



The Utility of Event Related Potentials in a Memory Disorders Clinic



Katherine W. Turk, M.D.^{1,2}, Cheongmin Suh¹, Prayerna Uppal¹, Ala'a El-Shaar¹, Brigid Dwyer, M.D.^{1,2}, Andrew E. Budson, M.D.^{1,2}

¹Center for Translational and Cognitive Neuroscience, VA Boston Healthcare System ²Department of Neurology, Boston University School of Medicine

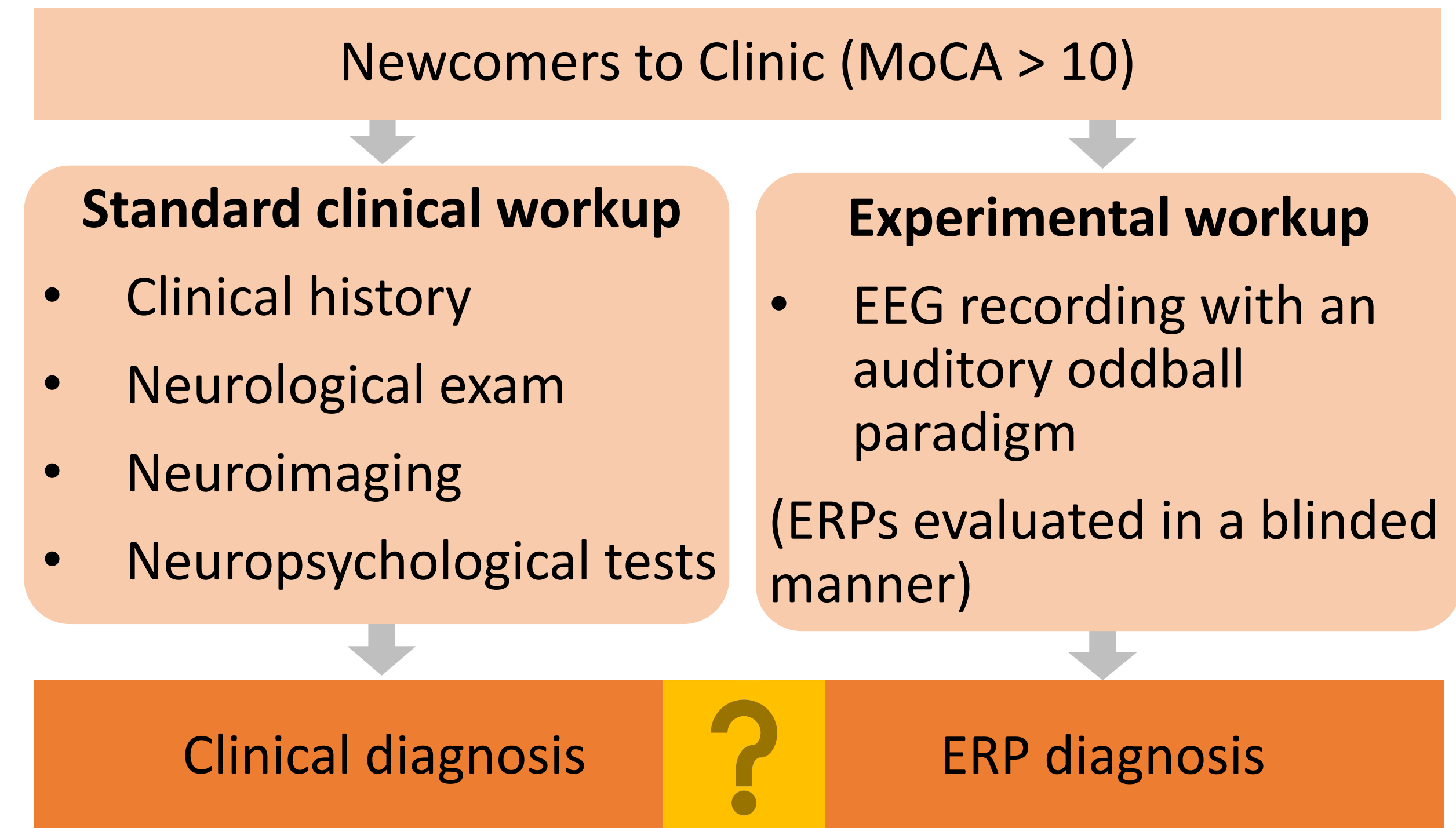
Introduction

Event related potentials (ERPs) are quantitative EEG-derived waveforms time-locked to stimuli that represent cognitive processing. ERPs have the potential to detect subtle cognitive changes in Alzheimer's disease (AD) by measuring changes in neuroelectrical signals. In particular, the P3b latency is thought to reflect stimulus processing time in relation to memory (Magliero et al., 1984), and has been found to correlate with AD-related cognitive impairment (Cecchi et al., 2015). We examine P3b latencies in relation to medial temporal lobe (MTL) atrophy and performance on MTL-related neuropsychological measures from a heterogeneous group of memory patients reflective of a typical memory clinic population.

