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Seizure-induced neuroplasticity and cognitive network reorganization in Epilepsy

Joseph I Tracy
Thomas Jefferson University, USA

Epilepsy is a network disorder with properties that inherently generate neuroplasticity. Accordingly, even focal, lesional forms of the disorder initiate neuroplastic responses throughout large regions of cortex, disrupting a wide array of neurocognitive networks. I will focus on temporal lobe epilepsy, describing the cognitive reorganization emergent during the disease course, providing evidence from task-based functional magnetic resonance imaging (fMRI), resting-state functional connectivity, and diffusion tensor imaging for both intra- and inter-hemispheric shifts in cognitive representations. Factors that mediate change in seizure and cognitive network organization are described, with a discussion of the neuroplastic responses that can emerge following a common treatment for the disease, i.e., anterior temporal lobectomy. The author will argue that only by understanding and measuring the potential for neuroplasticity will we be able to effectively predict cognitive outcomes in epilepsy, as it is these neuroplastic responses that govern the status of both neurocognitive and epileptogenic networks post-surgery. Multi-modal imaging is discussed as a means of estimating neuroplastic potential, delineating the potential cognitive mechanisms that might be available to serve recovery and good cognitive outcomes.

Joseph.Tracy@jefferson.edu