

The Neurocognitive Correlates of BOLD Activation in the Dorsolateral Prefrontal Cortex of Patients with Schizophrenia: An fMRI Investigation

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Numerous studies have implicated the dorsolateral prefrontal cortex (DLPFC; BA 9&46) in the pathophysiology of the neurocognitive dysfunctions which characterize many patients with schizophrenia. The purpose of the current investigation was to identify the neurocognitive correlates of BOLD activation in the DLPFC of patients diagnosed with schizophrenia. Twenty medicated outpatients, providing informed consent, were administered a comprehensive battery of neurocognitive assessments on the Computerized Multiphasic Interactive Neurocognitive Diagnostics System (CMINDS) and received a series of fMRI scans on a Picker Eclipse 1.5T scanner while performing a Sternberg working memory task (Manoach et al., 1999). Subjects responded to whether visually presented probe numbers were included in a memory set of 2 or 5 digits. SPM2 was used to analyze the images contrasting the 5- and 2-digit conditions. Region of interest analyses were conducted using the WFU Pickatlas (Maldjian et al., 2003) to summate the average contrast t values for BA 9&46. Pearson r comparisons yielded a consistent pattern of significant positive correlations between performance on the Auditory Verbal Learning Test (AVLT-15 words) for both immediate and delayed memory, and DLPFC activation, on the left more than the right hemisphere (Table 1). Also, a ratio of the left to right hemisphere extent of activation ($p < .01$, $k=5$) correlated with perseverative responses on the Card Sorting Test, a common measure of executive dysfunction in schizophrenia research ($r=.62$; $p=.005$). These preliminary analyses illustrate a relationship between the functional activation of the DLPFC and verbal memory and executive function task performance, both of which are characteristically disrupted in schizophrenia. The relationship between hemispheric asymmetry and perseverative errors is consistent with published literature demonstrating a failure to activate the right DLPFC, relative to the left, in patients with schizophrenia (e.g., Barch et al., 2003; Perlstein, et al., 2001).

Table 1: Pearson r coefficients (p value)

	left DLPFC	right DLPFC	bilateral DLPFC
AVLT Total Immediate	.58 (.007)	.47 (.04)	.57 (.009)
AVLT Trial 1	.55 (.01)	.39 (.09)	.52 (.02)
AVLT Trial 2	.52 (.02)	.50 (.03)	.54 (.01)
AVLT Trial 3	.59 (.006)	.46 (.04)	.56 (.01)
AVLT Delayed Recall	.55 (.01)	.36 (.12)	.50 (.02)

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