

Postconcussive syndrome after mild traumatic brain injury

Although the majority who experience a [concussion](#) or [mild traumatic brain injury](#) are likely to recover, an unknown number of these individuals may experience chronic cognitive and neurobehavioral difficulties related to recurrent injury.

These problems can severely disrupt the patient's [quality of life](#).

Epidemiology

[Postconcussive syndrome after mild traumatic brain injury epidemiology](#)

Clinical features

Post-concussion symptoms include:

Headaches.

Dizziness.

Fatigue.

Irritability.

Anxiety.

Insomnia.

Loss of concentration and memory.

ringing in the ears.

Of great concern are the evolutions of postconcussion symptoms that persist for weeks to months after [sports related traumatic brain injury](#).

see [Sport Concussion Assessment Tool](#).

Diagnosis

For the [diffusion tensor imaging](#) (DTI) measures, there were no significant differences in [fractional anisotropy](#), [axial diffusivity](#), [radial diffusivity](#), or mean diffusivity when comparing the postconcussional syndrome (PCS) present and PCS-absent groups. However, there were significant differences ($p < .05$) in mean diffusivity (MD) and radial diffusivity (RD) when comparing the PCS-

present and trauma control (TC) groups. There were significant differences in white matter between TC subjects and the PCS-present mild traumatic brain injury (MTBI) group, but not the PCS-absent MTBI group. Within the MTBI group, white-matter changes were not a significant predictor of ICD-10 PCS ¹⁾.

Magnetoencephalography

Significant correlations between slow wave activity on MEG and patterns of cognitive functioning were found in cortical areas consistent with cognitive impairments on exams. Results provide more objective evidence that there may be subtle changes to the neurobiological integrity of the brain that can be detected by MEG. Furthermore, these findings suggest that these abnormalities are associated with cognitive outcomes and may account at least in part for long term post-concussive symptoms in those who have sustained a mTBI ²⁾.

Dunkley et al. used non-invasive neuroimaging with [magnetoencephalography](#) to examine functional connectivity in a resting-state protocol in a group with mTBI (n = 20), and a control group (n = 21). They observed a trend for atypical slow-wave power changes in subcortical, temporal and parietal regions in mTBI, as well as significant long-range increases in amplitude envelope correlations among deep-source, temporal, and frontal regions in the delta, theta, and alpha bands. Subsequently, we conducted an exploratory analysis of patterns of connectivity most associated with variability in secondary symptoms of mTBI, including inattention, anxiety, and depression. Differential patterns of altered resting state neurophysiological network connectivity were found across frequency bands. This indicated that multiple network and frequency specific alterations in large scale brain connectivity may contribute to overlapping cognitive sequelae in mTBI. In conclusion, we show that local spectral power content can be supplemented with measures of correlations in amplitude to define general networks that are atypical in mTBI, and suggest that certain cognitive difficulties are mediated by disturbances in a variety of alterations in network interactions which are differentially expressed across canonical neurophysiological frequency ranges ³⁾.

¹⁾

Lange RT, Panenka WJ, Shewchuk JR, Heran MK, Brubacher JR, Bioux S, Eckbo R, Shenton ME, Iverson GL. Diffusion tensor imaging findings and postconcussion symptom reporting six weeks following mild traumatic brain injury. *Arch Clin Neuropsychol*. 2015 Feb;30(1):7-25. doi: 10.1093/arclin/acu060. Epub 2014 Nov 21. PubMed PMID: 25416729.

²⁾

Robb Swan A, Nichols S, Drake A, Angeles A, Diwakar M, Song T, Lee RR, Huang M. MEG Slow-wave Detection in Patients with Mild Traumatic Brain Injury and Ongoing Symptoms Correlated with Long-Term Neuropsychological Outcome. *J Neurotrauma*. 2015 Mar 26. [Epub ahead of print] PubMed PMID: 25808909.

³⁾

Dunkley BT, Da Costa L, Bethune A, Jetly R, Pang EW, Taylor MJ, Doesburg SM. Low-frequency connectivity is associated with mild traumatic brain injury. *Neuroimage Clin*. 2015 Mar 3;7:611-21. doi: 10.1016/j.nicl.2015.02.020. eCollection 2015. PubMed PMID: 25844315.

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