

Mapping the relationship between brain structure and function during a behavioral inhibition task in patients with bipolar disorder

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Introduction: Functional neuroimaging studies from our group and others have identified deficits in ventrolateral prefrontal cortex (VLPFC; BA47) in patients with bipolar disorder versus healthy subjects. No study however has investigated how these deficits may directly relate to abnormalities in underlying structure and is the focus of the present analysis.

Methods: 20 lithium-free bipolar I euthymic subjects (8f, 36.6±12.8yrs) and 20 healthy subjects (8f, 36.6±13.0yrs) were scanned at 3.0T during the performance of a Go/NoGo task. fMRI data were processed with FSL, resulting in a contrast of NoGo>Go for each subject. High-resolution structural MRI data were acquired at 1.5T and analyzed to provide a measurement of cortical gray matter density (GMD). Cortical pattern matching methods were used to associate homologous brain regions across subjects and register fMRI and GMD within subjects. A correlation analysis between these measures was performed at each point along the cortex to identify structure-function relationships.

Results: Although no group differences were found in GMD of VLPFC, GMD was reduced in patients in left anterior cingulate (BA24/32/33, $p<0.05$) and in right ventromedial PFC (BA11, $p=0.06$). Within controls, areas of denser cortex were significantly correlated with greater activation in VLPFC (BA47) and anterior cingulate cortex (BA24/32; see Figure). This normal structure-function relationship was reduced or absent in patients.

Discussion: This data are the first to demonstrate that functional deficits observed in VLPFC in patients are not the direct result of alterations in underlying GMD. Rather, functional deficits in VLPFC may result from structural deficits elsewhere or are independent of detectable changes in structure.

