EARLY BRAIN & BIOLOGICAL DEVELOPMENT A SCIENCE IN SOCIETY SYMPOSIUM

Dr. Ruth Lanius

The Aftermath of Adverse Childhood Experiences: Posttraumatic Stress Disorder and Beyond

Alberta family wellness initiative

Where science meets real life

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Collaborators

- PTSD Research Team: Melody Chow, Maria Densmore, Nancy Mazza, Stephanie Nevill, Jennifer Ryder, Suzy Southwell

- LHSC Traumatic Stress Service: Joanne Charron, Marie Fitzsimmons, Susan Glanfield, Anne Joynt, Karen Schurmans, Barb Smith, Nancy Wardrop

- Others: Robyn Bluhm, Nick Coupland, Paul Frewen, Kathy Hegadoren, Jim Hopper, Richard Lane, Jim Neufeld, Clare Pain, Peter Williamson

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Overview

- Review the broad physical effects of adverse childhood experience
- Describe the psychological sequelae of childhood maltreatment with a focus on posttraumatic stress disorder (PTSD) and self-dysregulation, including emotion and interpersonal dysregulation
- Examine neural correlates of emotion, interpersonal and self dysregulation in subjects with PTSD related to early life trauma
- Discuss the implications of these findings for attachment and intergenerational transmission of trauma and treatment

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The Adverse Childhood Experiences (ACE) Study

- **The largest study of its kind ever done to examine the medical, social, and economic effects of adverse childhood experiences over the lifespan (18,000 participants)**

Felitti, 1998

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What Includes Adverse Childhood Experiences?

- **Childhood emotional, physical and sexual abuse and neglect**
- **Growing up with domestic violence, substance abuse, parental loss, or crime**

Felitti, 1998

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ACE Study Findings

Adverse childhood life experiences affect adult:

- **Disease burden and medical care costs**
- **Well-being, depression, and suicide rates**
- **Alcoholism and drug use**
- **Job performance and disability**
- **Subsequent generations**

Adverse childhood experiences are associated with the ten most common causes of death in the United States

Top 10 Risk Factors: **smoking, severe obesity, physical inactivity, depression, suicide attempts, alcoholism, illicit drug use, injected drug use, 50+ sexual partners, history of STD.**

Psychological Sequelea of Early Adverse Experience

PTSD (DSM IV) Symptoms

- Exposure to traumatic event
- Re-experiencing
- Avoidance / numbing
- Hyperarousal
- Symptoms cause functional impairment

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Complex PTSD

DISORDERS OF EXTREME STRESS NOS

- **Alterations in regulating affective arousal**
- **Alterations in attention and consciousness**
- **Somatisation**
- **Chronic characterological changes**
- **Alterations in systems of meaning**

Herman, 1996

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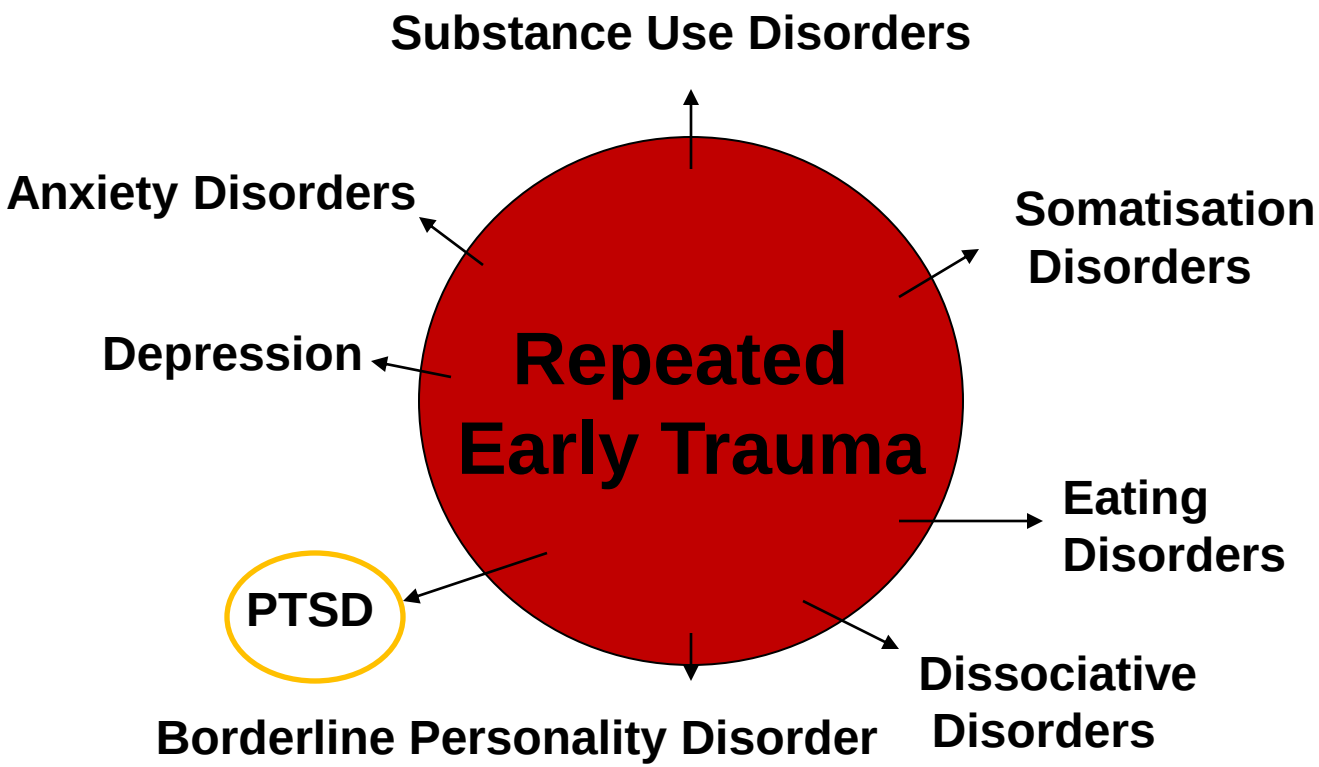
Psychiatric Comorbidity of Repeated Early Life Trauma



Fraser, 1998

In addition to PTSD, early life trauma is associated with an impaired sense of self and self-awareness as well as significant disturbances in emotion regulation and interpersonal functioning

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Prevalence of PTSD Related to Early Life Trauma

- The DSM-IV field trials for PTSD identified the prevalence of PTSD in a combined community and clinical sample as 77% for childhood sexual abuse and 45% for childhood physical abuse and 85% for individuals with physical and sexual abuse (Roth et al., 1997, Cloitre et al., 1997; O`Neill et al., 1991; Rowan et al., 1994).

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Prevalence of Childhood Abuse in Mental Health Care Settings

- In mental health settings, the rates of reported childhood abuse range from 35% to 50%, depending on the service (Cloitre et al., 1996).

