Abstract

Post-traumatic stress disorder (PTSD) is a prevalent, debilitating, and sometimes deadly consequence of exposure to severe psychological trauma. The current gold standard for the treatment of PTSD is exposure therapy. While often effective in reducing fear responses, the success of exposure therapy is often short-lived and followed by a return of fear symptoms that can culminate in a full-blown relapse. Achieving permanent fear reduction requires a better understanding of the involved brain networks and the underlying neural mechanisms that mediate fear extinction, specifically, fear extinction learning and recall. The amygdala is considered to be at the functional core of the brain networks involved in fear extinction, with other regions (e.g., prefrontal cortex and hippocampus) affecting amygdala function through top-down control. We propose to characterize the functional role of the subnuclei within the amygdala and the neural mechanisms with which other brain regions affect amygdala function during fear extinction learning and recall, through the use of stereotactic electroencephalography (SEEG) electrodes implanted in epilepsy patients. We will utilize the Pavlovian fear conditioning/extinction experiment, and record neural activity from the subnuclei within the amygdala (small-scale) and across the multiple brain regions (large-scale) during resting state, fear extinction learning/recall process, and single-pulse electrical stimulation. We will also determine the effect of basolateral amygdala electrical stimulation (BLAES) on fear extinction. Upon completing the proposed project, we will have gained a deeper understanding of the amygdala-mediated response during fear extinction and contribute to developing novel clinically practical “personalized” therapies for patients affected by PTSD.