

Predicting Response to Cognitive Behavioral Therapy for Psychosis Using Machine Learning and Functional Magnetic Resonance Imaging

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Abstract : Cognitive behavioral therapy for psychosis (CBTp) is effective in many but not all patients, making it important to better understand the factors that determine treatment outcomes. To date, no studies have examined whether neuroimaging can make clinically useful predictions about who will respond to CBTp. To this end, we used machine learning methods that make predictions about symptom improvement at the individual patient level. Prior to receiving CBTp, 22 patients with a diagnosis of schizophrenia completed a social-affective processing task during functional MRI. Multivariate pattern analysis assessed whether treatment response could be predicted by brain activation responses to facial affect that was either socially threatening or prosocial. The resulting models did significantly predict symptom improvement, with distinct multivariate signatures predicting psychotic ($r=0.54$, $p=0.01$) and affective ($r=0.32$, $p=0.05$) symptoms. Psychotic symptom improvement was accurately predicted from relatively focal threat-related activation across hippocampal, occipital, and temporal regions; affective symptom improvement was predicted by a more dispersed profile of responses to prosocial affect. These findings enrich our understanding of the neurobiological underpinning of treatment response. This study provides a foundation that will hopefully lead to greater precision and tailoring of the interventions offered to patients.

Keywords : cognitive behavioral therapy, machine learning, psychosis, schizophrenia

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