

# **Emotion Dysregulation: Consequences and Mechanisms**

**5<sup>th</sup> Purdue Symposium on Psychological Sciences**  
**Sponsored by the Department of Psychological Sciences at Purdue University**

Monday May 16 and Tuesday May 17, 2016  
Stewart Center 302/306, Purdue University, West Lafayette, IN

The Department of Psychological Sciences at Purdue University is pleased to host the fifth installment in its symposium series. This year's symposium gathers leading researchers in behavioral neuroscience and clinical psychology that use animal and human models to investigate the neuroscience of emotions and their impact on behavior.

Despite the multitude of laboratories investigating the neuroscience of emotions, there is a lack of interface between animal and human researchers, who would benefit from working together. The goal for this symposium is to pull together a range of scholars focusing on different aspects of the neuroscience of emotions, in order to encourage collaborations and cross-disciplinary initiatives to advance the field.

Symposium Coordinators:

**Susan Sangha, PhD**  
Assistant Professor,  
Behavioral Neuroscience

**Daniel Foti, PhD**  
Assistant Professor,  
Clinical Psychology

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*Each talk is 30 minutes with an additional 10 minutes for questions*

**Monday May 16, Stewart Center Room 302/306**

7:45 – 9:00 Registration & Breakfast

9:00 – 9:15 Opening remarks

*Session I. Negative urgency across disorders and species, Chair: Don Lynam*

9:15 – 9:20 Session introduction by Don Lynam

9:20 – 10:00 **Sheri L. Johnson**, UC Berkeley

Emotion-triggered impulsivity in the mood disorders

10:00 – 10:40 **Sarah Fischer**, George Mason University

Negative urgency and disordered eating

10:40 – 11:00 General discussion led by Don Lynam

11:00 – 12:30 Lunch provided

*Session II. Anhedonia across depression and schizophrenia, Chair: Daniel Foti*

12:30 – 12:35 Session introduction by Daniel Foti

12:35 – 1:15 **Greg Siegle**, University of Pittsburgh

Tailored interventions for individual differences in mechanisms of emotion dysregulation

1:15 – 1:55 **Greg Strauss**, Binghamton University

Emotion regulation in schizophrenia: when trying is not enough

1:55 – 2:35 **Deanna Barch**, Washington University in St. Louis

Emotion/cognition in depression and schizophrenia

2:35 – 2:55 General discussion led by Daniel Foti

3:00 – 3:15 Coffee and snacks

*Session III. Interaction of stress and feeding/eating disorders, Chair: Kim Kinzig*

3:15 – 3:20 Session introduction by Kim Kinzig

3:20 – 4:00 **Lori Zeltser**, Columbia University

Gene x environment interactions that promote anorexia-like behavior in mice

4:00 – 4:40 **Kelly Klump**, Michigan State University

Critical roles for puberty and ovarian hormones in the etiology of eating disorders: Evidence from human and animal models

4:40 – 5:00 General discussion led by Kim Kinzig

**Tuesday May 17, Stewart Center Room 302/306**

7:45 – 9:00 Registration & Breakfast

Session IV. Learning to inhibit the fear response, Chair: Susan Sangha

9:00 – 9:05 Session introduction by Susan Sangha

9:05 – 9:45 **John Christianson**, Boston College

Prefrontal and insular contributions to resilience to social anxiety

9:45 – 10:25 **William Truitt**, Indiana University School of Medicine

Reducing anxiety with social familiarity

10:25 – 10:45 Coffee

10:45-11:25 **Steve Maren**, Texas A&M University

Neural mechanisms of fear relapse

11:25 – 12:05 **Mohammed Milad**, Harvard Medical School

Fear extinction: her brain and his brain

12:05 – 12:25 General discussion led by Susan Sangha

12:30 – 1:30 Lunch provided

Session V. Interaction of stress and drug seeking, Chair: Julia Chester

1:30 - 1:35 Session introduction by Julia Chester

1:35 – 2:15 **Nicholas Gilpin**, LSU Health Sciences Center

Amygdala mediates hyperalgesia associated with stress and alcohol dependence

2:15 – 2:45 **Jeff Weiner**, Wake Forest School of Medicine

Unraveling the neurobiological substrates responsible for comorbid anxiety disorders and alcoholism

2:45 – 3:25 **Helen Fox**, Stony Brook University

Stress and emotion regulation during early abstinence from substance abuse

3:25 – 3:45 General discussion led by Julia Chester

Speaker Abstracts (in conference order)

### ***Session I. Negative urgency across disorders and species***

**Sheri L. Johnson**, University of California at Berkeley

*Emotion-triggered impulsivity in the mood disorders*

The focus of this talk will be on empirical work suggesting that urgency is elevated in mood disorders and important for outcomes. Among those at risk for bipolar disorder, those diagnosed with bipolar disorder, and those diagnosed with major depressive disorder, emotion triggered impulsivity is more robustly elevated than are other forms of impulsivity. In a study of adolescents in residential care, emotion-related impulsivity was tied to suicidal ideation and number of suicidal attempts. Within bipolar disorder, emotion-related impulsivity predicts aggression and suicidality, as well as poor quality of life and functional impairment.

