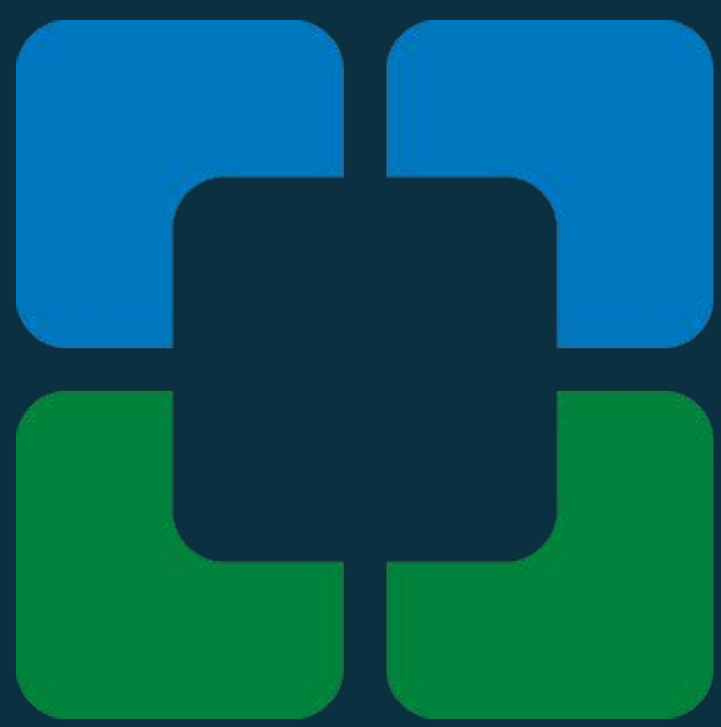




Cleveland Clinic

Spatial navigation performance is associated with plasma GFAP in cognitively normal adults

Taylor F. Levine, Ph.D.,¹ Catherine Chiao, B.S.,¹ Emily Post, B.A.,¹ MayaRae Mugosa, B.S.,²
Aryan Shah, B.S.,² Xiaowei Zhuang, Ph.D.,¹ Jefferson Kinney, Ph.D.,²
Dietmar Cordes, Ph.D.,¹ and Jessica Z.K. Caldwell, Ph.D.¹



Cleveland Clinic

¹Cleveland Clinic Lou Ruvo Center for Brain Health; ²University of Nevada, Las Vegas

BACKGROUND

- There is emerging evidence that spatial navigation may be more sensitive to early cognitive decline along the Alzheimer’s disease (AD) continuum compared to traditional psychometric measures.
- Spatial navigation may be a particularly useful cognitive marker of AD in women due to their well documented baseline advantages on neuropsychological tasks.
- This pilot study aims to examine whether spatial navigation is uniquely associated with plasma AD biomarkers and whether sex differences are observed across cognitive measures.

