



Heather Webber, PhD
Postdoctoral Research Fellow
Psychiatry and Behavioral Sciences

*Using Electroencephalogram to Measure Brain Responses in
Cocaine Use Disorder*

Heather Webber, Ph.D. is currently a postdoctoral research fellow at the Center for Neurobehavioral Research on Addiction at the University of Texas Health Science Center at Houston. Dr. Webber completed her bachelor's degree in Psychology at Montclair State University in New Jersey. She went on to complete her doctoral degree in Psychology at the University of South Florida in Tampa, Florida. In graduate school, she studied Cognitive Neuroscience with a minor in Psychopharmacology. The main method Dr. Webber uses to study the brain is Electroencephalography or EEG.

Dr. Webber's research seeks to identify biomarkers of reward and emotional functioning to better understand motivation and decision-making. Specifically, she is interested in individual differences in neurobiological factors associated with feedback-processing that lead to risky choice and impulsive behaviors in healthy adults and persons with substance use disorders. Her work takes a multidisciplinary approach by leveraging both basic and clinic research with the use of neurological (e.g., event-related potentials), physiological (e.g., heart rate variability), and pharmacological (e.g., genetics and drug manipulation) methods, with an eye towards setting the foundation for translational work on prevention, screening, and interventions for substance use disorders.

Abstract: Electroencephalogram (EEG) uses electrodes placed on top of the scalp to measure the electrical activity of the brain. Specifically, event-related potentials (ERPs) are changes in electrical activity measured by EEG that occur directly in response to specific events, such as viewing an image on a screen. Research measuring these responses has provided important information on how the brain attends to certain stimuli. For example, the late positive potential (LPP) is an ERP that occurs over the central-parietal electrodes, whose amplitude increases to interesting or "motivationally relevant" stimuli, such as pleasant or unpleasant compared to neutral images. The LPP could serve as an objective tool for assessing attention to motivationally relevant stimuli in individuals with substance use disorders, as drug cues are particularly relevant to drug users. The LPP was assessed in a sample of individuals with cocaine

use disorder (n=43). Participants viewed a slideshow of images (e.g., romantic scenes, objects, drug paraphernalia, accidents) while we recorded their EEG. K-means cluster analysis revealed two groups of cocaine users: one with larger LPPs to pleasant images compared to cocaine images ($P > C$) and one with larger LPPs to cocaine images compared to pleasant images ($C > P$). Future work is focusing on assessing if group membership predicts success in treatment and if neuromodulation techniques can rectify these LPP differences between groups.