Neural markers of emotion dysregulation in acute trauma survivors predict chronic PTSD

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PTSD is a major public health problem

7% lifetime prevalence

PTSD is associated with
- High rates of psychiatric and medical comorbidities
- High utilization of health resources
- Suicide risk

Kessler (2000); Kesslet er al. (2005); Keily et al. (2006); Schnurr et al. (2000)
Posttrauma Symptom Clusters

- Reexperiencing/Intrusions
- Hyperarousal
- Avoidance
- Plus Dysphoria/Numbing

King et al. (1998); Simms et al. (2002); Yufik & Simms (2010); DSM-5
Trauma exposure is common

SPECIAL POPULATIONS: TRAUMA

Epidemiology of Trauma: Frequency and Impact of Different Potentially Traumatic Events on Different Demographic Groups

Fran H. Norris
Georgia State University

The Frequency and Impact of Exposure to Potentially Traumatic Events Over the Life Course

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Trauma exposure is common

But which trauma exposed individuals are at risk for chronic PTSD?
Early identification of those at risk is critical

Early intervention to prevent chronic PTSD is efficacious

Identify markers of risk for chronic PTSD in acute trauma survivors

→ implement targeted early intervention
Neural circuits instantiating posttraumatic stress symptoms

Dégeilh et al. (2013), Pitman et al. (2012)
But what about acute trauma survivors?

Nearly all neuroimaging studies have been cross-sectional assessments of individuals with chronic PTSD.

Very few acute imaging studies (< 30 days post-trauma)
- 2 resting state connectivity (Daniels et al., 2012; 2013)
- 1 trauma imagery using PET (Osuch et al., 2008)

Need to better characterize acute post-trauma dysfunction in affect regulation circuitry with the goal of identifying acute predictors of chronic PTSD.
And what about imaging studies of symptom clusters?

Nearly all neuroimaging studies have examined PTSD symptoms in aggregate

Three fMRI studies examining symptom clusters
- Hopper et al. (2007), Sripada et al. (2013), & Sadeh et al. (2014)
Aims of the current study

Characterize recruitment of emotion regulation circuitry acutely post-trauma

Assess predictive utility of acute neuroimaging data for chronic PTSD symptoms

Exploratory: characterize neural circuits associated with symptom clusters
Acute post-trauma imaging & symptom assessment

24 motor vehicle crash (MVC) survivors scanned within 2 weeks of accident during trauma & neutral imagery

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Repeat 3 times each for trauma and neutral script
Acute post-trauma imaging & symptom assessment

24 motor vehicle crash (MVC) survivors scanned within 2 weeks of accident during trauma & neutral imagery

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Resting state scan (6 minutes)

6 months later: Impact of Events Scale-Revised (IES-R)
- Hyperarousal
- Avoidance
- Intrusions
Acute trauma imagery activation and 6-month PTSD symptoms

Amygdala

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$r^2 = 0.60$
$B = 0.1758$
$p = 0.0037$

$r^2 = 0.61$
$B = -0.161$
$p = 0.003$

deRoon-Cassini et al. (in prep)
Amygdala resting state connectivity in acute trauma predicts PTSD symptoms at 6 months

Seed for connectivity: amygdala cluster from imagery task findings
Amygdala resting state connectivity in acute trauma predicts PTSD symptoms at 6 months

vmPFC

Anterior mid-cingulate
Is acute recruitment of affect regulation circuitry predictive of chronic PTSD?
Is acute recruitment of affect regulation circuitry predictive of chronic PTSD?

Yes
Symptom cluster analyses

Analyzed symptom clusters in a unified model, controlling for other symptom clusters in each

- e.g. Avoidance controlling for Hyperarousal and Intrusions
Acute trauma imagery activation and 6-month avoidance symptoms

Same findings for Hyperarousal symptoms

diagram with brain images and scatter plots showing correlation between brain activity and trauma imagery.

diagram with brain images and scatter plots showing correlation between brain activity and trauma imagery.

Same findings for Hyperarousal symptoms
deRoon-Cassini et al. (in prep)
Acute trauma imagery insula activation predicts avoidance and intrusive symptoms

Avoidance

Intrusions

\( r^2 = 0.64 \\
B = 0.4236 \\
p < .002 \)

\( r^2 = 0.62 \\
B = 2.643 \\
p = 0.003 \)

deRoon-Cassini et al. (in prep)
Acute trauma imagery activation also predicts 6-month intrusion symptoms, but…

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deRoon-Cassini et al. (in prep)
Acute trauma imagery activation also predicts 6-month intrusion symptoms, but…

deRoon-Cassini et al. (in prep)
Changing neural associations with symptoms over time?

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Intrusions at 6 months post-trauma

deRoon-Cassini et al. (in prep)
Changing neural associations with symptoms over time?

Intrusions at 2 weeks post-trauma

Intrusions at 6 months post-trauma

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deRoon-Cassini et al. (in prep)
Implications

Aberrant recruitment of emotion regulation circuitry acutely post-exposure predicts chronic PTSD symptoms
Implications

Need to target trauma survivors early

May increase precision of etiological models and treatments
  – Identifying mechanisms associated with specific symptoms
  – Characterizing neural circuits instantiating symptoms over the course of disease progression
Disclosures

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Thank You

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