

Altered Frontoinsular Activation and Cortical Gyrification Associated with Daily-Life Negative Affect in Emotional Distress Disorders

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Introduction

- Emotional distress disorders are characterized by daily-life negative affect and impaired emotion regulation
- Abnormalities of the frontoinsular network has been proposed as a biomarker of emotional distress disorders
- Both altered task activation and cortical morphology of frontoinsular network regions have been found in individuals with emotional distress disorders
- Relationship between frontoinsular activation and cortical morphology with daily-life negative affect is still unknown

Study Aims

- Using multimodal neuroimaging and ambulatory assessment (AA), examined associations between frontoinsular activation and cortical morphology with daily-life negative affect in emotional distress disorders
 - Hypothesis 1: Increased medial prefrontal cortex (PFC) and decreased insula activation associated with increased daily-life negative affect
 - Hypothesis 2: Structural abnormalities of frontoinsular network regions (medial PFC, insula, and posterior parietal cortex) associated with increased daily-life negative affect

Methods

- Participants
 - 27 right-handed women receiving mental health treatment for at least one emotional distress disorder: anxiety (*n* = 8); mood (*n* = 4); anxiety/mood (*n* = 9); anxiety/borderline personality disorder (BPD; *n* = 1); mood/BPD (*n* = 1); anxiety/mood/BPD (*n* = 4)

Diagnostic Interviews

- Mini-International Neuropsychiatric Interview
- Structured Interview for DSM-IV Personality
- Multimodal Neuroimaging
 - Emotion Regulation Task fMRI
 - Structural MRI (gyrification, surface area, thickness)
- Two-Week Ambulatory Assessment (AA)
 - · Morning prompt and six random prompts each day

AA Daily-Life Negative Affect

- · Daily-life negative affect assessed with PANAS-X
- All participants answered more than 75% of prompts
- On average, daily-life negative affect was assessed at 81.04 different time points (range: 55-101) per participant

Emotion Regulation Task

• Neutral Attend Condition: Participants viewed a neutral image for 10 seconds



• Negative Attend Condition: Participants viewed a negative image for 10 seconds



• **Positive Reappraisal Condition:** Participants viewed a negative image for a total of 10 seconds. After the first 4 seconds, they heard a tone signaling them to reappraise the image as being more positive for the remaining 6 seconds



Analyses

- Examined whole-brain Spearman correlations between fMRI emotion regulation positive reappraisal task activation (Positive Reappraisal > Negative Attend) with AA daily-life negative affect
- Examined whole-brain Spearman correlations between cortical morphology (gyrification, surface area, thickness) with AA daily-life negative affect





Medial PFC

Increased bilateral medial PFC positive reappraisal task activation associated with increased daily-life negative affect ($r_s = .70; p < .001$)

• Insula/Putamen & Cerebellum

Decreased left insula/putamen (r_s = -.59; p = .002) and bilateral cerebellum (r_s = -.64; p < .001) positive reappraisal task activation associated with increased daily-life negative affect

Structural MRI Results

Emotion Regulation Task fMRI Results



- Left insula hypergyria ($r_s = .48$; p < .001) and right inferior parietal hypogyria ($r_s = .45$; p = .005) associated with increased daily-life negative affect
- Surface area and thickness were not correlated with daily-life negative affect

Discussion

- Increased medial PFC and decreased insula activation during positive reappraisal associated with daily-life negative affect in emotional distress disorders
- Hypergyria of the insula and hypogyria of the posterior parietal cortex associated with daily-life negative affect in emotional distress disorders
- This suggests that the frontoinsular network may play an important role in emotion regulation, and future research on activation with the frontoinsular network may help inform treatment for emotional distress disorders