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Factors Increasing Vulnerability to PTSD

- Genetic vulnerability
- Female gender
- History of psychiatric illness (e.g., depression, anxiety)
- Prolonged or repeated trauma exposure
- Childhood trauma
- Poor social support system

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Protective Factors

- A child's early caregivers play a crucial role in buffering him or her against the impact of stressful situations, and even more importantly, help build resilience against future adverse experiences

- The presence of secure early attachments is a protective factor

Neurobiology of PTSD Related to Early Life Trauma

Emotion Dysregulation: Emotional Under- and Overmodulation

PTSD has been shown to be a disorder involving both emotional undermodulation (re-experiencing/hyperarousal, fear and anger states) and emotional overmodulation in an attempt to restrict unwanted emotional experiences (states of dissociation, numbing and analgesia)

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Script-Driven Imagery Symptom Provocation Paradigm

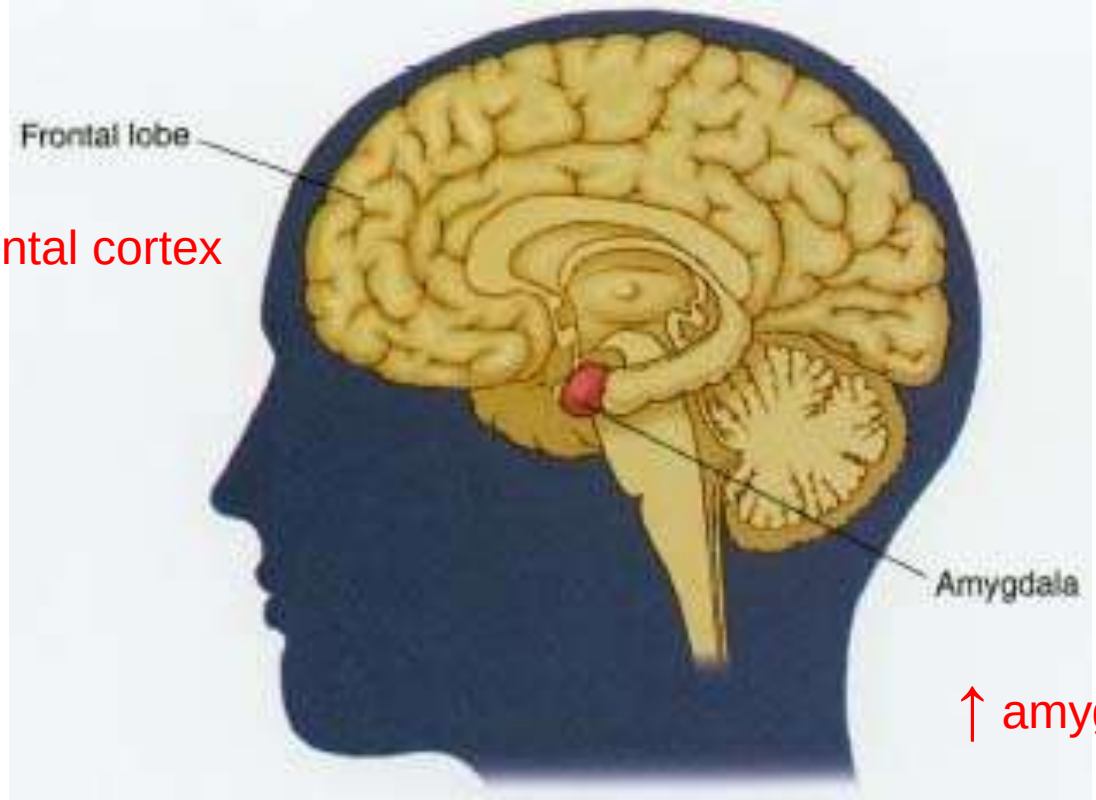
3T MRI Scanner at Robarts Research Institute

Flashback/Hyperarousal Responses

- “I could smell the alcohol on his breath and felt him hitting me all over again.”
- “I could feel being raped all over again. I could feel him holding down my hands.”
- “It felt like I was surrounded by smoke. I could smell and see it.”

Flashback Response

↓ medial prefrontal cortex



↑ amygdala

Lanius et al., American Journal of Psychiatry, 2010

Failed Corticolimbic Inhibition: Emotional Undermodulation

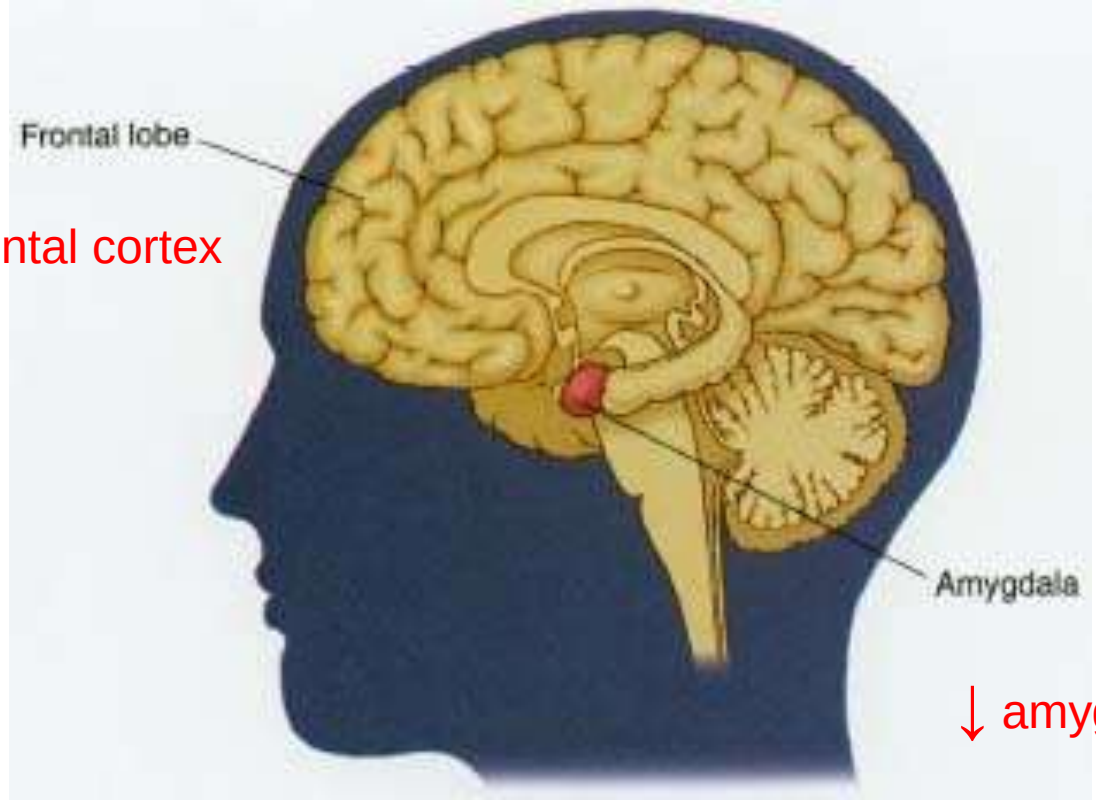
- Decreased medial prefrontal activation
- Decreased medial prefrontal activation could lead to failed inhibition of limbic reactivity
- Failed limbic reactivity could be associated with emotional undermodulation as observed during re-experiencing/hyperarousal and anger states in PTSD

Dissociative Responses

- “I was outside my body looking down at myself. It was too overwhelming to recall the traumatic memory.”
- “I was completely zoned out and could not tell what I was feeling.”
- “I was looking down at my own body while I was back reliving the rape.”

