Authors: Basil Ike DO, Landon Watts BS, Dave Oakley PhD, Monica Pita ATC, Mo Mortazavi MD

Abstract Title:
P300 Evoked Response Potentials Patterns in Different Complex Concussion Phenotypes

Objective:
Determine the utility of P300 Evoked Response Potentials (ERP) voltage patterns in predicting phenotypical sequelae of patients with complex concussions or Persistent Post Concussive Symptoms (PPCS)

Background:
ERPs have been used to aid in the diagnosis of multiple neurological disorders. They have also been recently used in the evaluation management of concussions.

Design/ Methods:
A retrospective study of 54 patients, 10 to 71yrs (mean age 29.6yrs), with PPCS were tested between 6-12 weeks post-injury using the standard oddball audio P300 ERP protocol with measures extracted including best central parietal P300 ERP. PPCS Phenotyping was completed in each patient using a standardized post-concussive questionnaire and Rivermead method for 5 primary phenotypes and mixed type.

Results:
Average P300 voltages for each phenotype were as follows:
- · Cognition- 14.1mV
- · Vestibular- 8.6mV
- · Headache- 11.1mV
- · Mood- 13.6mV
- · Neck Pain- 9.6mV
- · Visual- 9.8mV
- · Mixed- 6.9mV
- · P300 average Voltage for the entire group was 11.6mV.

Overall, these were significantly lower than age-matched controls whose average voltage was 16.3mV ($p < 0.0001$).

Mixed and Vestibular phenotypes demonstrated the lowest average voltage potentials (6.9mV and 8.6mV respectively), while Cognition and Mood demonstrated the highest average voltage potentials (14.1mV and 13.6nV respectively).

When comparing phenotypes against one other, mixed vs mood ($p=0.03$), cognition vs vestibular ($p=0.02$), and cognition vs mixed ($p=0.009$) showed statistical significance.

Avg SCAT5 scores for each phenotype illustrated mood (Voltage 13.6mV) was lowest at 40.3 and Mixed (Voltage 6.9mV) was highest at 70.5

Conclusion:
P300 ERPs can help identify persistent abnormal complex concussion neurophysiology. ERPs can also potentially exhibit phenotype specific patterns and can be a useful tool in helping differentiate more somatic/physiologic vs mood-based phenotypes. This can ultimately lead in the aid in diagnosis, prognosis, subtyping, and targeted phenotype management