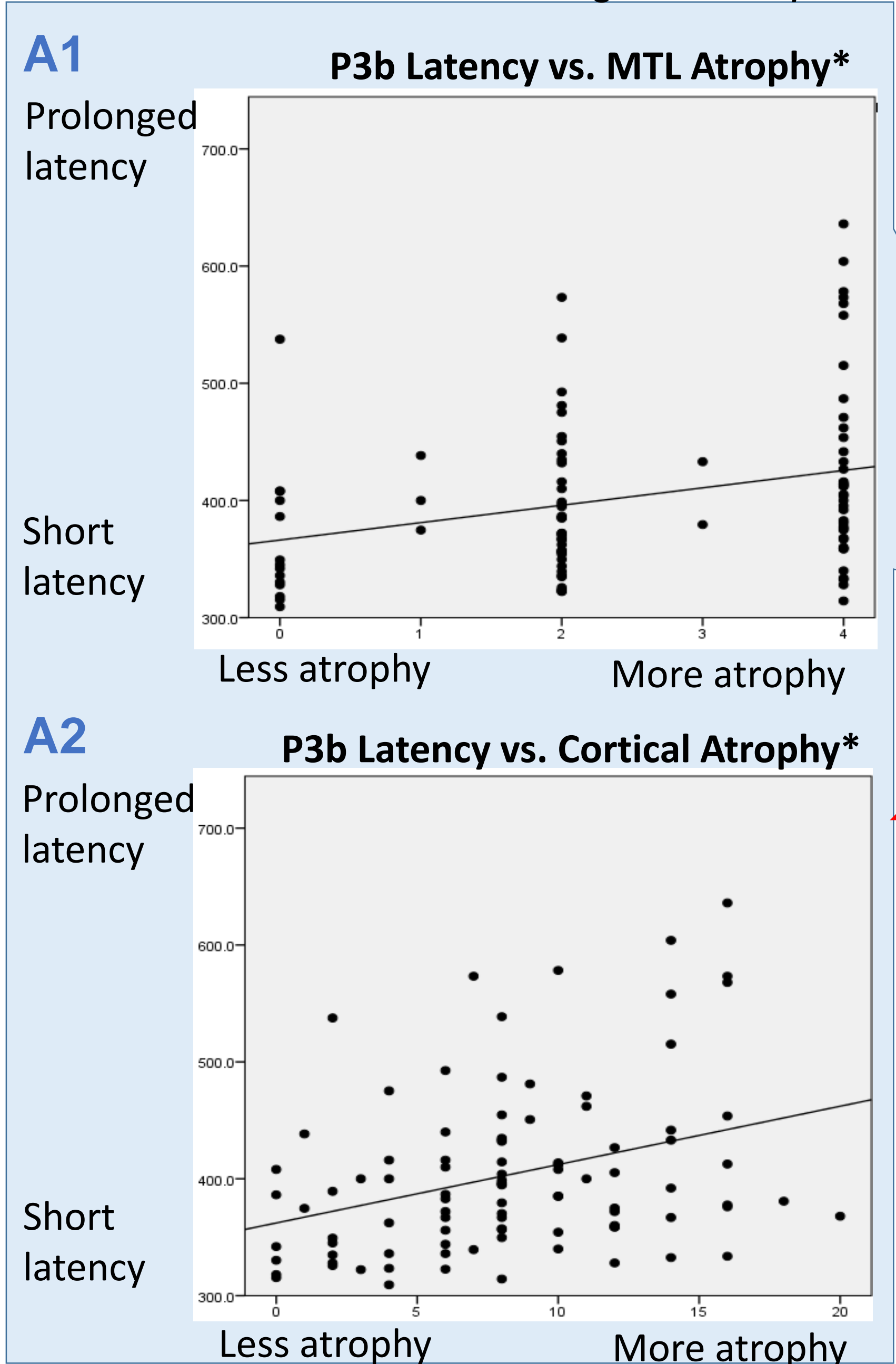
Methods

Participants consisted of 114 veterans 50-100 years old who were seen in the Memory Disorders Clinic between June 2016 - Sept 2017. Pearson's correlation was made between P3b latencies, cortical and MTL atrophy scores, and the word list learning task from the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) using SPSS. See figure 1 for details.