Dissociative Response

↑ medial prefrontal cortex



↓ amygdala

Lanius et al., American Journal of Psychiatry, 2010

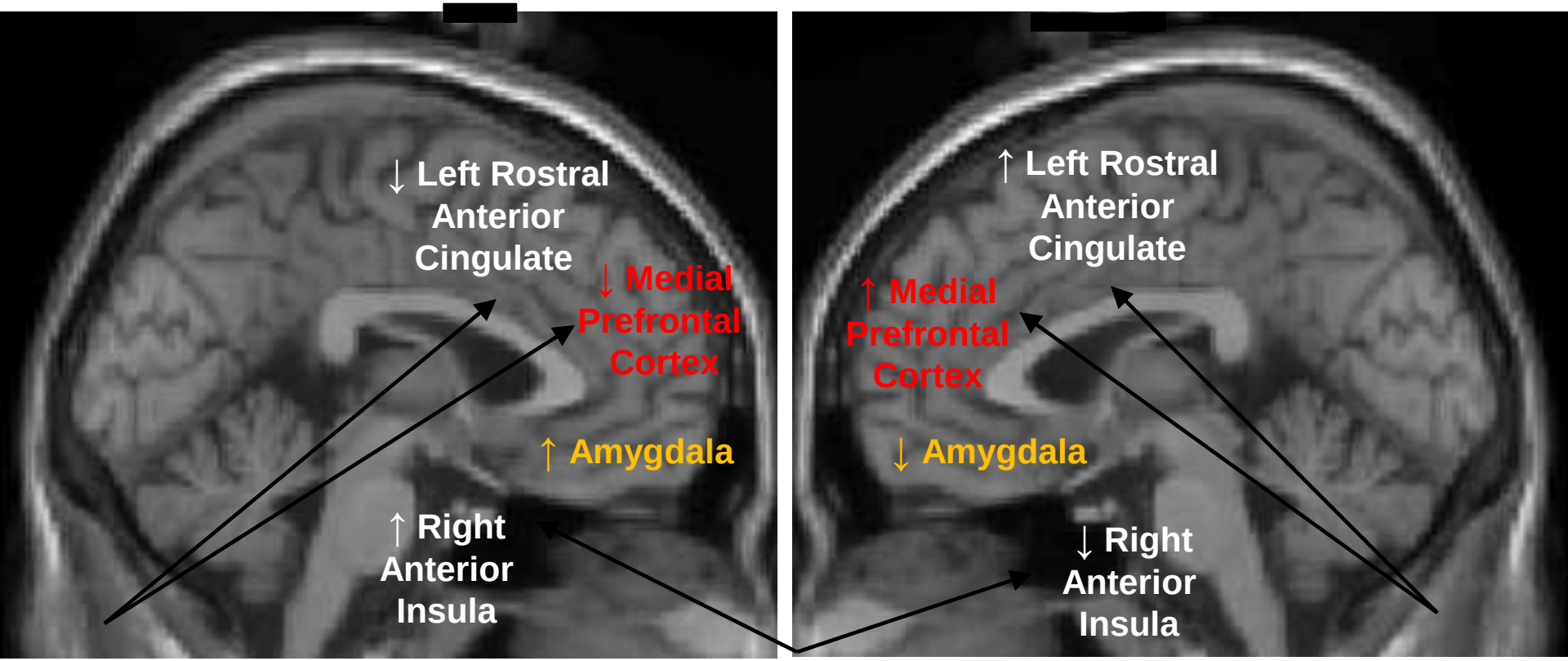
Corticolimbic Inhibition: Emotional Overmodulation

- Increased medial prefrontal activation
- Increased medial prefrontal activation could lead to overmodulation of limbic reactivity
- Hyperinhibition of limbic reactivity could be associated with emotional overmodulation as observed during dissociation in PTSD, including states of depersonalization and derealization, analgesia and numbing

Emotion Dysregulation in PTSD

Emotional Undermodulation ⟷ **Emotional Overmodulation**

Re-experiencing ⟷ **Dissociation**



Regions implicated in regulation of emotion and arousal

Region implicated in awareness of bodily states

Regions implicated in regulation of emotion and arousal

Lanius et al., 2010, *AJP*

Interpersonal Dysfunction

Interpersonal Dysfunction Includes

- **Social Isolation**
- **Sensitivity to criticism**
- **Difficulty standing up for oneself**
- **Revicimization (domestic violence, adult rape, physical assaults)**
- **Problems functioning at work**
- **Difficulty with child rearing**

Briere, 1988; Polusny, 1995; Browne & Finkelhor, 1986; van der Kolk, 1993; Cloitre, 1993

Social Emotions

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Social Emotions

- Social Emotions:
  - Elicited by social interactions and involve language, meaning and social intentionality
- Nonsocial Emotions:
  - Emerge as a result of stimuli that pose direct physiological relevance (e.g., food, fighting, fleeing)

