

**Society for Prevention Research  
26<sup>th</sup> Annual Meeting  
Washington, DC**

**Pre-Conference Workshop IV**

**Date:** Tuesday, May 29, 2018

**Time:** 8:30 am – 5:00 pm

**Applications of neuroscience for prevention scientists: Core concepts and emerging directions**

**Organizer and Presenter:** Lawrence Sweet, Ph.D., University of Georgia

**Presenters:** Adriana Galvan, Ph.D., University of California, James MacKillop, Ph.D., McMaster University, Michael McCormick, Ph.D., Auburn University, Uraina Clark, Ph.D., Icahn School of Medicine, Allen Barton, Ph.D., University of Georgia

All presenters are also affiliated with the Center for Translational and Prevention Science (CTAPS), a P30 Core Center of Excellence funded by the National Institute on Drug Abuse (P30 DA027827; PI: G. Brody)

**Description:**

This workshop is designed to provide attendees with instruction on core concepts and emerging directions regarding the application of magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI) techniques to prevention science. MRI and fMRI analyses represent a rapidly growing field in basic and applied research, providing scientists and clinicians with information on brain activity and neural systems that may underlie risk-taking behavior and impaired health. In this workshop, participants will be given an overview of MRI and fMRI methodology as well as specific applications of neuroscience to topics such as risky decision making, delay of gratification, and early life stress. Procedural considerations for conducting longitudinal MRI and fMRI research with adolescent and understudied populations will also be addressed.

The 7 presentations comprising this workshop contain the following specific learning objectives.

Presentation 1

- Identifying brain regions and brain systems of potential interest to prevention scientists
- Interpreting results from published MRI and fMRI studies

Presentation 2

- Describing neural correlates of risky decision making in adolescents and young adults
- Describing how risky decisions are simulated in the neuroimaging environment and assessed using neural and behavioral measures

Presentation 3

- Comparing different behavioral and brain imaging paradigms used to measure delay discounting and their relevance to prevention science
- Administering, scoring, and interpreting a delay discounting assessment

#### Presentation 4

- Describing the conceptual foundation of resting state functional connectivity and how to quantify it
- Identifying functional brain networks studied via resting state functional connectivity

#### Presentation 5

- Identifying brain regions susceptible to early life stress
- Comparing different neuropsychological assessments related to early life stress

#### Presentation 6

- Identifying procedures that facilitate the effective recruitment of adolescent and understudied populations into MRI studies
- Implementing protocols that improve MRI data quality with adolescent and understudied populations

#### Presentation 7

- Learning software for graphically depicting brain networks as they function over time

## Target workshop audience:

This workshop is geared toward researchers and practitioners who are interested in the application of neuroscience to the field of prevention science. The content of this workshop is designed to be accessible and informative for attendees from all backgrounds, from those with little or no previous experience in neuroscience to researchers currently conducting their own studies with MRI and fMRI scans.

## Materials provided to attendees:

### Presentation 1

- Handout describing brain regions of potential interest in prevention science research
- Handout of published MRI results with interpretation guides

### Presentation 2

- Handout of behavioral paradigms to assess risky decision making

### Presentation 3

- Software to score delay discounting measure

### Presentation 4

- Handout of common brain networks studied with functional connectivity

### Presentation 5

- Handout of assessments for studying early life stress and its neuropsychological effects

### Presentation 6

- Handout of protocols for recruiting and scanning understudied populations

### Presentation 7

- Link to access brain network graphing tool

## Presenters:

**Dr. Lawrence Sweet** is a neuropsychologist and an expert on multi-sequence MRI techniques, including functional, structural, and perfusion imaging approaches. Dr. Sweet has a particularly extensive background in fMRI experimental design, data analysis, and interpretation. His research program uses neuropsychological and neuroimaging methods to investigate neurocognitive and affective functioning in at-risk populations. He routinely acquires, analyzes, and interprets multi-sequence MRI data and has trained numerous investigators, postdoctoral fellows, and research assistants to conduct all aspects of fMRI research.

**Dr. Adriana Galván's** research expertise is in developmental, social, and cognitive neuroscience. During the past 10 years, she has examined the ways in which developing neural systems influence characteristic adolescent behavior, including heightened risk taking, reward sensitivity, and impulsivity. Her work has shown an exaggerated engagement of limbic and affective regions (e.g., striatum and amygdala) and delayed maturation of regulatory regions (e.g., prefrontal cortex) in adolescents compared with children and adults. Her recent

studies have examined the developing brain in context by examining social (family, peers) and hormonal influences in shaping the brain.

**Dr. James MacKillop's** research program uses behavioral economics and neuroeconomics to understand drug and alcohol addiction. This approach uses a blend of experimental psychology, microeconomics, and cognitive neuroscience to understand maladaptive decision making in drug addiction. His primary tools are decision-making paradigms that can be used in both behavioral and fMRI assessments. These paradigms index impulsivity, risk taking, cost-benefit decision making, and drug incentive salience.

**Dr. Mike McCormick** is a social neuroscientist whose program of research focuses on resting state functional connectivity and the neuroscience of risky decision making, framing, and information processing. Dr. McCormick has conducted research in multiple phases of neuroanalysis, with particular expertise in computational approaches for analyzing resting state functional connectivity. Dr. McCormick has also trained scientists from a variety of disciplines in resting state functional connectivity and its application to their areas of research.

