Neural reactivity in response to alcohol and trauma cues with depression severity as a moderator in patients with comorbid alcohol use disorder and posttraumatic stress disorder

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Background

- Alcohol use disorder (AUD) and posttraumatic stress disorder (PTSD) frequently co-occur.
- Patients with comorbid AUD/PTSD experience more severe social and psychiatric impairments and are at an increased risk for depressive symptomatology.
- Little is known about the neurobiological mechanisms underlying this comorbidity, and how neural circuits implicated in this comorbidity might be modulated by depression severity.
- The reward pathway is represented by dopaminergic projections from the ventral tegmental area to the nucleus accumbens (NAc) and has been implicated in both AUD and PTSD.

Objective and Hypothesis

- Use functional magnetic resonance imaging (fMRI) to examine blood-oxygen level dependent (BOLD) signal among individuals with AUD/PTSD while accounting for sex, depression severity, and sex by depression severity.
- NAc will show increased activity in response to the alcohol versus neutral cues, and greater depression severity will blunt this activation. No significant activation in the NAc is expected for the trauma versus neutral cues.

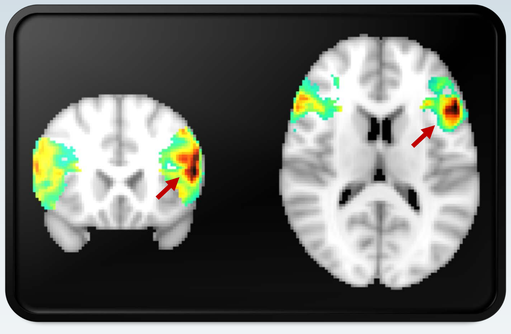
Methods

- **Participants:** 24 individuals with active AUD and PTSD, enrolled in a larger clinical trial
- **Procedure:** A baseline fMRI scan was performed, during which participants listened to personalized imagery script (trauma, alcohol, and neutral cues).
- **Data Analysis:** Voxel-wise general linear modeling characterized BOLD signal (threshold>3.1, corrected for multiple comparisons). Main effects for the group were modeled, as were effects for sex, depression severity, and the interaction of sex by depression severity.

Demographics

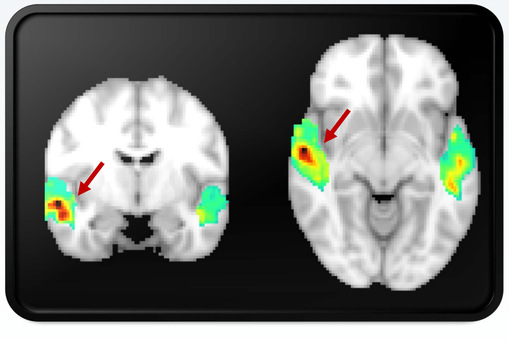
Characteristics	N (%) / Mean (SD)	Range
Gender, n (%)		
Female	14 (58.3%)	-
Male	10 (41.7%)	-
Age (years)	38.6 (12.2)	23 – 59
Race, n (%)		
Caucasian/White	22 (91.7%)	-
African American/Black	2 (8.3%)	-
Clinical Characteristics		
Alcohol Problems (AUDIT)	18 (8.7)	6 - 36
PTSD Symptom Severity (PCL)	35.5 (14.7)	11 - 61
Depressive Symptom Severity (BDI)	22.1 (11.5)	3 - 47

Results



Alcohol Cue > Neutral Cue

Peak activation in the left inferior frontal gyrus (IFG) (Z=6.4, p<0.05).

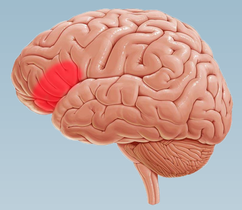


Trauma Cue > Neutral Cue

Peak activation in the right middle/superior temporal gyrus (Z=6.5, <0.05).

Conclusions

No difference in activation of NAc in response to alcohol cue or trauma cue versus the neutral cue, and no effect for depression severity or sex.



IFG activation in response to **alcohol cue**:

- Inhibitory control
- Control impulse and cravings in an in-scanner setting

Bilateral superior and middle temporal gyrus activation in response to **trauma cue**:

- Heightened sensory processing
- More dissociative symptoms

- This is one of the **FIRST** studies to employ in-scanner fMRI tasks in patients with comorbid AUD and PTSD.
- Based on our results, higher brain areas are recruited in response to alcohol and trauma cues in this distinct population of participants, rather than the reward pathway.
- Treatment should consider interventions that may reduce cue-elicited activation of these areas.
- Study limitations: Sample size, racial/ethnic differences.

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