

Understanding the Risk for Neuropsychiatric Disorders Using Functional Brain Imaging

John G. Kerns

University of Missouri-Columbia

fMRI

- Functional magnetic resonance imaging
- Non-invasive recording of mental activity
 - Repeated scanning

Neuropsychiatric Disorders

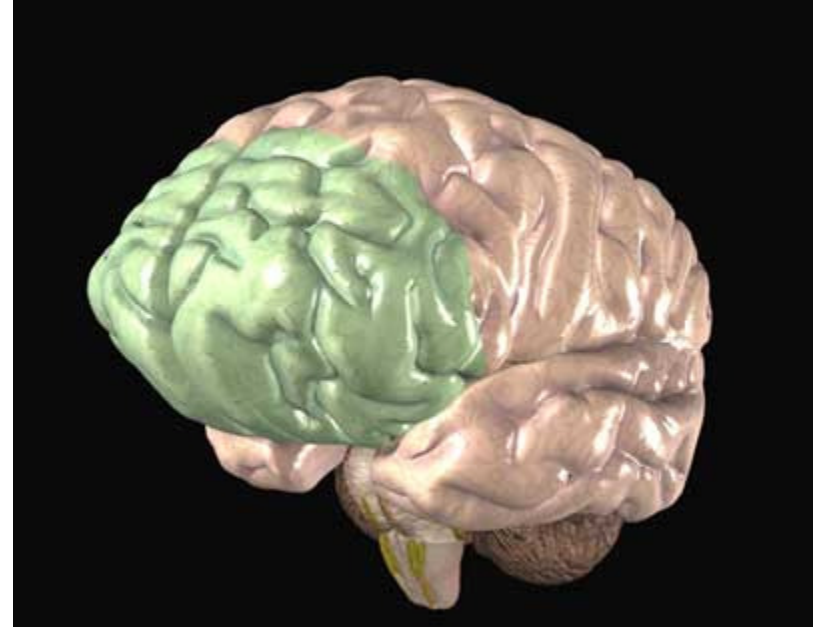
- Chronic disorders, long-term disability
- Detection & prevention

Loss of Control

- Schizophrenia
- Drug addiction

Prefrontal Cortex (PFC)

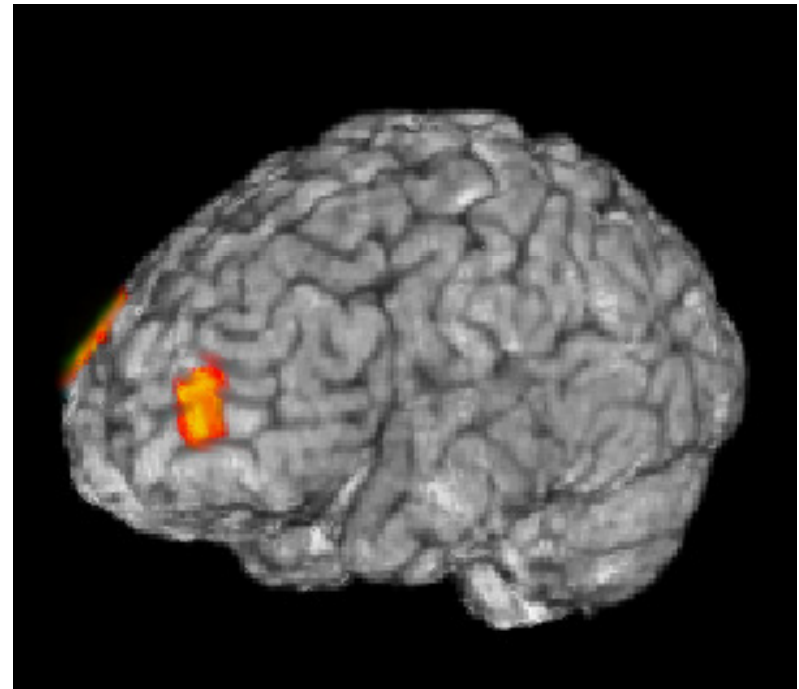
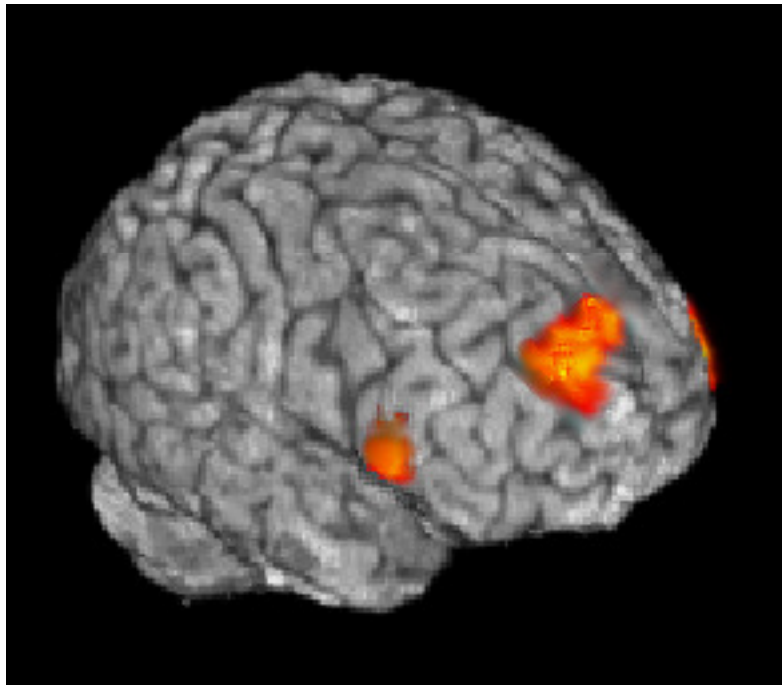
- Biases processing in rest of brain