Hareli & Parkinson, 2009

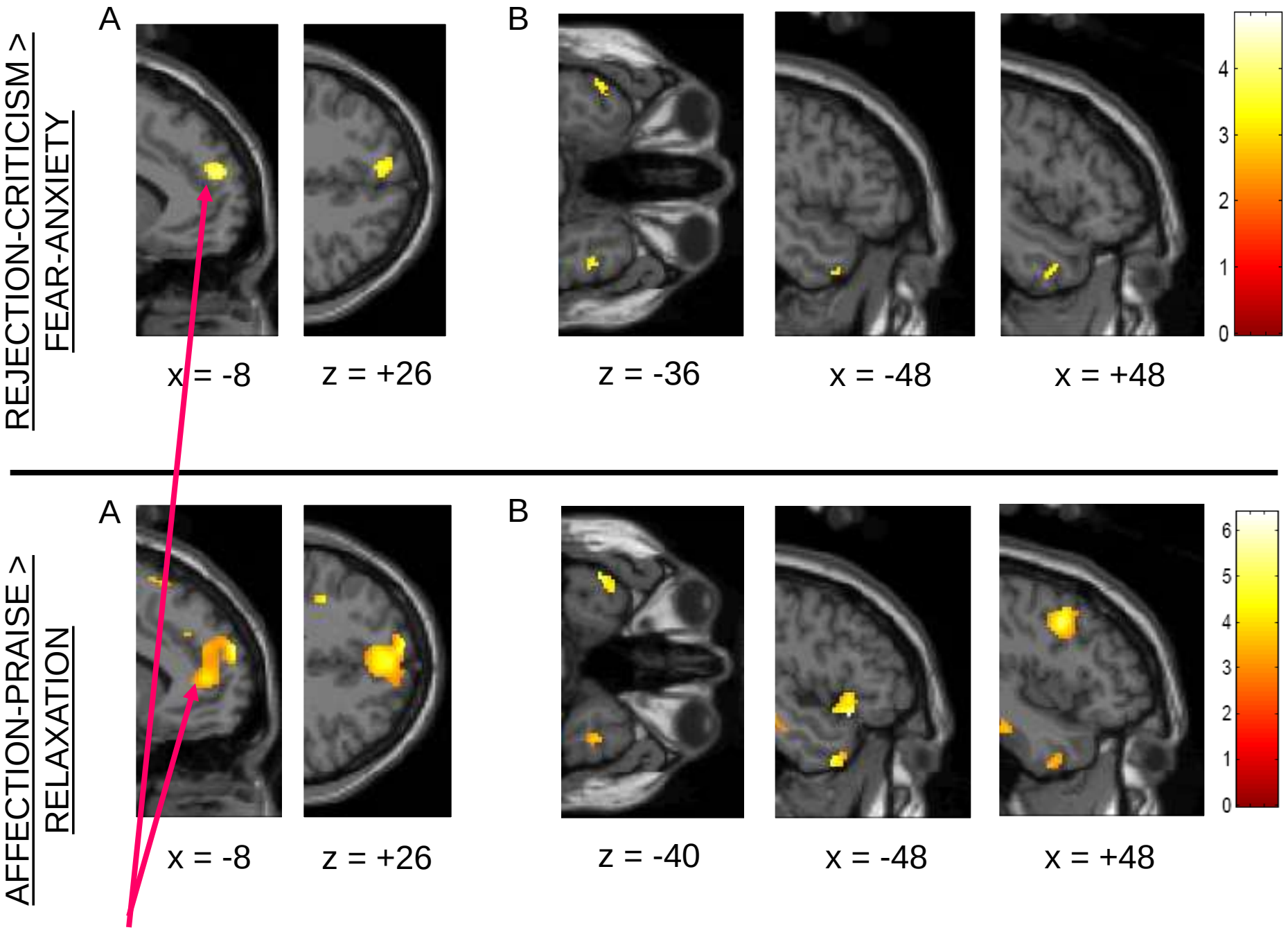
Processing of social and nonsocial dimensions of emotion exert powerful effects on brain activation

Neurocircuitry of Social Emotions

- Superior temporal gyrus: understanding complex social signals (e.g., eye gaze, mouth movements, body language)
- Right amygdala: responds to salient emotional properties that are specifically social
- Dorsomedial prefrontal cortex: represents emotions within the context of interpersonal interactions

Frewen et al., 2010; Britton et al., 2006; Hutcherson et al., 2006; Frith, 2006

Script-driven imagery of social (affection/praise; rejection criticism) and non-social (relaxation; fear/anxiety) scenarios



Dorsomedial PC: Processes emotions within context of interpersonal interaction

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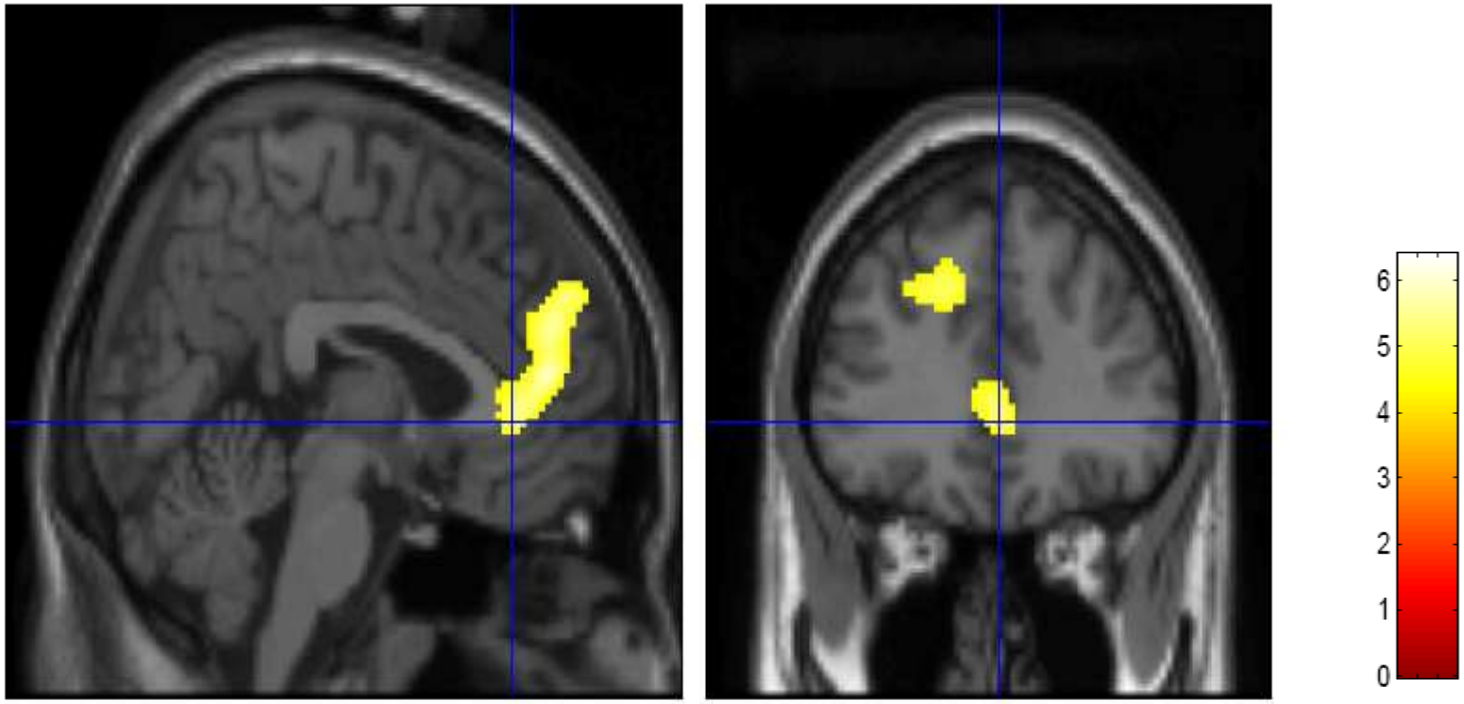
Control (n=20) > PTSD (n=14): Effect of Sociality



Frewen et al., Psych Trauma, 2010

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Discussion Points

- (1) Implications for the intergenerational transmission of trauma? (2) Implications for the ability to engage in psychotherapy?
- To what extent do the neural networks underlying social emotions need to be intact in order to utilize social support before, during and in the aftermath of trauma?
- Can activation of the social engagement system in psychotherapy lead to a reversal of the brain activation patterns during social emotional processing in PTSD?

