12. Neuropsychology II: Language, Working Memory, and Attention

THE EFFECTS OF D-AMPHETAMINE ON WORKING MEMORY AND LANGUAGE DEFICITS IN SCHIZOPHRENIA

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It has been hypothesized that language deficits in schizophrenia reflect a working memory dysfunction. More specifically, such deficits may be associated with a disturbance in the ability to generate and maintain discourse plans that guide and constrain subsequent language production. Such working memory deficits in schizophrenia may be related to reduced dopamine effects in prefrontal cortex. To test this hypothesis, healthy controls and schizophrenic patients performed language and working memory tasks on each of two days, following administration of either d-amphetamine (0.25 mg/kg) or placebo (double-blind, randomized order). All schizophrenic patients were medicated with low dose (<250 mg CPZ equivalents) high potency neuroleptics. On each day, participants completed structured interviews to assess language function, our modified version of the Continuous Performance Test, and a spatial working memory task. Among controls, amphetamine significantly increased the amount and complexity of speech, and decreased pausing. Among patients, amphetamine increased verbosity and decreased pausing, while significantly reducing formal thought disorder and unclear references. These findings are consistent with the hypothesis that language deficits in schizophrenia are associated with decreased dopamine effects in prefrontal cortex.

BEHAVIORAL ASSESSMENT OF FRONTAL/CINGULATE ATTENTION DEFICITS IN SCHIZOPHRENIA

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Schizophrenia is associated with prefrontal cortical pathology, as well as vast deficits in the attention domain. We employed a modified Posner paradigm to demonstrate that schizophrenic patients show selective deficits in self-guided attention, hypothesized to rely upon the anterior cingulate region, but do not show deficits in stimulus-driven attention, hypothesized to rely upon the posterior parietal regions.

Methods: Thirteen medicated schizophrenics and 13 healthy controls participated in this study. All subjects were first given the BPRS for clinical assessment of symptomatology. Subsequently, subjects' attention functions were assessed using a series of cued-orientation tasks with (1) a peripheral box cue, (2) a central arrow cue, (3) and a central word cue.

Results: Our results indicated that patients' performance was significantly impaired when responding to targets preceded by a central word cue relative to central arrow and peripheral box cues ($F(2,24)=4.74$, $p<0.05$), which did not differ for healthy subjects. Furthermore, patients but not healthy subjects responded slower to right visual field targets preceded by an invalid cue relative to targets preceded by a valid or no-cue.

Implications: These findings suggest a deficit in self-guided attention orientation in schizophrenia, while orientation in response to peripheral targets is intact. In addition, a selective deficit in orientation to right-visual field in response to invalid cues also suggests a greater left hemisphere involvement in the schizophrenic patients' deficit. We suggest that schizophrenic patients show abnormalities in anterior attention systems relying upon the anterior cingulate cortex, but not posterior parietal attention systems.

BEHAVIORAL DISSOCIATION OF WORKING MEMORY AND SELECTIVE ATTENTION FUNCTIONS IN SCHIZOPHRENIA

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Impaired working memory and attention are considered landmark cognitive deficits of schizophrenia. The present research investigated the role of selective attention and feature binding during a working memory task. More specifically, we aimed at differentiating memory deficits linked to buffer limitations, from those linked to divided attention by manipulating memory load and stimulus feature dimensions during a shape working memory task. *Methods:* Thirteen medicated schizophrenic and 13 healthy subjects were given a continuous performance working memory task during which abstract shapes appeared one at a time on a computer screen. Subjects were asked to encode all the shapes and respond if any shape repeated (targets). The 3 experimental conditions consisted of a 'center' presentation, where the 'location' dimension was not manipulated, a 'redundant' condition, where the shapes appeared at random locations on the screen and targets always repeated at the original place of presentation, and a 'non-redundant' condition, where the stimuli appeared at different screen locations and so did targets. *Results:* Our results revealed that healthy subjects showed highest accuracy and d' (discrimination) on redundant trials ($p<0.005$), indicating that while making a decision based on the attended dimension of 'shape' healthy subjects also encoded their unattended attribute of 'location'. In contrast, redundancy of target location did not improve patients' target detection capability, as indicated by lower accuracy during both redundant and non-redundant