**Sarah Fischer**, George Mason University

*Negative urgency and disordered eating*

Negative urgency is defined as the tendency to act rashly during the experience of distress. It is associated with binge eating cross-sectionally, prospectively, in clinical and non-clinical samples, and in longitudinal studies of school age youth. Recent studies utilizing fMRI, experimental methods, and ecological momentary assessment point to potential mechanisms through which this trait may influence pathological eating behavior. For example, two experimental studies indicate that individuals with high levels of negative urgency are more likely to impulsively eat following shifts in arousal. Data suggests that individual differences in this trait are a risk factor for eating disorders, and play a role in the maintenance of binge eating via affect regulation mechanisms.

### ***Session II. Anhedonia across depression and schizophrenia***

**Greg Siegle**, University of Pittsburgh

*Tailored interventions for individual differences in mechanisms of emotion dysregulation*

I will present data suggesting that there are multiple patterns of emotion dysregulation in depression including high levels of reactivity, blunted reactivity to all emotional information, and anhedonia. I will suggest these patterns are associated with different neural mechanisms and thus, may be appropriate for qualitatively different types of targeted interventions. I will summarize our group's work pursuing a few such interventions.

**Greg Strauss**, Binghamton University

*Emotion regulation in schizophrenia: When trying is not enough*

Prior studies provide evidence for increased stress reactivity in schizophrenia, which is associated with disease liability, increased severity of psychotic symptoms, and poor functional outcome. The current presentation proposes that these abnormalities are best conceptualized as an impairment in emotion regulation, rather than emotional reactivity. Data from several recent studies using electrophysiology, eye tracking, and ecological momentary assessment will be presented to support this proposal. Findings are interpreted through the conceptual framework of the updated process model of emotion regulation and it is concluded that individuals with schizophrenia have abnormalities at all three stages of emotion regulation (identification, selection, implementation), which lead to more frequent emotion regulation attempts that are unfortunately ineffective at reducing negative emotion.

**Deanna Barch**, Washington University in St. Louis

*Emotion/cognition in depression and schizophrenia*

Motivational and hedonic impairments are core aspects of a variety of types of psychopathology. These impairments cut across diagnostic categories and may be critical to understanding major aspects of the functional impairments accompanying psychopathology. Given the centrality of motivational and hedonic systems to psychopathology, the RDoC initiative includes a “positive valence” systems domain that outlines a number of constructs that may be key to understanding the nature and mechanisms of motivational and hedonic impairments in psychopathology. These component constructs include initial responsiveness to reward, reward anticipation or expectancy, incentive or reinforcement learning, effort valuation, and action selection. In this talk I review behavioral and neuroimaging studies providing evidence for impairments in a subset of these constructs in individuals with psychosis versus in individuals with depressive pathology

**Session III. Interactions of stress and feeding/eating disorders**

**Lori Zeltser**, Columbia University

*Gene x environment interactions that promote anorexia-like behavior in mice*

A major obstacle to developing new treatments for anorexia nervosa is the lack of animal models that recapitulate the pattern of disease onset typically observed in human populations. The Zeltser lab developed a novel translational mouse model to study interactions between genetic, psychological and biological risk factors that promote anorexic behavior. This model incorporates several factors that are consistently associated with increased risk of anorexia – adolescent females, genetic predisposition to anxiety imposed by the Brain-derived growth factor (BDNF)-Val66Met gene variant, social isolation stress and caloric restriction. We are beginning to identify signaling pathways in the brain that drive anorexic behavior in our model, with the ultimate goal of identifying novel therapeutic targets for anorexia.

**Kelly Klump**, Michigan State University

*Critical roles for puberty and ovarian hormones in the etiology of eating disorders: Evidence from human and animal models*

Eating disorders are significantly heritable in adulthood. However, genetic effects on disordered eating symptoms show dramatic developmental shifts across adolescence and puberty that provide important clues about neurobiological systems involved in their etiology. This talk will review findings from developmental twin and animal studies implicating puberty and ovarian hormone functioning in the genetic diathesis for disordered eating symptoms.

**Session IV. Learning to inhibit the fear response**

**John Christianson**, Boston College

*Prefrontal and insular contributions to resilience to social anxiety*

Exposure to traumatic stressors has several consequences including social anxiety. Stressor sensitization of the serotonin system mediates stress induced social anxiety but this is prevented by psychological factors including coping and safety signals. I will review the evidence that indicates these factors engage the prefrontal and insular cortex, respectively, to blunt stressor induced neuronal activity leading to a resilient phenotype.

**William Truitt**, Indiana University School of Medicine

*Reducing anxiety with social familiarity*

Social support is a powerful tool for reducing anxiety, and is a critical component of successful anxiety treatments such as interpersonal therapies. Similarly, social familiarity reduces anxiety-like behavior in rats. Using the social interaction habituation protocol, rats learn to reduce anxiety-like responses to an aversive stimulus through social familiarity training. This social familiarity-induced anxiolysis (SoFiA) appears to be a form of safety learning that is dependent on the ventral medial prefrontal cortex and the amygdala. Furthermore, SoFiA learning is selectively disrupted following mild traumatic brain injury, which may result from a disrupted cortico-limbic network.