Oxytocin and Childhood Abuse

- Oxytocin is important in mediating social affiliation, attachment, social support, maternal behavior and trust, as well as protection against stress and anxiety.
- Decreased oxytocin has been associated with higher levels of childhood abuse and neglect and more intense anxiety sympotms (Heim et al., 2009).

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Sense of Self and Self-Reflection in PTSD related to early life trauma

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Sense of Self

- The ability to reflect upon oneself requires a robust sense of self, which has been described as “a collection of schemata regarding one’s abilities, traits and attitudes that guides our behaviors, choices and social interactions” (Johnson et al., 2002)

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Sense of Self and Trauma

Trauma can destroy the sense of an adaptive and agentive self

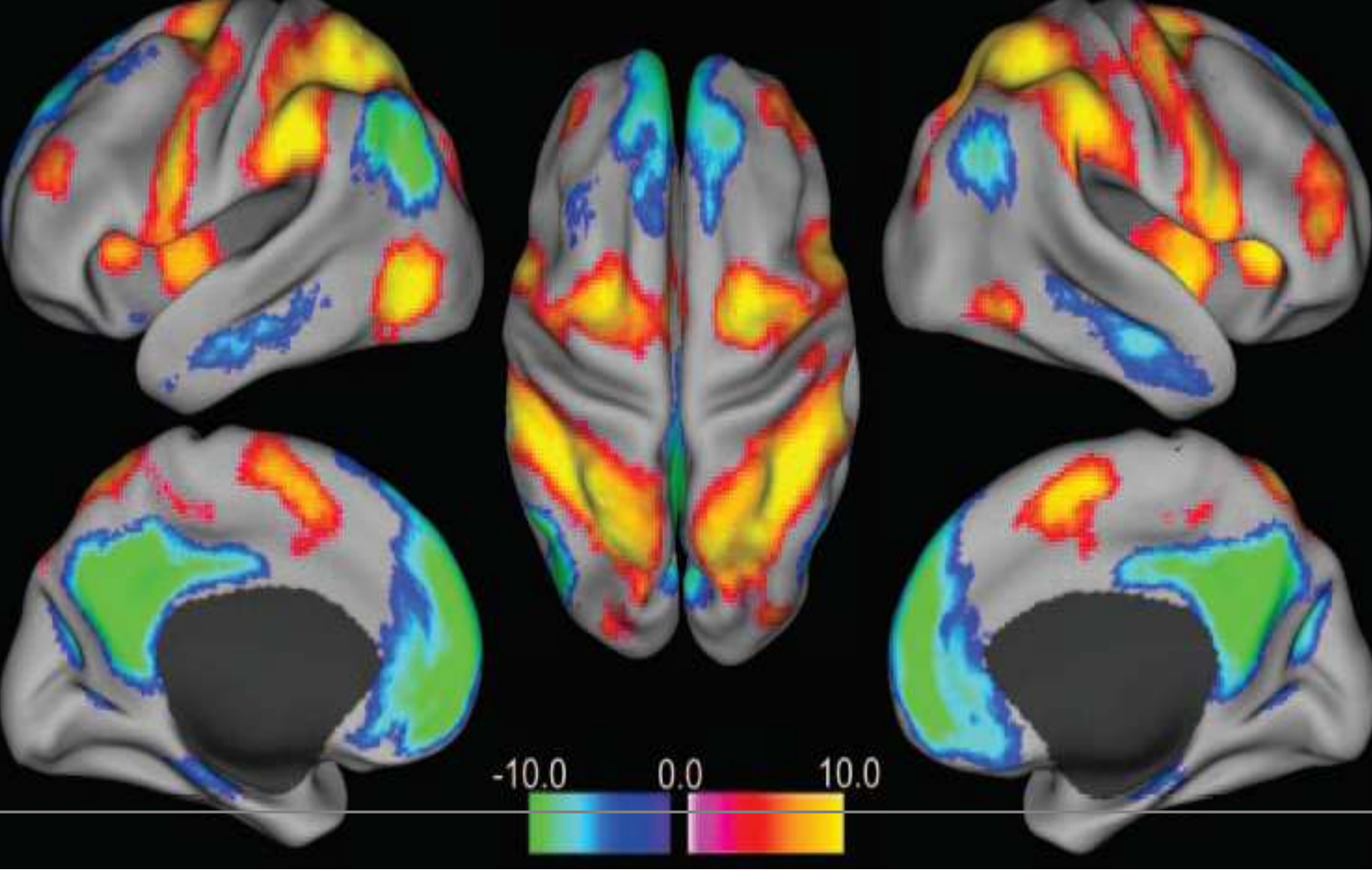
- **I feel dead inside…**
- **I will never be able to feel normal emotions again…**
- **I have permanently changed for the worse…**
- **I feel like an object, not like a person…**
- **I have no future…**
- **I don't know myself anymore…**
- **My life has been destroyed by the trauma…**

(Items from Foa & Colleagues' *Posttraumatic Cognitions Inventory, Psychological Assessment, 1999*)

my FRAGMENTED SELF

The "Default" State/Network

- Refers to the activity state of the brain at rest
- Mental activity occurring during task-unrelated thought
- Typically self-referential
- May serve to consolidate, stabilize, and set the context for future information processing



Fox et al. *PNAS*, 2005

Posterior Cingulate Cortex

- Evaluates objects and past events for self-relevance
- Differentiates potentially emotional objects/events from non-emotional ones
- Interacts with subgenual AC to process self-relevant emotional and non-emotional information

Medial Prefrontal Cortex

- Self-referential reflective awareness
- Monitoring and modulation of emotions
- Exercises inhibitory mechanisms on the emotional limbic system

