Event Related Potentials in Older Patients with Memory Loss and Traumatic Brain Injuries

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Background

- Event related potentials (ERPs) are a type of quantitative electroencephalogram (EEG) that may be used as a potential biomarker of Traumatic Brain Injury (TBI).
- TBI biomarkers may also have implications for the detection of neurodegenerative diseases related to TBI, including CTE.

Objectives

To investigate how ERPs may be a potential biomarker for TBI by identifying ERP measures that significantly differ between memory disorder patients with and without a history of TBI.

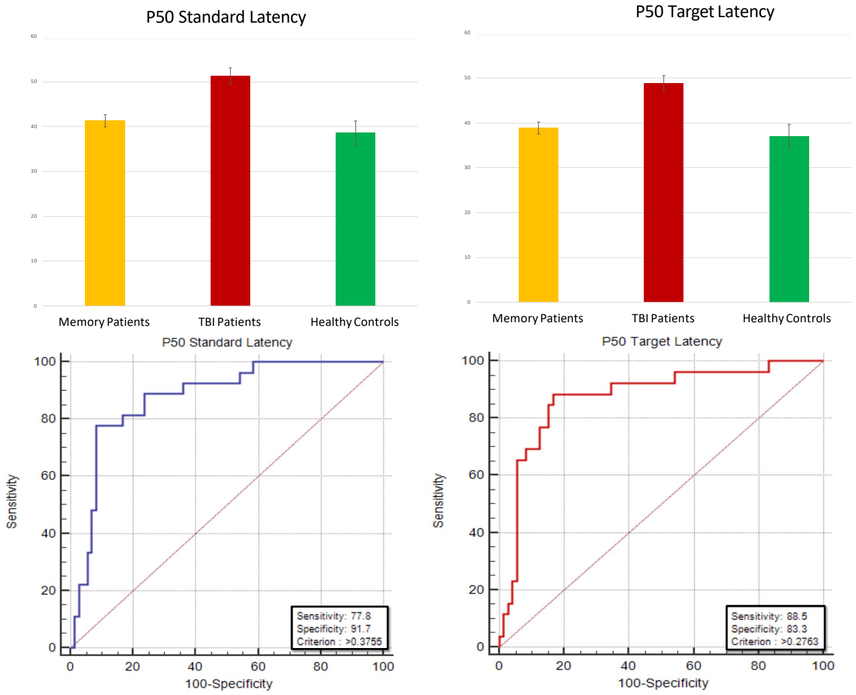
Methods

166 subjects who presented with memory complaints either with or without a history of TBI underwent an EEG with a three-tone auditory oddball task using an 8-active electrode COGNISION™ rig. ANCOVA was used to determine differences between memory patients with and without a history of TBI and healthy older adults controlling for age, education, Geriatric Depression Scale (GDS) and General Anxiety Inventory (GAI). ERP measures predictive of TBI status were obtained by bivariate logistic regression controlling for age, education, GDA and GAI. Significant ERP predictors were analyzed using receiver operating characteristic (ROC) curves and logistic regression.

Table 1. Descriptive statistics between groups.

Characteristics	Memory patients without TBI history (n=85)	Memory patients with TBI history (n=53)	Healthy Older Controls (n=28)
Age*	73.8 (8.6) [a]	69.8 (6.7) [b]	76.5 (7.9) [a]
Years of Education*	14.0 (2.7) [a]	14.0 (2.5) [a]	16.6 (2.6) [b]
MMSE*	24.7 (3.5) [a]	25.7 (3.5) [a]	28.8 (1.0) [b]
Button press accuracy (%)*	89.9 (14.2) [a]	86.5 (19.0) [a]	96.5 (9.5) [b]
False alarms (%)	1.8 (3.8)	1.6 (2.8)	0.7 (0.8)
Median reaction time (ms)*	524 (137.9) [a]	492.7 (103.6)	457.3 (112.5) [b]
GDS*	4.13 (3.3) [a]	6.5 (3.4) [b]	2.0 (2.8) [a]
GAI*	5.9 (5.9) [a]	7.7 (5.9) [a]	1.4 (2.9) [b]

Note: [a,b] Letters denote significant differences (p<0.05). Groups with the same letter are not significantly different. Groups with differing letters are significantly different from each other.



Results

- Both P50 Standard Latency and P50 Target Latency differed between the memory patients with and without history of TBI and healthy controls ($F_{(1,134)}$ = 5.106, $p < 0.01$, $F_{(1,134)}$ = 6.119; $p < 0.005$).
- To test the hypothesis that P50 Standard and P50 Target Latencies predicted the absence/presence of TBI, we performed two logistic regressions, controlling for age, education, GDS and GAI. Both P50 Standard Latency ($p < 0.005$) and Target Latency ($p < 0.005$) were significant predictors.
- Regression scores were then submitted to ROC analysis. Areas Under the Curve (AUCs) of P50 Standard (0.876) and P50 Target (0.874) Latencies were near identical (p =1.000), suggesting that they were equally predictive of TBI Status.

Conclusions

- P50 Target and Standard Latencies are potential predictors of the presence/absence of a TBI history in older patients with memory disorders.
- P50 has been previously used to examine the ability of the brain to inhibit irrelevant sensory inputs. This process is referred to sensory gating (Ally, 2007). P50 sensory gating may reflect a preattentional inhibitory mechanism that may protect higher order cognitive functions (Lijffijt, 2009). Our results showing greater latency are consistent with the idea that individuals with TBI have impaired preattentional inhibitory control.
- Prolonged P50 latency may be related to underlying temporal lobe abnormalities after TBI such as synaptic depression (Wehr and Zador, 2005). Alternatively, it may be related to disrupted fronto-temporal network interactions due to damaged white matter tracts.

References

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