Event Related Potentials elicited during Cognitive Tasks: Biomarkers for Mild Cognitive Impairment?

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BACKGROUND

- 10% of persons with Mild Cognitive Impairment (MCI) will convert to dementia each year (Graham et. al., 1997)
- ERPs are derived from electroencephalograms (EEG) - measure the brain's response to cognitive events
- Studies have shown that ERPs can distinguish between groups of patients with MCI and Healthy Controls (HC)
- Event-related potentials (ERPs) as potential biomarkers of early cognitive change
- **Study Question**: Can ERPs elicited during working memory, inhibitory controls and semantic memory tasks identify people with MCI

METHODS

- 15 MCI participants recruited from the Bruyère Memory Program; 17 HC recruited from the community
- Classifications of MCI/HC confirmed by clinical committee
- Participants performed n-back, go/no-go, and verbal recognition tasks while EEG recording
- EEGs: NeuroScan NuAmps 4.3 Brain Analyzer 2.1
- The P200, P300 and N400 ERP components analyzed
- Receiver operating characteristics (ROC curves): amplitudes and latencies

Participants

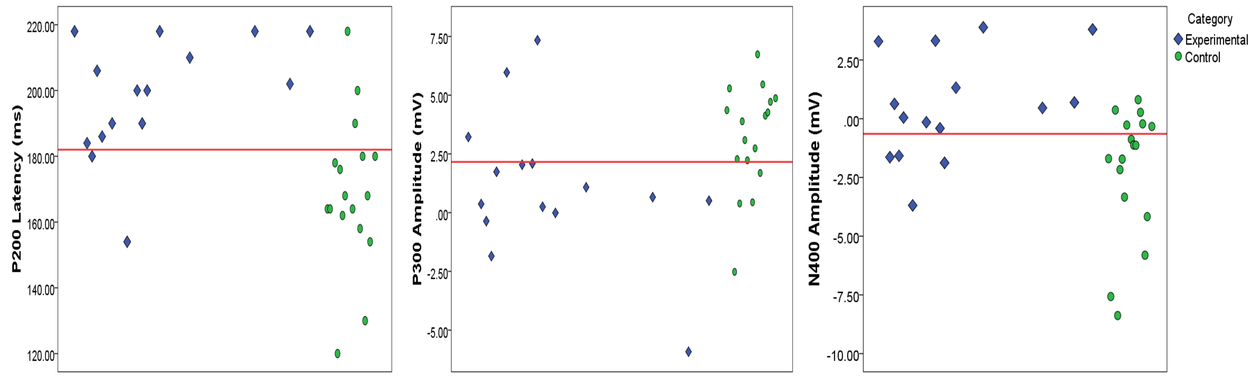
	MCI (n=15; 8 females)	HC (n=17; 11 females)	P
Age	75.7 (6.1)	72.4 (5.9)	.127
Education	14.7 (2.8)	15.6 (3.0)	.382

Cognitive Tests Results

Test	MCI (n=15)	HC (n=17)	P
MoCA	22.6 (2.6)	27.6 (1.6)	<.001
RBANS Total	79.8 (9.5)	114.3 (9.0)	<.001
Trails A (sec)	55.0 (26.3)	37.2 (12.6)	.019
Trails B (sec)	164.4 (81.6)	81.3 (23.3)	<.001

RESULTS

Test	ERP Paradigm	Sensitivity (%)	Specificity (%)	Area Under the Curve	P
N-Back	P200 Latency	86.7	82.4	.85	<.001
Go/No-Go	P300 Amplitude	80.0	76.5	.74	.022
Verbal Recognition	N400 Amplitude	80.0	71.6	.79	.005



Optimal sensitivity/specificity cut-offs from left to right: 182.0 ms in PZ (N-Back), 2.160 mV in FCz (Go/No-Go) and -1.615 mV in CPz (Verbal Recognition).

DISCUSSION

- First comparison of the diagnostic utilities of these ERP paradigms
- ERP P200 latency for the n-back task = best diagnostic accuracy in this population – measuring working memory
- ERP differences in three paradigms suggest differences in working memory, inhibitory control and semantic memory in MCI
- EEG changes may predate cognitive changes: bio-marker?
- Repeat with a larger sample size
- Compare ERP data from other cognitive paradigms

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