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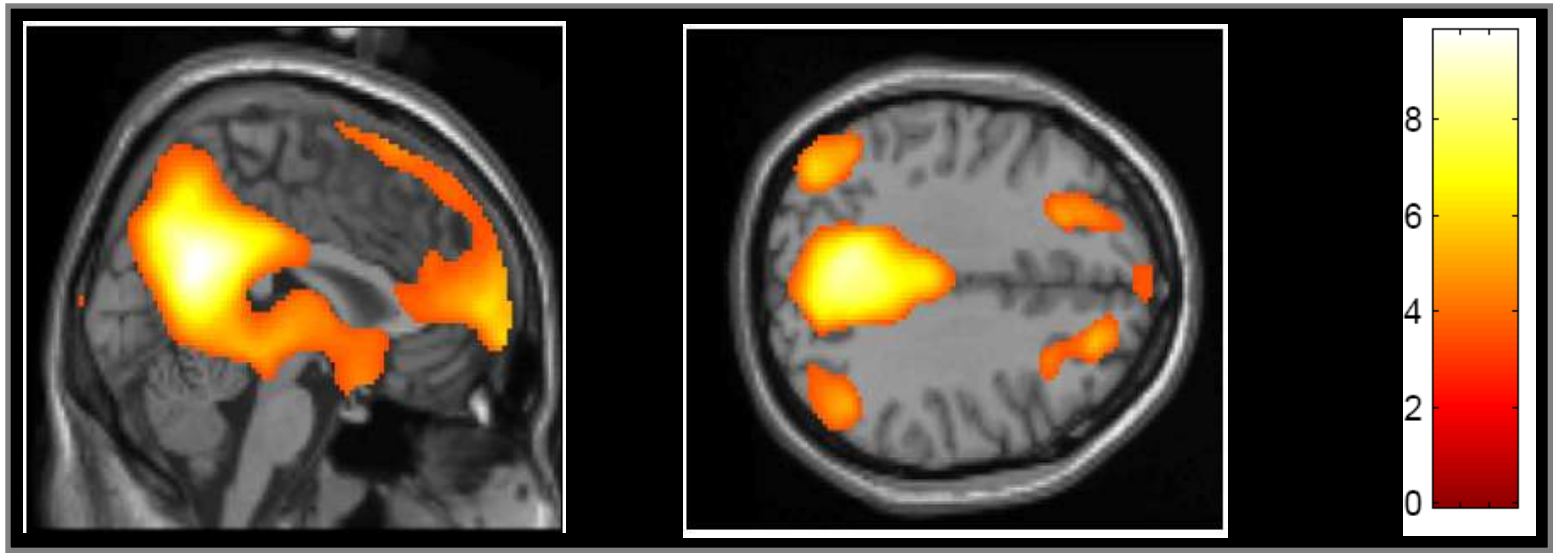
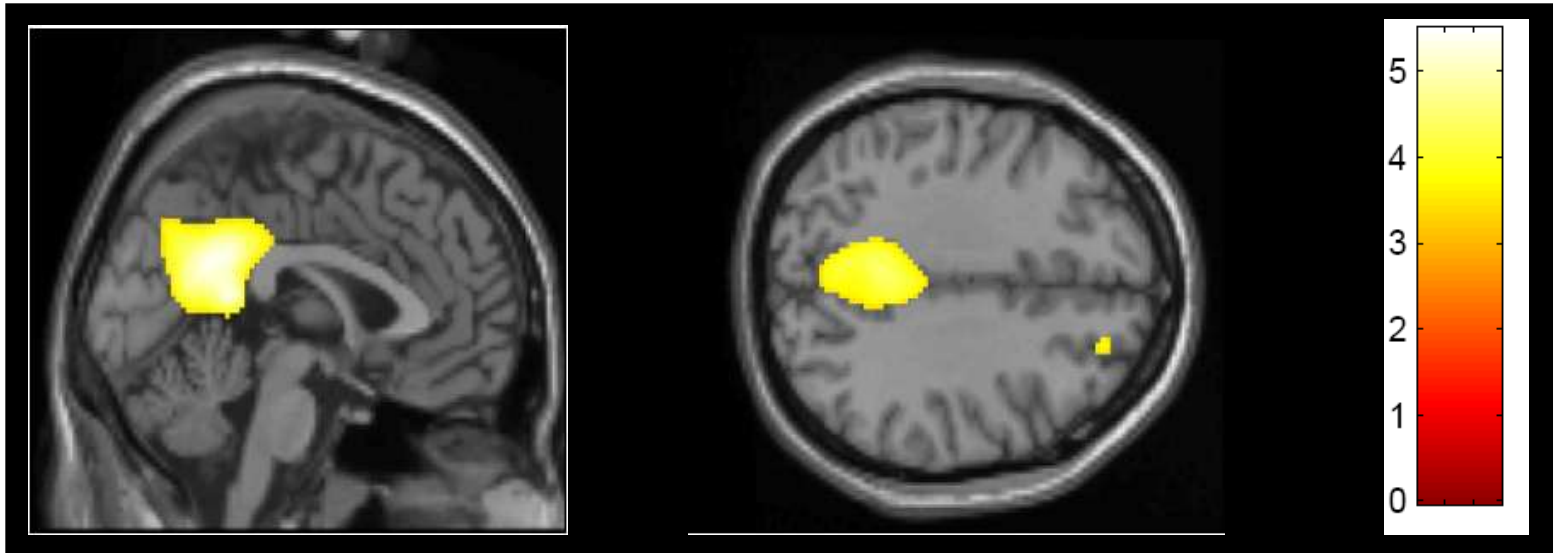
Lateral Parietal Cortex

