

**The Hilda and Preston Davis Foundation Awards Program for  
Eating Disorders Research: Junior Faculty  
2019 Award Recipients**

- **Ann Haynos, Ph.D.**

Assistant Professor

*University of Minnesota*

Real-time fMRI Neurofeedback to Alter Limbic Disturbances and Eating Disorder Behavior in Anorexia Nervosa

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Treatment progress for anorexia nervosa (AN) has been slowed by inadequate translation of basic findings on the neurobiological mechanisms promoting AN into interventions. Therefore, there is an urgent need to develop novel approaches to altering the key neural processes implicated in the persistence of disordered eating in AN. AN is characterized by pronounced problems with emotion regulation that maintain eating disorder behaviors (e.g., restrictive eating) and do not resolve with standard treatment. Emerging evidence highlights disrupted functioning of brain regions involved in the limbic circuit (e.g., amygdala) in AN, which promotes emotion regulation deficits and, thereby, eating disorder symptoms. Individuals with AN demonstrate poor coordination between the amygdala and prefrontal cortex (a cognitive control region) and hyper-reactivity of the amygdala to aversive stimuli. However, there are no treatments for AN aiming to directly correct limbic disturbances. Real-time fMRI (rt-fMRI) neurofeedback is an innovative, non-invasive method for altering neural circuit disruptions that provides individuals visual data showing their moment-to-moment brain activity and allows them to use this information to alter neural activation in real time. rt-fMRI neurofeedback targeting limbic disturbances has been shown to have a positive clinical impact in psychiatric populations; however, this approach has not been examined in AN. In this study, participants with AN (n=32) will be randomly assigned to receive three sessions of rt-fMRI neurofeedback targeting down-regulation of the amygdala or the intraparietal sulcus, a sham brain region unrelated to emotional processing, while viewing aversive images. Effects of amygdala (versus sham) neurofeedback on limbic activation, emotion regulation, and eating disorder symptoms will be evaluated to establish the role of limbic circuitry in maintaining symptoms of AN, and the ability of rt-fMRI neurofeedback to alter this key neural mechanism. This study will determine the potential of rt-fMRI neurofeedback as a cutting-edge technology for correcting neurobiological mechanisms of AN.

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• **Joseph McGuire, Ph.D.**

Assistant Professor

*Johns Hopkins University*

Fear Conditioning and Extinction Learning In Anorexia Nervosa

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Anorexia nervosa (AN) is a chronic and debilitating condition characterized by an intense fear of weight gain that leads to compensatory learned behavioral responses (e.g., avoidance, restricted eating, excessive exercise). It predominantly onsets in adolescence and disproportionately affects women. Given its deleterious consequences, high morbidity, and alarming mortality, effective treatment of AN during adolescence is essential to diminish the burden of disease across the lifespan. Unfortunately, effective treatment for AN remains elusive. Most evidence-based treatments, including family-based treatment and cognitive behavioral interventions, involve some element of exposure with response prevention. Although fear conditioning and extinction learning play a key role in exposure-based treatments, there has been a surprising lack of systematic evaluation of fear conditioning or extinction learning in adolescents with AN.

This proposal will evaluate fear conditioning, extinction learning, and extinction recall in 40 adolescent females with AN and 40 matched controls using an immersive virtual reality fear conditioning/extinction task. Fear conditioning is the process of learning that something is threatening, whereas extinction learning is the process of forming and strengthening a new non-fear response to inhibit the learned fear response. Finally, extinction recall is the process of recalling extinction learning over time and across contexts. Extinction recall is essential to effectively inhibit learned fear responses across time and/or settings.

First, we will examine whether adolescents with AN have elevated fear conditioning. Second, we will evaluate whether adolescents with AN have impaired extinction learning. Third, we will determine whether adolescents with AN have impaired extinction recall. Finally, as food consumption and extinction learning have both been linked to estradiol levels, we will explore the relationship between estradiol and extinction learning/recall. By determining whether there are impairments in these processes among adolescents with AN, exposure-based treatments can be tailored to compensate for identified deficits in order to improve treatment outcomes.