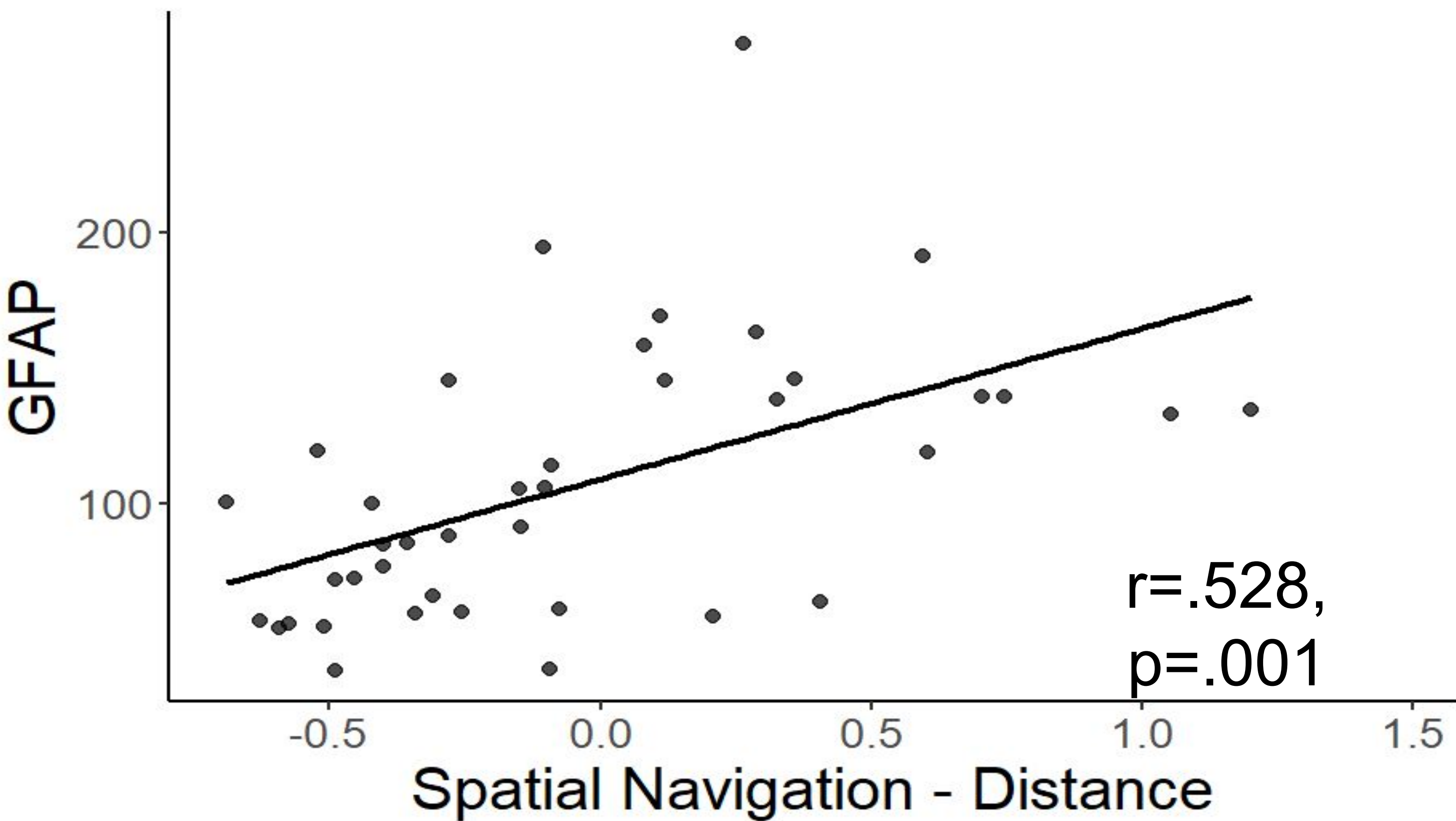
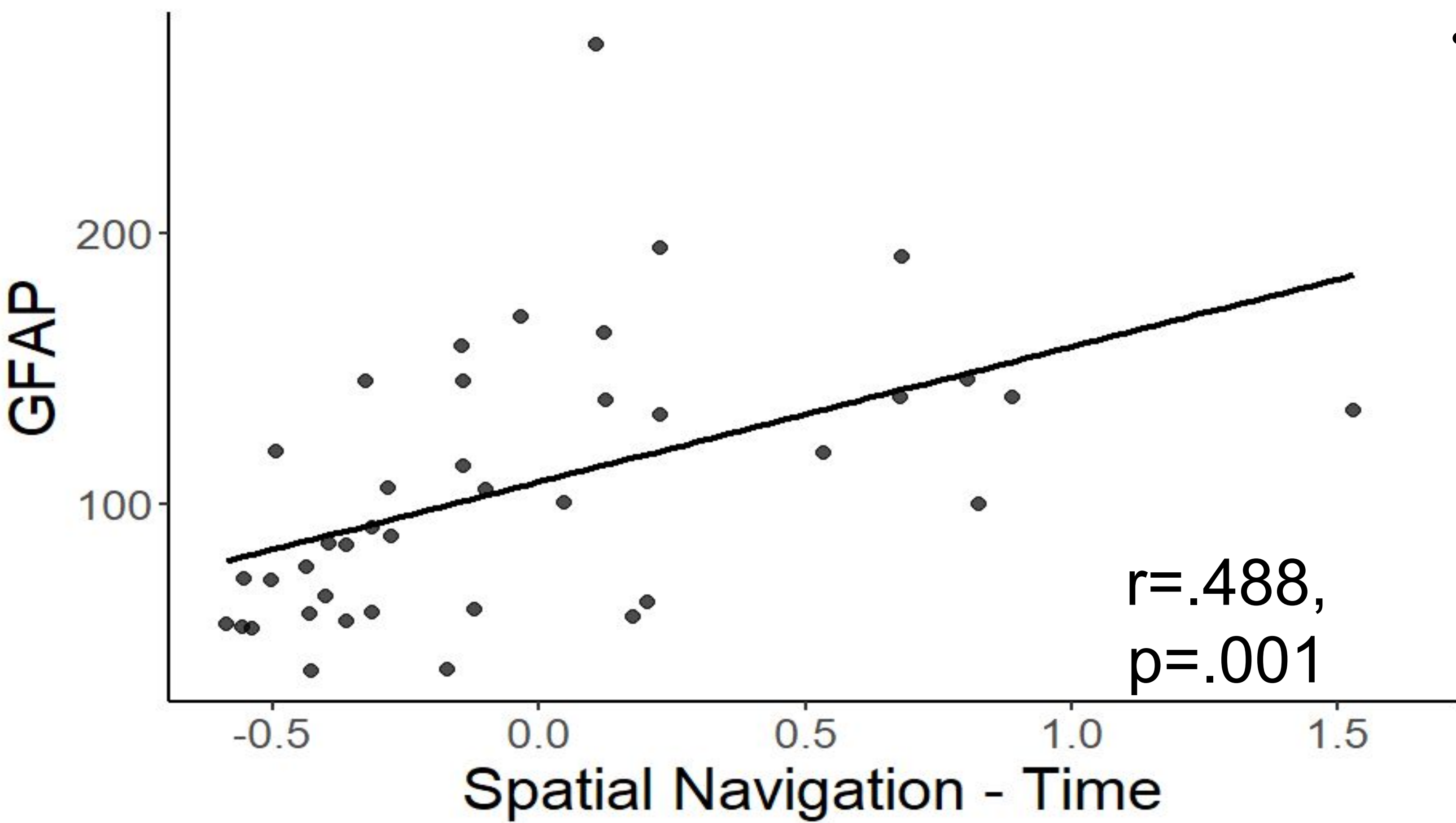
METHODS