- Self-representation
- Body perception

Controls (n=16): Positive Correlation



PTSD (n=18): Positive Correlation



Bluhm et al. J of Psychiatry & Neuroscience, 2009

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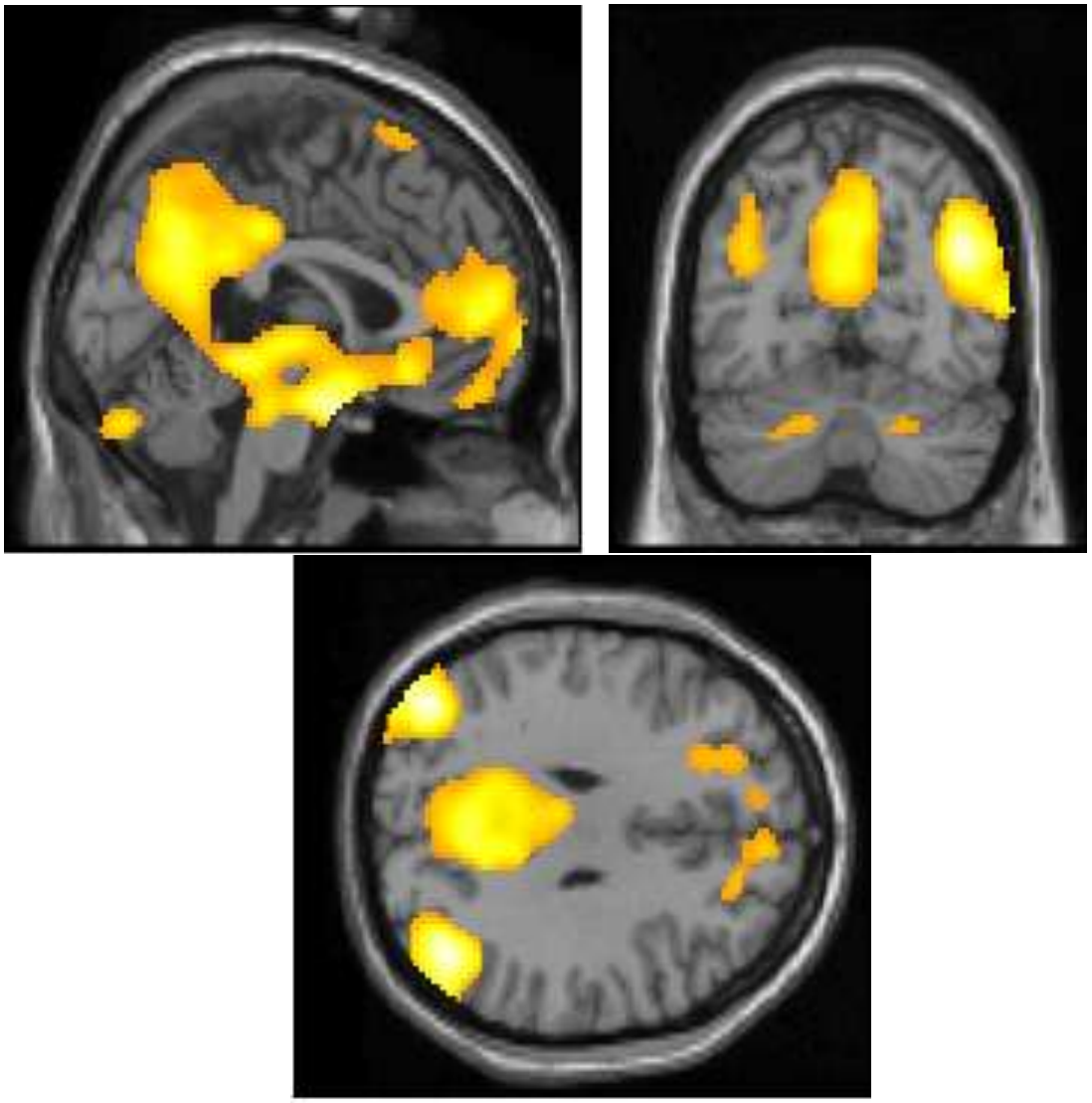
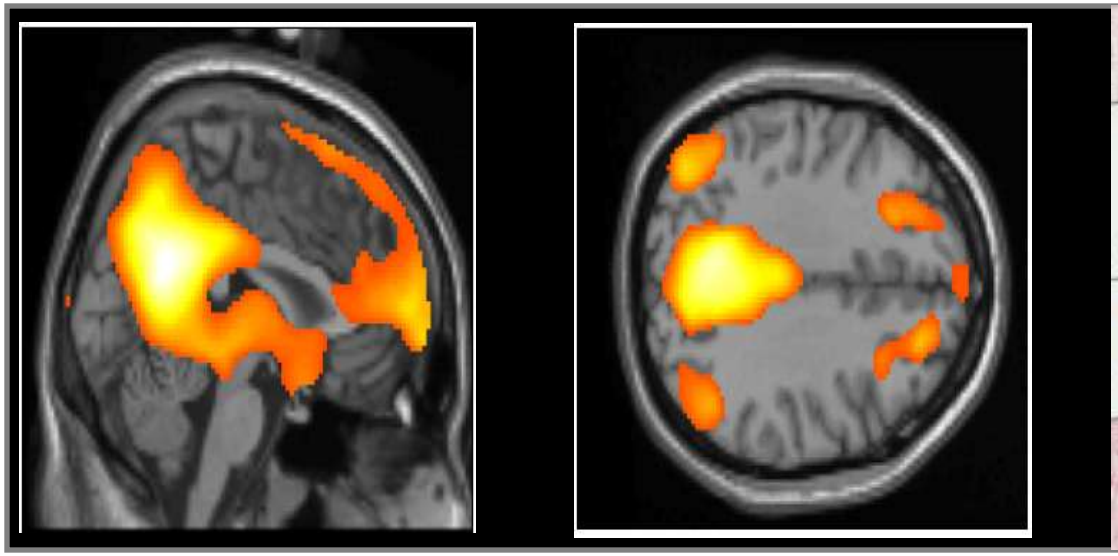
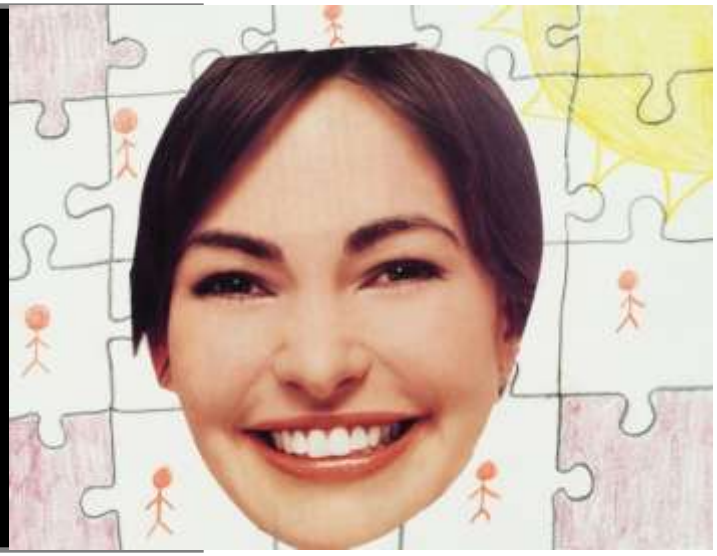
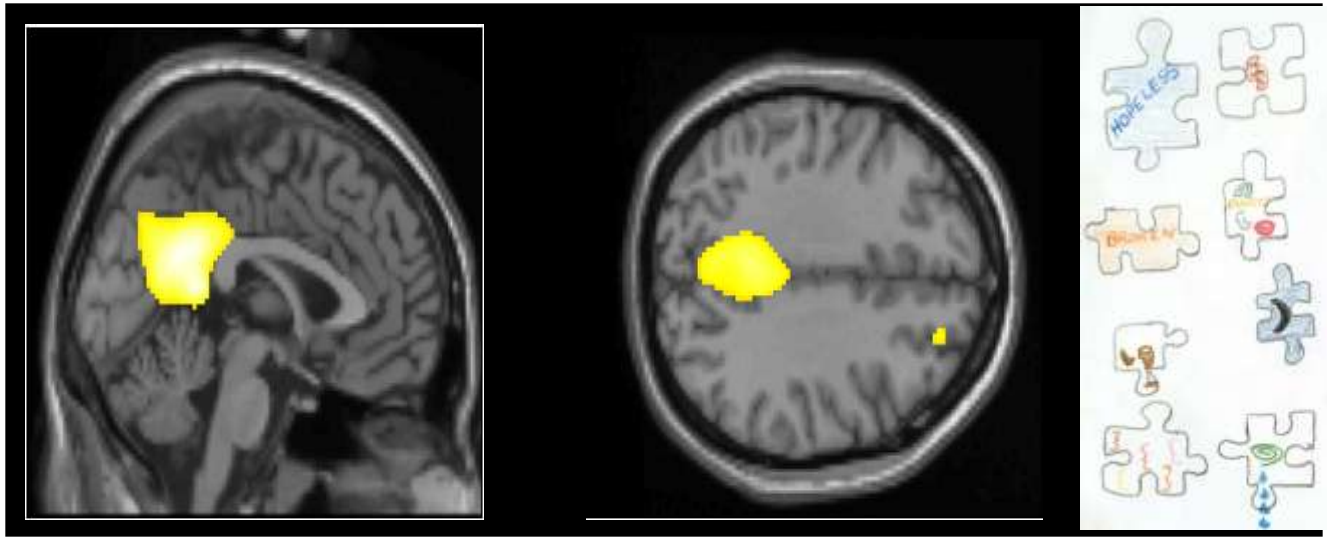
Controls greater than PTSD



