

Poster presented at the *International Congress for Schizophrenia Research*; April 2011

BEHAVIORAL ADJUSTMENTS IN RESPONSE TO ERROR COMMISSION AND TO CUES PREDICTING ERROR LIKELIHOOD: DACC ACTIVITY MODULATION IN SCHIZOPHRENIA

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Background: Individuals with schizophrenia (SCZ) show deficits adjusting their performance to changing demands. Detecting an error in performance is critical for evaluative functions that allow adjusting behavior to optimize outcomes. Previous research shows activity in the dorsal anterior cingulate cortex (dACC) signals error commission, and that the magnitude of this response predicts behavioral adjustments (ie posterror slowing). A large body of literature suggests dACC response to error-commission is diminished in SCZ compared to healthy controls (HC). However, evidence regarding behavioral adjustments is mixed. It is unclear whether deficits adjusting performance can be directly traced to impairments detecting an error, or to more subtle alterations in self-regulation.

Methods: We examined error-related behavioral adjustments (posterror slowing) and brain activity (using fMRI) during a change-signal task in SCZ and HC. By using two difficulty conditions, we were able to compare behavioral adjustments and patterns of brain activity not only in response to error commission, but also to cues that predict the likelihood of committing an error. We estimated BOLD responses using a general linear model including accuracy and error-likelihood (high, low) as regressors. To test the hypothesis that SCZ will show diminished brain activation responses to error-commission, we conducted ANOVAs using accuracy and error-likelihood as within-subject factors and group as a between-subject factor. To test the hypothesis that SCZ will fail to show a modulation of brain activation according to implicit cues that predict error-likelihood, we focused on correct Go-trials to eliminate signals associated with error-commission or with the need to modify action plans. To examine behavioral effects of accuracy on subsequent trials, we compared reaction times in correct trials following an error in change trial or a correct response.

Results: Compromises in error- based behavioral adjustments are indicated by deficits slowing responses after incorrect trials. Diminished error related responses in dACC suggest alterations in the proper signaling of error commission. A negative correlation between dACC activity modulation between conditions and behavioral adjustments suggest alterations in self regulation involving the ability to increase cognitive control in demanding tasks.

Conclusion: Alterations in the modulation of dACC responses to implicit environmental contingencies may relate to deficits adjusting behavior in SCZ.