- **Participants:** Cognitively normal participants from the Women’s Alzheimer’s Movement and Prevention Center at Cleveland Clinic and the Center for Neurodegeneration and Translational Neuroscience. **See Sample Characteristics.**
- **Spatial Navigation:** Participants completed three four-minute learning trials where they were allowed to freely explore a computerized virtual environment. After a 15-minute delay, participants were instructed to find goal locations within the learned environment (six test-trials). Spatial navigation ability was operationalized by z-score composites of time and distance taken to reach the goal location.
- **Verbal Memory:** Rey Auditory Verbal Learning Test (RAVLT) delayed recall.
- **Global Cognition:** Montreal Cognitive Assessment (MoCA).
- **AD Biomarker:** Plasma glial fibrillary acidic protein (GFAP).
- **Statistical Analyses:** Pearson correlations were used to examine the association between GFAP and cognitive measures. If significant, models were corrected for age. Sex differences were examined using t-tests.

SAMPLE CHARACTERISTICS

	Total Sample	Men	Women
N	45	21	24
Age (years) (M, SD)*	70.16 (11.09)	72.19 (10.12)	68.38 (11.81)
Age range	37-85	52-85	37-85
Education (years) (M, SD)	16.62 (2.33)	16.48 (2.11)	16.75 (2.35)
Education range	10-20	12-20	10-20

KEY RESULTS SUMMARY



- Spatial navigation performance was correlated with plasma GFAP.
- This association did not remain significant when adjusting for age.

RESULTS

- Plasma GFAP was correlated with spatial navigation, but not verbal memory and global cognition.
- Correlations did not remain significant when age was added to the model.
- Women outperformed men on verbal memory [$t(30.796)=2.188$, $p=.036$], with marginal differences when controlling for age and education ($\beta=-1.411$, $p=.091$).
- There were no observed sex differences in spatial navigation or global cognitive performance.

CONCLUSIONS

- Spatial navigation ability may be a particularly sensitive marker of early AD pathology in cognitively normal adults, regardless of sex.
- Traditional psychometric measures were developed to detect cognitive change associated with the mild cognitive impairment and symptomatic stages of AD. Alternative cognitive tasks may provide additional information in the preclinical stage.

FUTURE DIRECTIONS

- The current study is a pilot and subsequently underpowered. Future research would benefit from continued data collection.
- Examination of other plasma biomarkers (e.g., ptau217).

ACKNOWLEDGEMENTS

Research reported in this study was supported by The Women’s Alzheimer’s Movement at Cleveland Clinic; NIA grant R01-AG074392; NIGMS 5P20GM10905. We also thank the participants and the E.L. Weigand Chair for the Women’s Alzheimer’s Movement Prevention and Research Center.