



## **Systems Biology, Neuroimaging, Neuropsychology, Neuroconnectivity and Traumatic Brain Injury**

### **Purpose**

This review argues that a systems biology approach to understanding quantitative neuroimaging findings in TBI better uses the information derived from quantitative neuroimaging and its relation with neuropsychological outcome than does traditional clinical techniques. Different image analysis methods are reviewed to illustrate how different neuroimaging techniques correlate with different aspects of TBI-related neuropathology. Likewise, this review explores the influence of damage on brain connectivity and neural networks and how best to capture these pathologies using imaging.

### **Participants**

N/A- literature review

### **How was the study conducted?**

The author reviewed literature that discusses quantitative neuroimaging findings in TBI in order to interpret the most effective ways to administer and interpret neuroimaging for TBI patient treatment.

### **Findings**

The author finds that a systems biology approach starting at a tissue level of analysis moving to whole brain and neuropsychological integration is the most effective means of diagnosing and treating the patient with TBI. This finding calls for a study with large sample sizes to begin the process of extracting the most meaningful neuroimaging variables that relate to neurocognitive and neurobehavioral outcome in TBI. This study should yield novel insights in how best to extract the most meaningful and predicative information from a scan. The current challenge to the TBI investigator and clinician is how to best bring these rich data gathering methods together to better understand TBI and help improve diagnosis, treatment and recovery.

### **Military Impact**

This review identifies a need for a large study that would enable the TBI investigator and clinician to bring neuroimaging studies together to better understand TBI and help improve diagnosis, treatment and recovery. Findings from such a study would be used to provide better care to Veterans and service members with mTBI, thus permitting better treatment of this population.

*Bigler E.D. Systems Biology, Neuroimaging, Neuropsychology, Neuroconnectivity and Traumatic Brain Injury. Frontiers in Systems Neuroscience. 2016 ; 10(): . PubMed:27555810 PubMed Central: PMC4977319 <https://www.frontiersin.org/articles/10.3389/fnsys.2016.00055/full>*