**Dr. Uraina Clark** has expertise in assessing cognitive and affective abnormalities in neuropsychiatric patient populations, with an emphasis on conditions that affect frontal-subcortical systems (e.g., alcoholism, chronic stress, Parkinson disease, HIV, and aging). Dr. Clark's research utilizes structural and functional neuroimaging techniques, as well as neuropsychological assessment, to investigate the underpinnings of neurobehavioral impairments in adults. Her current program of research examines the ways in which psychosocial variables (e.g., chronic stress and early life stress) and biological characteristics (e.g., HIV-related disease variables) contribute to an elevated risk of cognitive and affective abnormalities in individuals with HIV.

**Dr. Allen Barton's** research focuses on family-centered prevention science for at-risk populations. Dr. Barton research uses multi-level, longitudinal cohort studies and randomized prevention trial to (a) test causal hypotheses involving family process and biological, neurocognitive, and psychosocial outcomes, and (b) evaluate the efficacy and mechanisms of impact of newly-developed family-centered prevention programs. Dr. Barton has overseen the development of study protocols and procedures on multiple research studies with MRI scans that involved samples composed of rural African American youth and young adults. In these studies, Dr. Barton has been responsible for coordinating research activities across the project life cycle, including study design, participant recruitment, study protocol administration, data processing, and data analyses.

## **Outline of workshop**

8:30-8:45      **Introductions and orientation to the workshop**

8:45 – 9:45      **What is neuroscience and how can it benefit prevention science?**

*Presenter: Lawrence Sweet*

### A. Lecture Content

- What is neuroimaging and how can it benefit prevention scientists?
- What types of data can be collected from magnetic resonance imaging? How is each type analyzed and interpreted?

- Morphometry (structural MRI)
- Functional MRI (fMRI)
- Functional connectivity
- What are the various brain regions and their functions?
  - What do morphological findings represent?
  - What do functional connectivity findings represent?
  - What do patterns of fMRI brain response represent?

#### B. Hands-on activity

- Interpreting brain MRI results
  - Morphometry
  - Functional connectivity
  - fMRI brain activation

### 9:45 – 10:45 **Paradigms of risky decision making**

*Presenter: Adriana Galván*

#### A. Lecture Content

- Why are risky decision making and its neural correlates important to prevention scientists?
- What behavioral measures assess risky decision making?
- What is an fMRI paradigm, and what paradigms have been used to assess risky decision making?
- How do normative maturational changes in the adolescent brain yield increases in risky decisions?

#### B. Hands-on activity

- Administration of common tasks used to quantify risky decision making

### 10:45 – 11:00 **Break**

### 11:00 – 12:00 **Understanding the role of delay discounting in drug abuse**

*Presenter: James MacKillop*

#### A. Lecture Content

- What is temporal discounting of rewards?
- How is delay discounting (DD) relevant to prevention efforts, particularly for drug and alcohol abuse?
- What behavioral and brain imaging paradigms are used to measure discounting of delayed rewards?
- What is the neural basis of reward preferences (i.e., brain regions associated with DD)?

#### B. Hands-on activity

- Administration and scoring of DD task
- Analysis and interpretation of DD data

12:00 – 1:00 **Lunch Break**

1:00 – 2:00 **The brain at rest**  
*Presenter: Michael McCormick*

A. Lecture Content

- What is resting state functional connectivity (rsFC)?
- How is rsFC relevant to prevention efforts, particularly for drug and alcohol abuse?
- How is rsFC quantified?
- What are some of the functional networks that are commonly studied?

B. Hands-on activity

- Quantifying rsFC

2:00 – 3:00 **Early life stress and the brain**  
*Presenter: Uraina Clark*

A. Lecture Content

- What effect does early life stress (ELS) have on health in adulthood, including substance use and neuropsychiatric conditions?
- How does ELS exposure create changes in brain structure, functioning, and performance that contribute to psychopathology and poor health?
- What assessments are used for studying ELS and its effects on neurocognitive functioning and development?

B. Hands-on activity

- Administration of measures (e.g., psychological questionnaires, behavioral measures, neuropsychological measures) relevant to the study of ELS

3:00 – 3:15 **Break**

3:15 – 3:45 **Neuroscience research with adolescents and understudied populations**  
*Presenter: Allen Barton*

A. Lecture Content

- How can recruitment, engagement, and data quality be improved when conducting fMRI research with adolescents and/or understudied populations?
- What study protocol considerations are important for participant retention in longitudinal MRI studies?
- What are common challenges in collecting different types of imaging data?
  - o Structural
  - o Resting state
  - o Task-based

B. Hands-on activity

- Participant engagement material
- Scanner protocol illustrations

3:45 – 4:15 **Auburn Neural Network App**  
*Presenter: Michael McCormick*

A. Lecture Content

- What is the Auburn Neural Network App (ANNA)?
- What are the capabilities and implications of ANNA for prevention research?

B. Hands-on activity

- Demonstration of ANNA

4:15 –4:25 **Break**

4:25 – 5:00 **Discussion and Questions**