The Hilda and Preston Davis Foundation Awards Program for Eating Disorders Research: Senior Postdoctoral Fellows 2018 Award Recipients

- **Anita Tusche, Ph.D.**
  Postdoctoral Fellow
  California Institute of Technology
  Mentor: Ralph Adolphs, Ph.D.

  Multimodal Markers of Relapse in Anorexia Nervosa
  High relapse rates among individuals with anorexia nervosa, together with alarmingly high mortality rates, are a major challenge in the treatment and aftercare of this eating disorder. Clinicians lack a battery of reliable objective markers that predict which patients will succeed or fail in maintaining a healthy weight after discharge. This project aims to inform a battery of such markers predictive of relapse, focusing on the mechanisms that underlie maladaptive dietary choice behaviors, a hallmark feature of anorexia nervosa, even after treatment. I will quantify the predictive value of behavioral and neural markers that characterize restrictive food choices and people's ability to flexibly change dietary choice patterns in order to maintain a healthy weight. Sophisticated computational models will characterize processes that drive heterogeneity in dietary success and its rigidity/flexibility. Behavioral measures will characterize faster processing speed of health and calorie concerns in individuals with anorexia nervosa and quantify their tendency to attend to calorie information more strongly during dietary choices. Brain responses (as measured with functional magnetic resonance imaging, fMRI) and brain structure (gray matter volume, MRI) in areas related to cognitive control will serve as biomarkers for the ability to flexibly alter these computations, mapping cognitive rigidity in dietary choice patterns in anorexia nervosa. Markers are compared to those in healthy controls. I will assess the power of these multimodal markers to predict relapses rates and symptom severity in individuals with anorexia nervosa after 6 months, using advanced regression models (machine learning techniques). The project could ultimately assist in the treatment and aftercare of those individuals at highest risk of relapse. It also opens up the possibility of a personalized medicine approach that considers the "fit" of an intervention for a specific individual, or subgroup of individuals, based on new computational characterizations of dysfunctional processes in this heterogeneous disease.

- **Blair Uniacke, M.D.**
  Postdoctoral Research Fellow
  Research Foundation For Mental Hygiene, Inc.
  Mentor: Joanna Steinglass, MD

  Reward-Based Learning in Anorexia Nervosa
  Alterations in reward processing and value-based decision making have been proposed as promising models to explain the perplexing behavior of self-starvation among individuals with Anorexia Nervosa (AN). Yet, specific differences in these processes between individuals with AN and their healthy peers have not been well characterized. We hypothesize that among adolescents with AN, behavior is shaped by avoidance learning more than approach learning, and that both learning rates differ from healthy individuals. We further hypothesize that individuals with AN will show differences in neural activation patterns associated with these learning patterns in model-based fMRI analyses. AN commonly begins during adolescence, which is also a developmental period associated with hypersensitivity to reward. Abnormalities in neural patterns during this phase of development may help explain the emergence of AN and may suggest targets for treatment development.

  This study will leverage advances from computational neuroscience and fMRI to rigorously investigate approach and avoidance learning in youth with AN 14-18 years old compared with healthy peers. Through model-based fMRI (i.e. computational modeling combined with fMRI), we can begin to understand how different parts of the brain carry out cognitive functions. We will employ model-based fMRI to 1) compare rate of learning from reward and punishment between adolescents with AN and healthy peers; 2) examine the underlying neural mechanisms; and 3) explore the relationship between reward learning and maladaptive eating behavior. These data will be used to identify individual variability in approach and avoidance learning parameters, which may have implications for actual eating behavior and treatment response. By examining associated brain activity, we can identify potential neural mechanisms of illness. This study will generate pilot data for a larger-scale grant proposal for NIMH, and serve as a foundation for development of expertise in reward systems in AN.