Future Directions







Implications for Intergenerational Transmission of Trauma

Self-Reflection and Secure Attachment

- Increased ability of the mother for reflective function/mentalizing (thinking about others' minds) was associated with increased rates of secure attachment in her children
  (Fonagy et al., 1993, 2004)

Intergenerational Transmission of Trauma

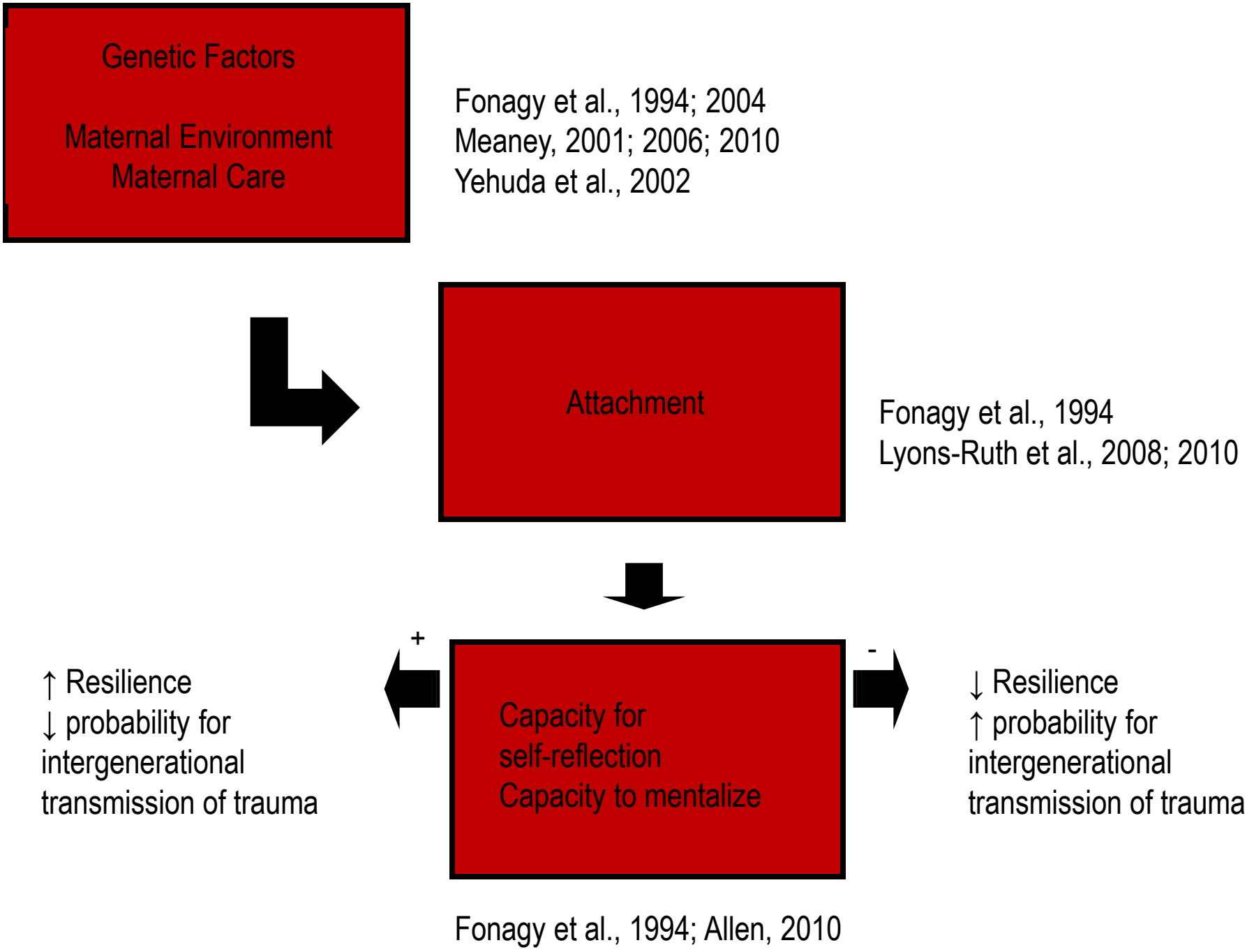
- Childhood maltreatment in the parent's own past is recognized as one of the most important risk factors in the abuse of children (Widom, 1989)

- This is not inevitably the outcome

Intergenerational Transmission of Trauma (con't)

- In one study, 10 mothers who had been able to break the cycle of abuse differed from 14 mothers who failed to do so in terms of their superior ability to talk about their past abuse in a coherent and integrated fashion that enabled them to reflect on their style of parenting their own children

  (Egeland and Susmann-Stillman, 1996; Allen, 2009)


Genetic Factors
Maternal Environment
Maternal Care
Fonagy et al., 1994; 2004
Meaney, 2001; 2006; 2010
Yehuda et al., 2002
Attachment
Fonagy et al., 1994
Lyons-Ruth et al., 2008; 2010
+
-
↑ Resilience
↓ probability for
intergenerational
transmission of trauma
Capacity for
self-reflection
Capacity to mentalize
↓ Resilience
↑ probability for
intergenerational
transmission of trauma
Fonagy et al., 1994; Allen, 2010

Future Directions

- To what extent can interventions that focus on increasing emotional awareness, self-reflection and the capacity for mentalizing modulate stress reactivity and the intergenerational transmission of trauma (e.g., Slade and colleagues, Allen & Fonagy)?
- Identification of high risk caregivers

Treatment that targets PTSD symptoms PLUS emotion, interpersonal, and self-dysregulation

STAIR+PE

- Skills training in affective and interpersonal regulation plus prolonged exposure- Treatment specifically developed for PTSD-related to childhood abuse
- Skills training in emotion, interpersonal and self-regulation plus and prolonged exposure
- Has been shown to reduce the impairment of childhood abuse related PTSD and its associated emotion-, interpersonal- and self-dysregulation

Cloitre et al., 2003, 2006, 2010

Education is the most powerful weapon you can use to change the world

Nelson Mandela

Thank You!