Controversial Topics in Gambling: Alberta Gambling Research Institute's 13th Annual Conference

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Neural Correlates of Emotion Regulation: Implications for Gambling

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Research Team and Funders

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• Emotion regulation & attentional control are features in many models of human psychopathology
  – Mood disorders
  – Suicide
  – ADHD
  – Substance abuse and addiction
  – Criminality
  – Pathological gambling

  – Maladaptive behaviours may be to escape from/or to down-regulate emotional experience

• Emotion – Attention interactions in the Brain
  – Adolescents with mental health concerns
  – Healthy adolescents
The Population

• Adolescents with chronic mental health disorders (mood disorders & ADHD): CASA House, voluntary treatment program for adolescents (12-18 yrs)

• History of not responding to previous traditional intervention, require higher degree of intensive treatment, all have tried medication

• Feelings of hopelessness, suicidal thoughts and behaviors, high anxiety, inability to concentrate on task completion, poor academic performance, disregard for authority, verbal and/or physical aggression, and low tolerance for frustration

• History of abuse
Mixed Methods

• Intervention
  – Mindfulness-Based Stress Reduction (MBSR)

• Quantitative
  – Neuroimaging
    • fMRI & ERP with emotional oddball
    • DTI & Resting State
  – Mental health, scholastic performance, quality of life, stress, coping style, attention control (ToVA) emotion regulation (ERQ), CAMM

• Qualitative
  – individual structured interview
Attentional control & emotion processing are sub-served by two separate but integrated & (perhaps) reciprocal networks.

**Dorsal:** attention-control system

**Ventral:** emotion processing system

From Iordan et al., (2013). *Frontiers in Human Neuroscience*
The Emotional Oddball Task

ERP of Interest Elicited During EOT

P100

LPP

P300

fMRI Evidence for Separable Executive and Emotional Networks in Healthy Adults with EOT

Yamasaki et al., (2002) PNAS
Main Research Objectives

- Investigate emotion & attention systems during an emotional oddball task (EOT) with infrequent emotional distraction in adolescents suffering from affective disorders (before and after MBSR therapy).

- Combine neuroimaging methods to provide a comprehensive picture of the spatial & temporal dynamics in the brain during emotional and cognitive aspects of the EOT.
Groups

Adolescents with chronic mental health disorders (N=33)
~ Half receive MBSR therapy
Control comparison group (N=20)

Two neuroimaging sessions

ERP Session (256 electrode net)
fMRI Session (1.5T)

Modified emotional oddball task (sad, fear & neutral images).
4 stimulus sets
Each 56 pictures (9.5% of trials), 68 targets (11.5% of trials), and 465 scrambled (79% of trials)

Examine patterns in ERP: P100, P300 & LPP
fMRI: ventral & dorsal regions
Attentional Control Score (ToVA)
Subjective Stress

Perceived Stress Scale

Subjective Stress

CASA HC

Perceived Stress Scale

CASA

HC

Perceived Stress Scale
Reaction Time to Images During fMRI

Shafer et al., (2011). NFSI & ICBEM

N = 14
Fear vs. Sad Images: RT and Amygdala Activation

Shafer et al., (2011). NFSI & ICBEM
Reaction Time to Targets During fMRI

Shafer et al., (2011). NFSI & ICBEM
Decreased vs. Increased Activation in dIPFC for Emotional Images and Targets—After Images

Dorsal-lateral Prefrontal Cortex

Images

Targets after Images

Time (TR; 1 TR = 2 seconds)

% Signal Change

Shafer et al., (2011). NFSI & ICBEM
Decreased vs. Increased Parietal Activation for Emotional Images and Targets After Images

Shafer et al., (2011). *NFSI & ICBEM*
RT to Images & Targets Shows Negative Relationship with Attentional Control

Shafer et al., (2013) Society for Neuroscience

N = 33
RT in Response to Images During ERP Task

P100 in Response to Images

LPP in Response to Images

P300 in Response to Targets

Increased RT to arousing fearful images was reflected in amygdala activation & P100 amplitude in clinical sample

Decreased dorsal stream activation associated with fearful images

- Increased dorsal stream activation associated with targets after fearful stimuli
  - dLPFC
  - LPC
  - Larger P300 to targets following emotional images compared to HC

Taken together these results support a brain-based model of reduced control following emotional distraction in at-risk youth. Future research is needed to explore possible links with problem gambling