Correlated Cingulate and Insula Response during Negative Interpersonal Feedback in Socially Anxious Adults

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Background: Individuals with social anxiety exhibit cognitive biases related to hyper-attentiveness and failure to disengage from negative social cues, especially unexpected feedback. An abundance of literature shows the anterior cingulate and bilateral anterior insula are involved in identifying emotionally salient features of social interactions in people with social anxiety. In this study, we modeled brain activity associated with two types of social interaction---cooperation and betrayal---while participants with varying social anxiety levels played the Prisoner's Dilemma game. We hypothesized significantly elevated BOLD signals in the anterior cingulate and bilateral anterior insula, as well as correlated activity in these regions, in association with negative feedback linked to unreciprocated cooperative responses.

Method: 32 volunteers who were categorized as having high or low trait anxiety (Liebowitz Social Anxiety Scale; LSAS) played the Prisoner's Dilemma task against a computerized confederate whom they were deceived to believe was a human co-player at a remote location. The unreciprocated responses were defined in trials which the player “cooperated” and the co-player “betrayed,” and vice versa. BOLD data were collected and analyzed using ANOVAs with player choice and feedback to the outcome as predictors of event-related response ROIs. Results were corrected for multiple comparisons.

Results: The test subjects consisted of 5 men and 27 females, aged 18-35; of these, 17 scored at or above the upper 25th percentile on the LSAS; while 15 self-reported low social anxiety (LSAS < 50th%). Our final analysis will test the hypothesis that the anterior cingulate and bilateral anterior insula will show significant BOLD response and correlation regardless of anxiety level of the subjects; however, BOLD response and correlation will be stronger in context of unreciprocated negative feedback.

Conclusions: We expect that socially anxious participants will respond atypically to cues perceived as negative feedback and will show a heightened sensitivity to emotionally negative salient features. Subjects in the study will exhibit significant BOLD responses and correlation between the anterior cingulate and bilateral anterior insula in association with negative feedback; which could represent heightened self-reflective processing. These responses will suggest that both regions played roles in social processing of individuals with social anxiety.