

The Cingulate Gyrus in Schizophrenia: Imaging Altered Structure and Functions

Adrian Preda, Laurie M. Rilling,
Ronald B. Chin, and Carol A. Tamminga

Chapter contents

Goals of This Chapter	656
Schizophrenia	656
Volumetric Brain Imaging	657
Magnetic Resonance Imaging (MRI)	657
Diffusion Tensor MRI	658
Functional Brain Imaging and Cognition	659
Complex Attention and Executive Functions	660
Working Memory	661
Cingulate-mediated Executive Dysfunction	662
Effect of Antipsychotic Drugs on Anterior Cingulate Function	665
Functional Imaging Ear Marks Cingulate Pathology	666
References	668

Several convergent lines of evidence suggest the involvement of the cingulate cortex in the manifestations of schizophrenia: (1) the cingulate mediates specific aspects of cognition that are abnormal in the illness (predominantly, attention and executive function; Gold & Weinberger, 1995; Green *et al.*, 1992; Posner & Petersen, 1990), as well as evidences (2) postmortem histological and neurochemical abnormalities (Benes & Bird, 1987; Benes *et al.*, 1987; Benes, 1993; Benes & Tamminga, 2002), and (3) *in vivo* imaging changes in the illness (Tamminga *et al.*, 2000a; Carter *et al.*, 1998; Gold & Weinberger, 1995; Green *et al.*, 1992; Posner & Petersen, 1990).

Early *in vivo* imaging data gathered using whole-brain, unbiased sampling approaches, raised the possibility of ACC involvement in schizophrenia, especially when volunteers were drug-free, at rest, and floridly psychotic (Tamminga *et al.*, 1992). Indeed, in the drug-free condition, correlations could be detected between neuronal activity in anterior cingulate cortex (ACC) and the level of psychotic symptoms (Tamminga *et al.*, 1992), correlations that were not present during antipsychotic drug treatment. More detailed analyses have followed, also showing ACC dysfunction during the performance of tasks shown to be mediated by ACC (Carter *et al.*, 1997). Even in test conditions where performance