The Relationship Between Anxiety and Brain Activity During an Emotional Inhibitory Control Task in Adolescents and Young Adults

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Introduction
Adolescence is a period characterized by limited inhibitory control and hypersensitivity to emotion, with increases in the prevalence of mood disorders and other forms of psychopathology. During this period, adolescents are required to make complex cognitive decisions in the face of emotional distraction. To complicate matters, adolescents become increasingly vulnerable to anxiety. In spite of the increasing relevance of this topic, our understanding of the relationship between anxiety symptoms and the neural correlates of cognitive control remains incomplete. The current study utilizes fMRI to investigate age-related differences in cognitive control and the influence of anxiety. We hypothesized there would be...unrelated to anxiety. However, these results suggest that there are developmental changes in the relationship between anxiety symptoms and brain activity during an emotional go-nogo task.

Questions:
Does trait anxiety relate to brain activity in an emotionally challenging cognitive task?
Are there developmental differences in this relationship?

Participants
17 Adolescents (12-14 years old)
13 Adults (20-22 years old)

Anxiety Measures
State-Trait Anxiety Inventory (STAI)
State-Trait Anxiety Inventory for Children (STAI-C)

Task
Go-nogo task with emotional background (IAPS images)
Picture blocks (20 trials each) included:
- All-go trials (scrambled)
- Rest block
- Scrambled images
- Neutral images
- Positive images

Behavioral Results
- No-go Accuracy
- Reaction Time (Go trials)

fMRI Task Results
- All
- Inhibitory Control: Scrambled Nogo > All go
- Emotion Modulation: Negative > Neutral

Discussion
This emotional go-nogo task activated brain regions important for cognitive control and emotion regulation. Behavioral results indicated that inhibitory control with emotional backgrounds was challenging (especially for teens) and that negative images in particular resulted in slower reaction times. In typically developing participants with normal levels of anxiety, there were regions that showed significant correlations with trait anxiety. Adolescents showed unique regions of activation that varied with anxiety. These results suggest that there are developmental changes in how anxiety relates to cognitive control, such that low anxiety teens and adults use distinct brain regions to cope with negative distractors while recruiting cognitive control circuits. Future directions include investigating different kinds of anxiety and exploring how life stress impacts developmental changes in the relationship between cognitive control and anxiety.

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