### Anterior Cingulate Cortex Reactivity to Emotional Stimuli Relates to Prospective Changes in Alcohol Use in Bipolar Disorder

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**Background:** Alcohol use disorders (AUDs) are highly prevalent in bipolar disorder; however, mechanisms that contribute to comorbidity are unknown. Differences in anterior cingulate cortex (ACC) structure and function are reported in bipolar and AUDs. We recently reported ACC morphometry relates to prospective changes in alcohol use in typically developing young adults. It is unknown if ACC differences relate to risk for alcohol misuse in bipolar disorder. This study investigated ACC structure and function, and relations with prospective changes in alcohol use in bipolar disorder and typically developing young adults.
**Methods:** Forty-seven young adults (23 bipolar disorder type I, 24 typically developing; 69% female, mean age + SD=21.2+2 years) completed assessment of alcohol use and structural and functional MRI, including a Continuous Performance Task with Emotional and Neutral Distracters. A subset of participants (16 bipolar disorder, 19 typically developing) completed follow-up assessment of alcohol use, on average 1.5 years later. ACC gray matter volume (GMV) and response to emotional, compared to neutral, stimuli was measured, and relations with prospective changes in alcohol use modeled. Structure-function relations were explored.
**Results:** Greater ACC response related to subsequent increase in quantity of alcohol use across all participants (main effect of activation, $p<0.005$). ACC GMV was associated with ACC response in bipolar disorder only (GMV x group interaction, $p<0.05$). ACC structure and function, and alcohol use did not differ between groups.
**Conclusions:** Variation in ACC activation during emotional processing may relate to risk for prospective increases in alcohol use during young adulthood in bipolar disorder and typical development.
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**Keywords:** Bipolar Disorder, Functional Magnetic Resonance Imaging (fMRI), Alcohol Drinking, Young Adulthood, Alcohol Use Disorder

### Baseline Functional Connectivity Between Default Mode Network and Auditory Cortex Predicts Improvement in Auditory Hallucination Following Real-Time Neurofeedback in Schizophrenia

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**Background:** Auditory hallucination (AH) is a core feature of schizophrenia and may be medication-resistant. It is hypothesized that schizophrenia patients have aberrantly high functional connectivity between the auditory cortex (i.e., superior temporal gyrus, STG) and the anterior hub of the default mode network (i.e., medial prefrontal cortex, MPFC), resulting in heightened attention to internally generated auditory perceptions. We have previously demonstrated AH reduction following fMRI-based neurofeedback targeting the STG, a technique in which individuals use real-time feedback about STG activity to volitionally modulate activity in that area. In this study, we investigated whether baseline MPFC-STG connectivity predicted AH change post-neurofeedback.
**Methods:** We acquired resting state fMRI scans from 8 schizophrenia patients with medication-resistant AH, who then received neurofeedback targeting their individually localized STG. During neurofeedback, while monitoring their own STG activity, patients were instructed to upregulate STG activity by attending to sentences recorded in their own voice and downregulate STG activity by ignoring sentences in a stranger's voice. AH was assessed using the Psychotic Symptom Rating Scales (PSYRATS).
**Results:** After neurofeedback, patients showed significantly reduced PSYRATS scores ($t = -3.48$, $p = 0.01$). Weaker baseline MPFC-STG functional connectivity was significantly associated with more reduction in PSYRATS scores ($r = 0.728$, $p = 0.04$).
**Conclusions:** We found that weaker baseline MPFC-STG connectivity predicted more AH improvement following neurofeedback in medication-resistant schizophrenia patients. This suggests that STG-directed neurofeedback is more effective at reducing AH for patients starting with weaker MPFC-STG connectivity and may inform treatment decisions if neurofeedback becomes a standard treatment option.
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**Keywords:** Schizophrenia, Auditory Hallucination, Real-time fMRI Neurofeedback, Resting State Functional Connectivity, Prediction of Response

### Brain Development From Childhood to Adolescence Alters Cerebello-Cortical Dynamic Functional Connectivity

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**Background:** Cerebello-cortical functional connectivity (FC) increases from childhood to adolescence. The variability in connectivity, the dynamic FC (dFC), is an important feature of neural communication that has not been explored in brain development from childhood to adolescence. We hypothesized that the dynamics of connectivity between the fronto-parietal networks (FPN) and cingulo-opercular networks (CON)