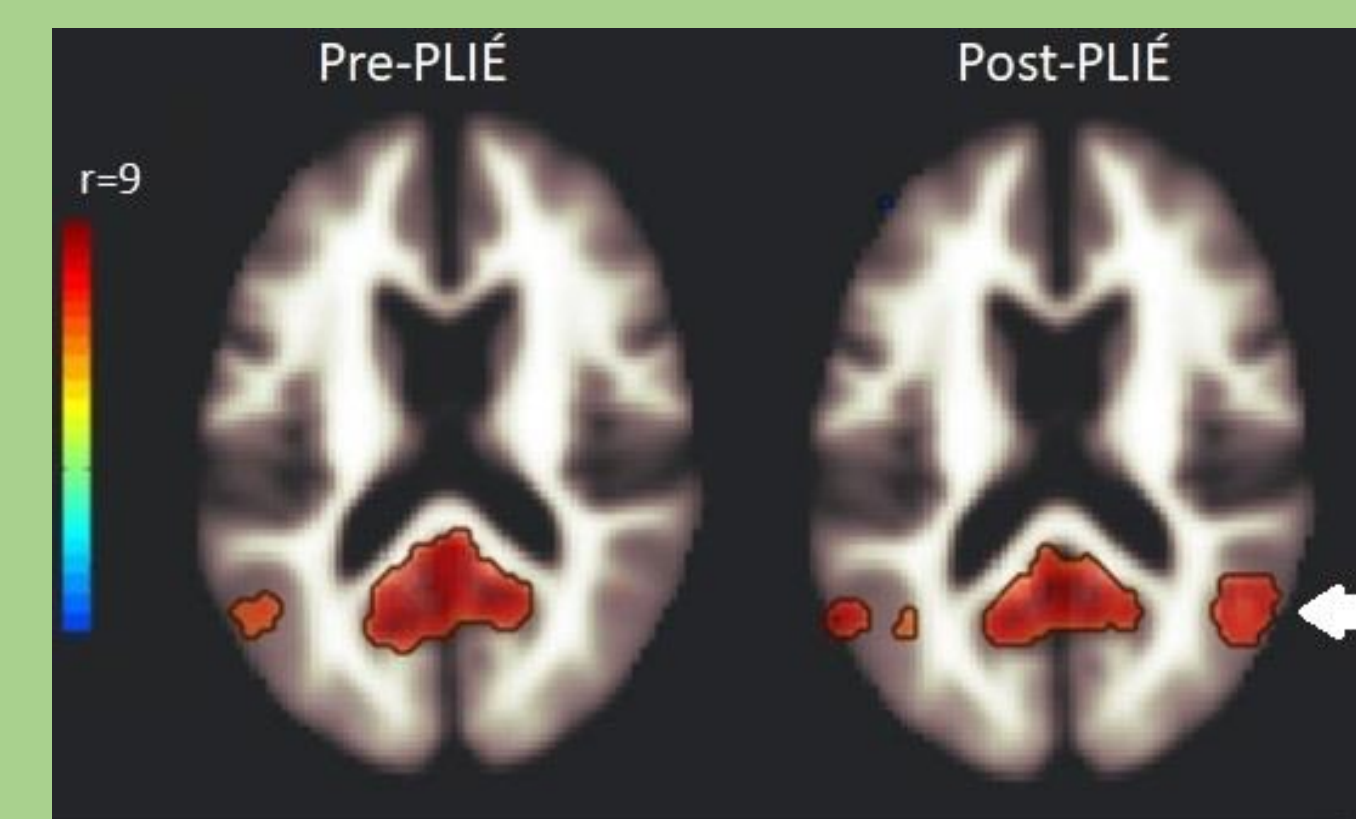
### DMN activity with ACC as seed:

- Bilateral hippocampal activity in Post-PLIÉ, but not Pre-PLIÉ



### DMN activity with PCC as seed:

- Left and right lateral parietal cortex functionally connected in Post-PLIÉ



## CONCLUSION

- Significant pre-post improvements observed for cognitive and behavioral outcomes
- Increased DMN connectivity to ACC and PCC nodes
- Results provide proof-of-concept for PLIÉ intervention in people with MCI

## NEXT STEPS

- Extend study by adding control group
- Identify neural changes that correlate with cognitive and behavioral changes

## ACKNOWLEDGMENTS

Department of Defense Grant: W81XWH-17-1-0490

ClinicalTrials.gov: NCT03526146

Dr. Barnes, Dr. Mehling, and Dr. Chesney are co-inventors of PLIÉ and have the potential to earn royalties.