

## **Cortical thinning in cingulate and occipital cortices in first episode schizophrenia**

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### **Abstract**

Cytoarchitectural abnormalities have been observed in the cingulate cortex in schizophrenia. The regional specificity of changes in neural and glial structure and density, however, has been difficult to confirm given the labor intensiveness of postmortem measurement techniques. Advances in computational image analysis methods now allow differences in cortical thickness to be examined at high spatial resolution *in vivo* that may better characterize neuropathological processes in schizophrenia than standard volumetric measurements. These methods have not previously been applied to examine changes in cortical thickness in the cingulate cortex or in other cortical regions bordering the medial walls of the cerebral hemispheres in first episode schizophrenia.

High-resolution (256x256x124; 1.5 mm slice separation) T1-weighted MR images and cortical pattern matching methods were used to compare gray matter thickness between 72 (51m/21f) first episode patients (mean age = 25.1±4.7 SD) and 78 (33m/44f) healthy comparison subjects (mean age = 27.3±6.6). Cortical thickness, defined as the 3D distance measured from the cortical white-gray matter boundary in tissue classified brain volumes to the medial hemisphere surface, was measured at sub-voxel resolution at thousands of spatially equivalent cortical locations. Effects of Diagnosis were compared at homologous cortical surface points after covarying for sex. Sex by Diagnosis interactions and simple effects were also assessed. Statistical results were mapped back onto the group average cortical surface to reveal highly localized patterns of thickness changes. The significance of mapping results was confirmed by permutation testing.

Statistical maps showed significant cortical thinning within the cingulate cortex bilaterally, with pronounced effects in the caudal anterior cingulate and posterior cingulate gyrus (Brodmann Areas 24, &33) in schizophrenia patients compared to controls. Patients also showed cortical thinning in occipital and frontopolar regions and exhibited no significant increases in cortical thickness compared to controls in any cortical location. Disease-related patterns of cortical thinning showed some differences within male and female groups: thinning was pronounced in left paracentral lobule in male patients and in the right posterior cingulate in female patients compared to same sex controls.

Patients experiencing their first episode of schizophrenia show reductions in gray matter thickness within the medial walls of the cerebral hemispheres in cingulate and occipital

regions. Reductions in cortical thickness may correspond to previously described cytoarchitectural and neurochemical abnormalities observed in the same or proximal anatomic locations. Reductions in cortical thickness in these regions may further relate to specific functional impairments observed in schizophrenia and point to systems-wise disturbances that include heteromodal association cortices where cortical thinning has previously been shown in the same schizophrenia study group.