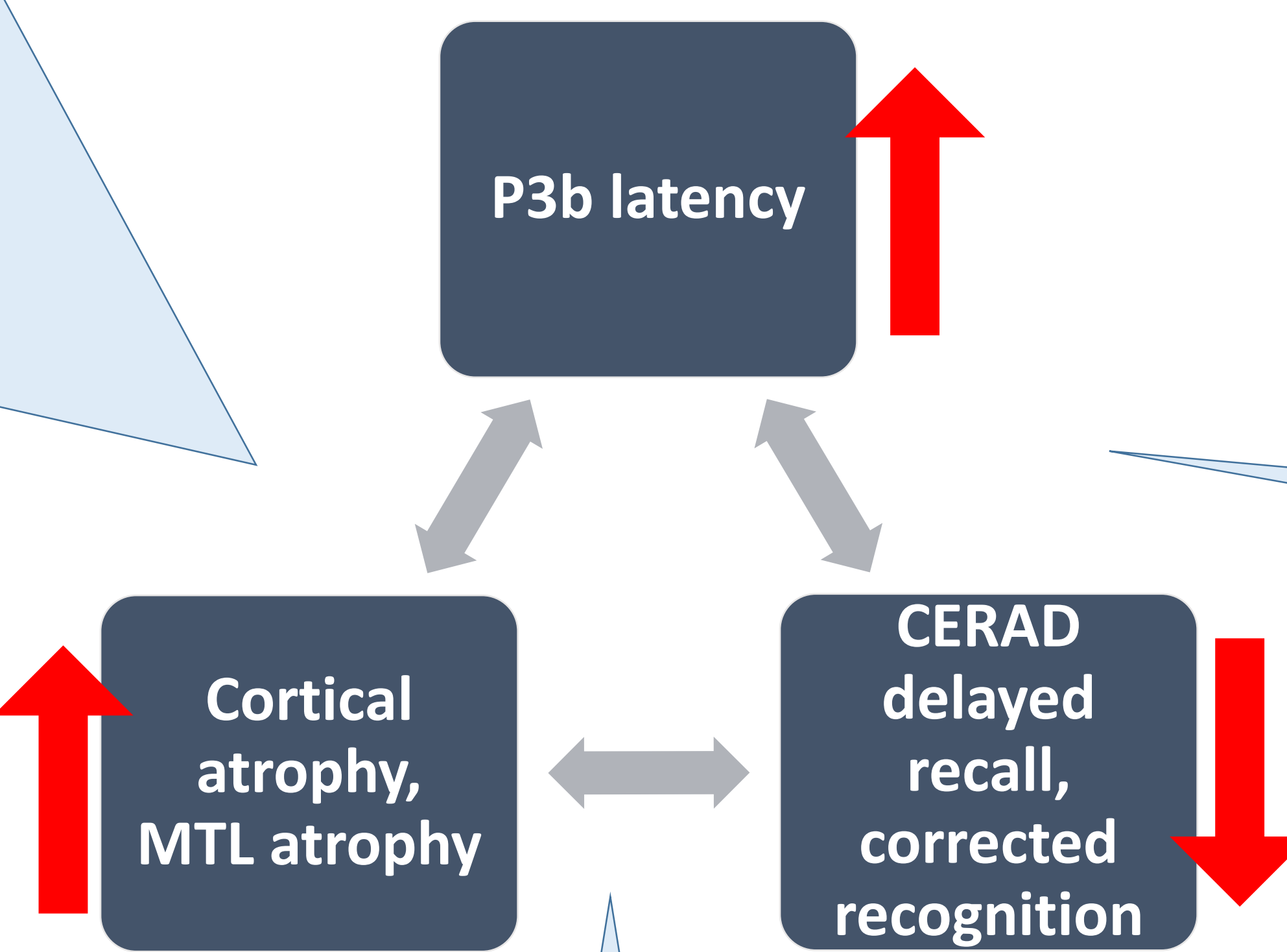
Figure 1. Flow chart of study design



* Denotes significance $p < .05$



Hypothesis/ Results



| Demographics (n=114) | | | | | | | |
|----------------------|------------|--------------------|------------|----------------|-----------------------|-------------------|------------------------|
| | Age | Years of education | MoCA | Delayed recall | Corrected recognition | MTL atrophy score | Cortical atrophy score |
| Mean ± SE | 72.3 ± 0.8 | 14.0 ± 0.3 | 20.1 ± 0.5 | 3.2 ± 0.2 | 7.6 ± 0.2 | 2.5 ± 0.1 | 8.3 ± 0.5 |