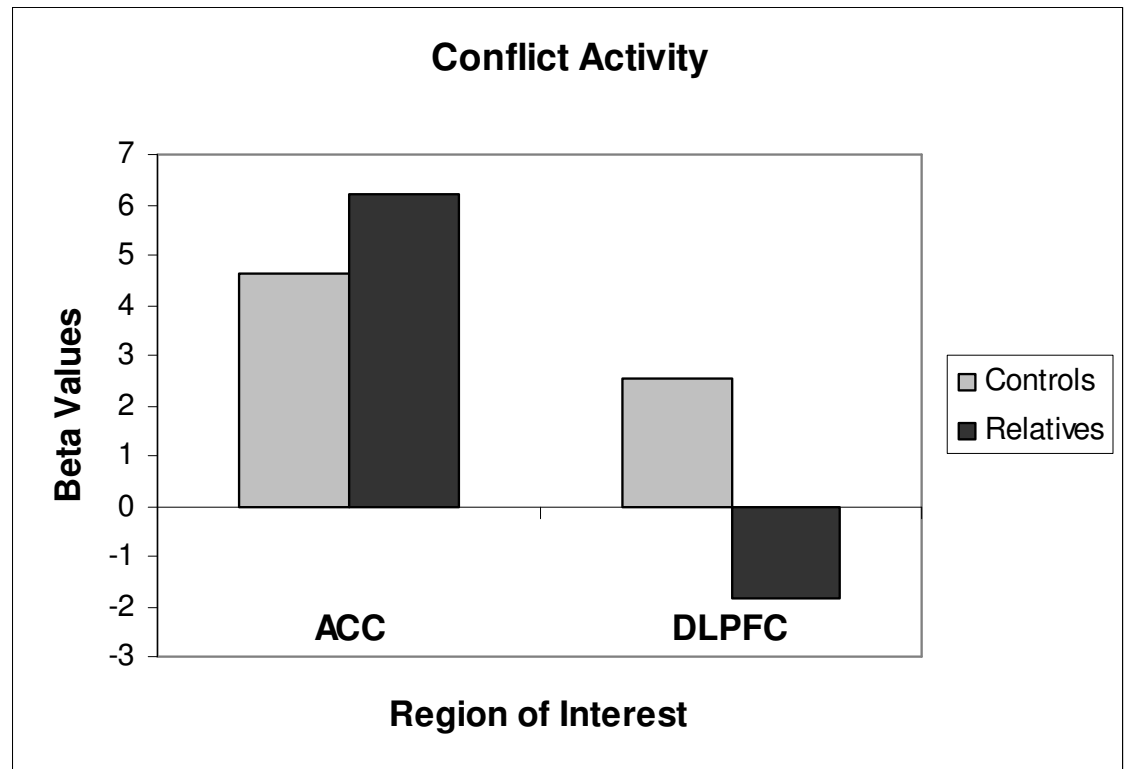
Brain Imaging and Prefrontal Cortex Dysfunction

- Can we detect before illness onset?
- Can it be caused by early substance use?
- How to treat?

PFC Deficit in Schizophrenia



PFC Deficit in Relatives



Schizophrenia Prefrontal Dysfunction

- Related to genetic risk
- Imaging research can detect increased risk

Schizophrenia Age of Onset

- Late adolescence and early adulthood
- Why this age of onset?

Adolescent Brain Development

- Late maturation of prefrontal cortex

Drug-Induced Brain Injury?

- Can insults to brain development help cause schizophrenia?
 - Extreme alcohol use?

Animal Alcohol Exposure

- Prefrontal damage
- Especially in adolescent/young adult rats

Human 21st Birthday Drinking

- At least 21 drinks
 - 34% of males
 - 24% of females

21st Birthday Drinking

- Estimated BAC of 0.26 (medically serious consequences)
 - 49% of males
 - 35% of females

fMRI & 21st Birthday Drinking

- People likely to extreme drink
- Scan at 3 time points
 - 2 weeks before 21st birthday
 - 3 days after 21st birthday
 - 5 weeks after 21st birthday
- Will extreme drinking predict PFC dysfunction?

Preventing Extreme Drinking

- Normative information decreases drinking on 21st birthday
 - All participants will be given this information
 - Expect them to drink less by being in our study

PFC Deficits

- How to treat?

Attention Shaping

- Monetary rewards
- Rewarding successive approximations
 - e.g., 30 seconds; then 45 seconds
- Increases attentiveness in schizophrenia

fMRI & Attention Shaping

- Does treatment increase PFC activity in schizophrenia?
- Or does it increase activity elsewhere in brain?
- Can this be used to refine treatment?

Brain Imaging and Prefrontal Cortex Dysfunction

- Detectable before illness onset
- Can it be caused by early substance abuse?
- How to treat?