

How Concussions Alter Brain Network Properties

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In this work, we analyze quantitative electroencephalography (qEEG) data taken from service members and veterans of the Iraq and Afghanistan Wars. This population is at high risk of concussions, or mild traumatic brain injuries (mTBIs). As a part of CENC, the Chronic Effects of Neurotrauma Consortium, we are working to determine physiological differences between patients who have incurred mTBIs and those who have not. We develop a novel thresholding method for processing coherence data from qEEG to construct unweighted, undirected graphs representing brain connections. This method reduces the confounding effect of post traumatic stress disorder (PTSD), which is prevalent in this population. We test whether mTBI is associated with measures of local and long-range connectivity in these graphs, and we consider which graph properties predict the severity of postconcussive symptoms and/or impaired cognition. We find that brain networks of patients with severe mTBI are more dense but less structured (more random) than those without mTBI.