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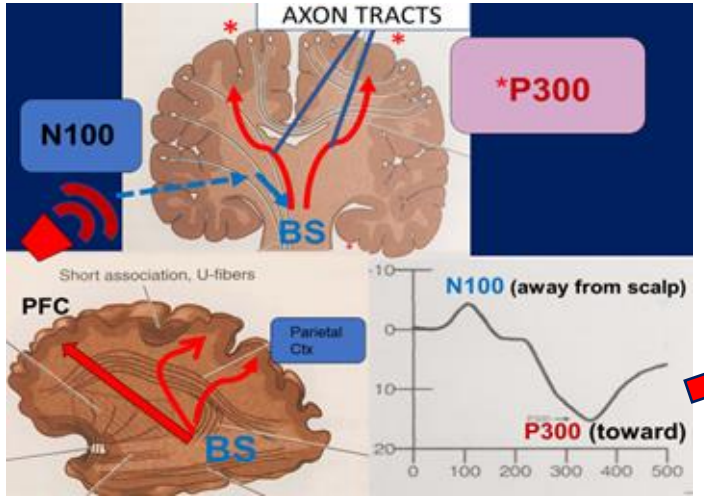
BACKGROUND

Modern EEG P300 Biomarkers

- Technology has improved to the ease of an "APP"
- EEG Headset systems are simplified and fast
- Automatic artifact clearing
- Data display is clear and standardized

Injury decreases brain power. It should improve with Rehab. Brain physiology change is shown by Cortical P300 response. P300 testing is used for diffuse brain injury such as mTBI (concussion), cognitive dysfunction, Alzheimer's as well as localized brain injury: stroke, TBI, MS. Cortical P300 pathway diagram below



1st 100mSec

- N100 response: Sound input into the midbrain and transmitted to brainstem travelling away from the scalp EEG sensors

2nd 100mSec

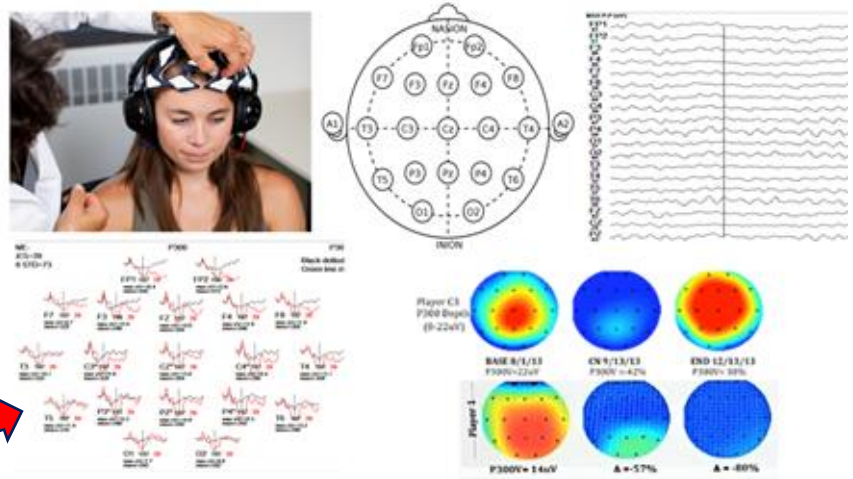
- No response during tone analysis between cortical areas

3rd 100mSec

- Large P300 response from thalamus toward all cortical areas following Positive analysis of target tone; output from thalamus toward cortex is displayed as a positive electrical response by (scalp) electrodes.

METHOD

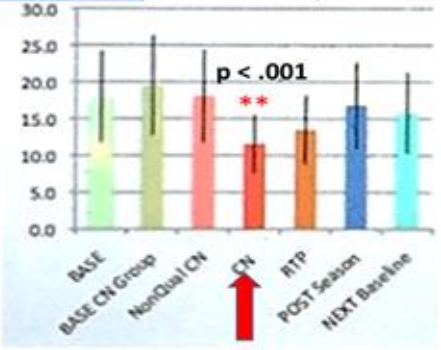
Pre season or before intervention P300 Amplitude and Delay obtained. Groups include young adult athletes (N=348) as well as older adults with CNS dysfunction undergoing rehabilitation.



RESULTS

P300 Tests	
Player Baselines	348
NCAA Football	158
High School Football	142
Women's Soccer	28
CONCUSSIONS	
Suspected Events	56
Concussive Events (CN)	44
# F/U Tests Conducted	132

P300 Amplitude



DISCUSSION: Diffuse brain injury, e.g. mTBI (concussion)

- In the days following a concussion, the P300 amplitude is markedly reduced compared to baseline and progressively increases back to baseline. Healthy repeat testing shows a 12% SD and post-injury amplitude reduction is shown to be 4 SD or more.
- At RTP (return to play) based on NCAA Guidelines, most athletes have returned to baseline amplitudes +/- 1 SD.
- Occasionally, P300 is slower to return compared to function at RTP (30%).
- Other researchers have shown similar physiologic marker improvement slowing (35%). Churchill 2017, Lazzarino 2013

Focal or global brain dysfunction ABI or metabolic

Cortical P300 can demonstrate localized brain dysfunction eg stroke, MS Improvements from intervention can also be demonstrated.

Case study

65 y.o. female with 20 years of intermittent LE weakness. Multiple neuro evaluations, MRIs, EMGs, lab showed possible Lyme or MS. Steroid and antibiotic were ineffective. Diet modifications and exercise helped a little. Dx of psychogenic weakness was frequently made.

Conclusion

EEG Cortical P300 testing is technically easy to apply. Output data can quantify brain physiology and help guide Rehabilitation therapies.

As data bases grow, additional applications will be developed plus precision within the field will likewise advance.