**Stephen Maren**, Texas A&M University

*Neural mechanisms of fear relapse*

While it is generally adaptive to rapidly learn about threats in the environment, this form of learning can lead to psychopathology including post-traumatic stress disorder (PTSD). In the clinic, exposure therapy is an effective method for suppressing pathological fear, but relief can be transient and prone to relapse. Recent work from my laboratory has explored the neural mechanisms underlying fear relapse after extinction, a form of learning that models exposure therapy in humans. Interestingly, extinction memories are labile and fear relapses upon the passage of time and changes in context. The return of fear after extinction is consistent with the proposal that extinction results in a new inhibitory memory that is formed along side the excitatory fear memory. We have now identified a network of brain structures in the rat including the amygdala, hippocampus, and prefrontal cortex that contribute to regulation of fear responses after extinction. In particular, we show using electrophysiological and cellular imaging approaches that reciprocal hippocampal-prefrontal circuits control fear output by regulating amygdala neurons involved in fear expression.

**Mohammed Milad**, Harvard Medical School

*Fear extinction: Her brain and his brain*

The study of the neural correlates of fear extinction has moved forward in the past decade. The plethora of data published in this domain have identified a network of brain regions, the function of which appears critical in mediating conditioned fear learning and fear inhibition. These same regions appear to also be dysfunctional in patients with anxiety disorders such as posttraumatic stress disorder. One aspect that lags behind in this field is the understanding of how sex hormones may influence and interact with the function of this network in the context of fear inhibition. I will present translational data to show the role of sex hormones, estrogen in particular, in fear extinction and how such hormones may modulate the functional reactivity of this network. Data will be presented showing that estrogen enhances the functional activation of the ventromedial prefrontal cortex in both female rats and in women. More recent data will also be presented showing that oral contraceptives may impair fear extinction in women. Lastly, recent evidence showing that a single administration of estrogen to women may help facilitate fear extinction will be presented. These data raise a number of issues that will be discussed regarding the clinical implications to the potential use of estrogen as adjunct to therapy. The potential interactions between oral contraceptives and fear extinction will also be discussed.

## **Session V. Interaction of stress and drug seeking**

**Nicholas Gilpin**, LSU Health Sciences Center

*Amygdala mediates hyperalgesia associated with stress and alcohol dependence*

Humans diagnosed with alcohol use disorder (AUD) and stress disorders exhibit altered pain signaling, and report altered pain sensitivity. For example, humans with AUD are more sensitive to painful stimuli during withdrawal, which suggests that some humans drink alcohol to relieve pain, and that alcohol drinking worsens pain outcomes. Alcohol-dependent rats exhibit increases in nociceptive sensitivity during withdrawal, and stress can produce analgesia or hyperalgesia based on experimental parameters. This talk describes the results of studies that used behavioral pharmacology and optogenetic techniques to test the roles of 1) central amygdala, 2) brain corticotropin-releasing factor type-1 receptor (CRFR1) signaling, and 3) melanocortin type-4 receptor (MC4R) signaling in hyperalgesia produced by traumatic stress or alcohol dependence. Our results suggest that alcohol dependence and traumatic stress produce neuroadaptations relevant for nociceptive signaling, and that these neuroadaptations are a promising therapeutic target for reducing pain in humans with AUD and/or stress disorders.

**Jeff Weiner**, Wake Forest School of Medicine

*Unraveling the neurobiological substrates responsible for comorbid anxiety disorders and alcoholism*

Although anxiety disorders and alcoholism frequently co-occur, the neural substrates responsible for this comorbidity are unclear. This talk will review recent studies demonstrating that a simple rodent adolescent social isolation procedure leads to the expression of numerous behavioral risk factors for both disorders, including enduring increases in anxiety measures and ethanol self-administration. The results of neurobiological studies that have uncovered mesolimbic adaptations that may contribute to the “addiction vulnerable” phenotype engendered by this model will also be presented. Together, these studies provide initial support for the face, construct and predictive validity of adolescent social isolation as a model of heightened vulnerability to comorbid anxiety disorders and alcohol dependence and highlight the potential utility of this model in identifying neurobiological substrates that may contribute to the strong association between these diseases.

**Helen Fox**, Stony Brook University

*Stress and emotion regulation during early abstinence from substance abuse*

The ability to regulate affect and emotion as well as the manner in which emotion regulation is compromised may be critical to outcome during early abstinence from substance abuse. For example, both internal and external stressors may be pivotal in impinging upon one’s ability to regulate cognitively and successfully manage negative affect. Moreover, these processes may underlie a range of goal-oriented behaviors associated with treatment outcome, including impulse control, planning and organizational skills. Bio-behavioral data is presented delineating stress system sensitization as well as cognitive and emotional dysregulation during early abstinence from alcohol and cocaine. The potential role of these stress and regulatory mechanisms in the development of relapse medications will also be discussed.