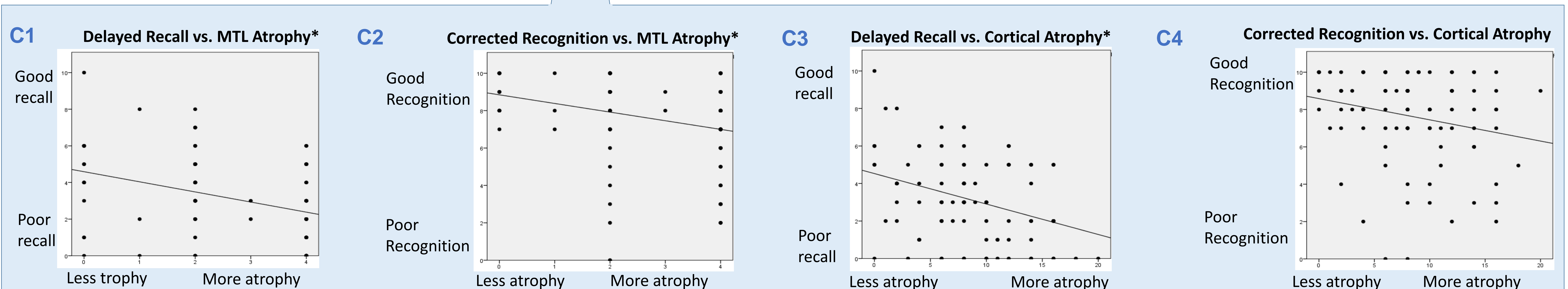
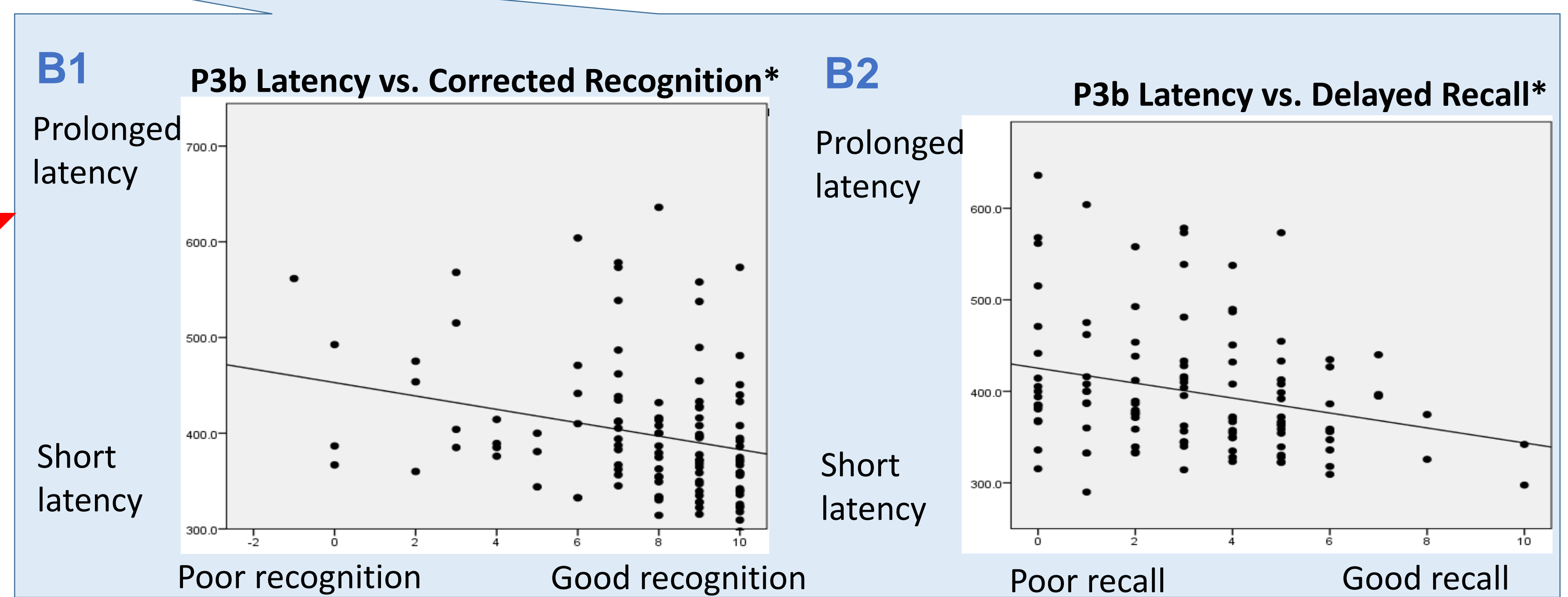


Figure 2. Scatterplots of bivariate correlations. Pearson's correlation was used to assess the relationship between variables: A1. P3b latency vs. MTL atrophy $r(93) = .295, p = .004$ A2. P3b latency vs. cortical atrophy $r(94) = .334, p = .001$ B1. P3b latency vs. corrected recognition $r(112) = -.202, p = .032$ B2. P3b latency vs. delayed recall $r(93) = -.263, p = .005$ C1. Delayed recall vs. MTL atrophy $r(93) = -.350, p = .001$ C2. Corrected recognition vs. MTL atrophy $r(93) = -.227, p = .027$ C3. Delayed recall vs. cortical atrophy $r(94) = -.346, p = .001$ C4. Corrected recognition vs. cortical atrophy $r(94) = -.179, p = .081$.

Conclusion

- We found relationships between P3b latency, MTL and cortical atrophy, and CERAD measures in the expected directions.
- The results validate P3b latency as a supportive biomarker of memory impairment.
- Future directions include whether the same relationships remain significant examining subgroups consisting of AD and other etiologies of memory decline.

Acknowledgements

- This study is supported by a Fellowship Research Grant through the Alzheimer's Association
- The Cognision EEG hardware was generously donated by Neuronetrix™

References

- Cecchi, Moore, Sadowsky et al. (2015). *DADM*, 1(4), 387-394.
Magliero, Bashore, Coles, & Donchin. (1984). *Psychophysiology*, 21(2), 191-186.