

Understanding the neurophysiological component of persistent fatigue following concussion using transcranial magnetic stimulation and neurosensory assessment.

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Introduction

Post concussion syndrome/symptoms (PCS) is defined as ongoing symptoms following a concussion or mild traumatic brain injury (mTBI) for a minimum of three months.¹ Whilst individuals can experience a range of symptoms, fatigue is a common symptom but is often overlooked.²

Aim

To study the underlying neurophysiology between those with chronic PCS, with ongoing fatigue, to those who have recovered from a concussion and age-matched controls with no history of concussion.

Methods

Participants were categorized into one of three groups:

1. Post-concussion with ongoing fatigue (n=11; 41.1 ± 14.9 yr);
2. Post-concussion without fatigue (n=11; 34.9 ± 5.8 yr);
3. Non-concussed controls (no history of concussion) (n=13; 39.2 ± 8.7 yr).

Testing involved participants completing:

- Fifteen question self-report post-concussion fatigue scale³
- Single-pulse transcranial magnetic stimulation (Magstim, UK)^{4,5} (fig 1)
- Neurosensory tactile vibration (Cortical Metrics, USA)⁶ (fig 2)

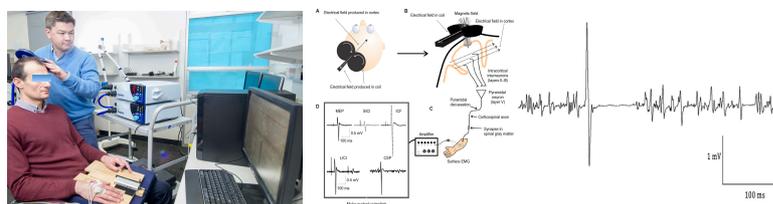


Fig 1. Single and paired pulse, TMS schematic^c, and example single pulse MEP waveform (from author's own collection)

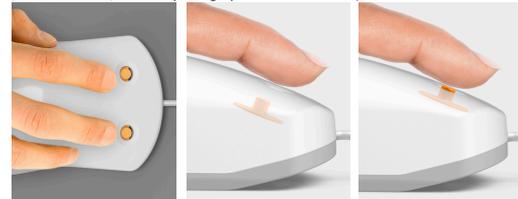


Fig 2. Neurosensory vibration (corticalmetrics.com)

Results

Mean time reported post-concussion was 15.6 ± 6.3 mths. Figures 3 to X illustrate differences between groups (*p<.05).

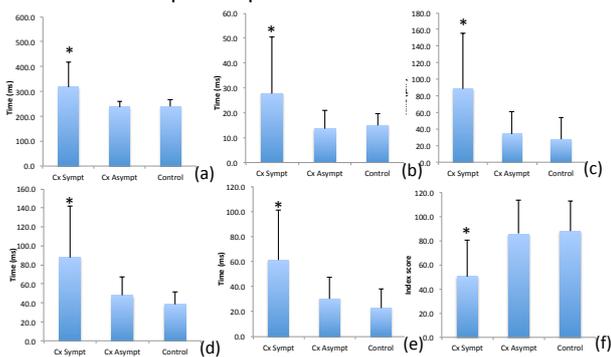


Fig. 3. (a-f) Comparison of mean reaction time (a) and variability (b), discriminate intensity of stimulus (c), duration of stimulus (d), which stimulus appeared first (e) and fatigue index (f).

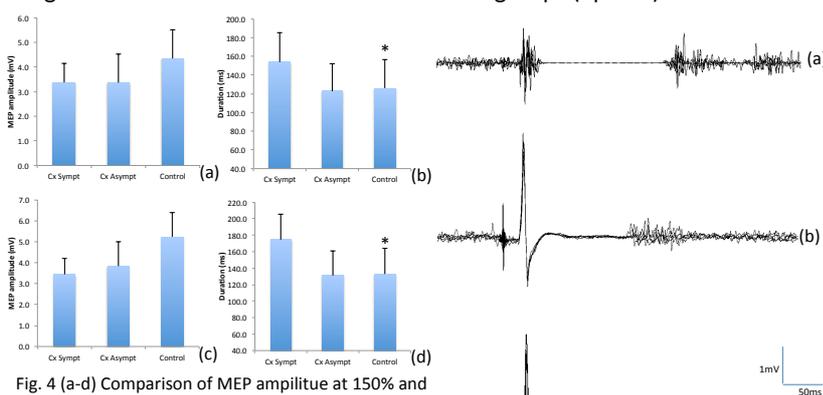


Fig. 4 (a-d) Comparison of MEP amplitude at 150% and 170% aMT (a, c respectively) and cSP duration at 150% and 170% aMT (b, d respectively).

Summary and conclusions

This preliminary study showed differences in GABAergic neurophysiological mechanisms between those with ongoing fatigue compared to those who have recovered from a concussion, and controls.

Whilst clinical and cognitive measures are still vital in understanding persistent fatigue following a concussion or mTBI, this preliminary study illustrates the importance of utilizing neurophysiological measures as part of a multi-modality assessment schedule.

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References

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Fig. 5 (a-c) Example of overlaid MEP sweeps from 3 participants at 170% aMT between PCS fatigue (a), post concussion asymptomatic (b) and control (c).