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Verbal memory in schizophrenia: additional evidence of subtypes having different cognitive deficits

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Abstract

A prior study found a selective deficit in verbal working memory in a subgroup of patients with schizophrenia who performed as well as healthy controls on a screening test of attention and auditory perception [Arch. Gen. Psychiatry 55 (1998) 1093]. Given the importance of defining pathophysiologically distinct subtypes of schizophrenia, the present study aimed to replicate and extend this finding. Patients with schizophrenia who passed the screening test (discriminators or Dsz patients) were compared to those who did not (nondiscriminators, NDsz patients), and healthy controls on a word serial position test (WSPT) and on other tests of verbal and nonverbal cognitive function. Dsz patients performed more poorly than controls on the WSPT and showed serial position effects consistent with a verbal memory deficit. They also showed a deficit in verbal memory but not visual memory on the Wechsler Memory Scale-Revised. In contrast, the NDsz patients showed overall poor performance on both verbal and nonverbal tests, consistent with a generalized deficit. Verbal working memory deficits were not related to education, gender, severity of symptoms, medication status, or hemispheric dominance for perceiving dichotic words. The findings add to growing evidence for the existence of a subgroup of schizophrenia having a specific verbal memory deficit that is not limited to working memory, but extends to learning and recall of verbal material.

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1. Introduction

Studies using visually presented spatial or verbal stimuli have found evidence that working memory

impairment is a primary cognitive deficit in schizophrenia (Park and Holzman, 1992; Carter et al., 1998; Cohen et al., 1997; Perlstein et al., 2001; Callicott et al., 2000). Patients with schizophrenia also show deficits in verbal working memory on auditory tasks (Gold et al., 1997; Wexler et al., 1998; Menon et al., 2001). Gold et al. used a letter–number sequencing task, in which subjects must simultaneously store and manipulate the order of spoken letters and numbers. Patients showed deficits on this task, which were

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highly correlated with performance on the Wisconsin Card Sorting Test. They suggested that impairments of working memory may be responsible for some of the generalized deficits found in schizophrenia on multiple cognitive tests. However, this also raises an important question that has plagued neuropsychological studies of schizophrenia. How does one differentiate between a generalized deficit in cognitive function and a deficit that is specific to the cognitive function under study, e.g., verbal working memory? Similarly, to what extent does the poor performance of patients on working memory tests reflect a generalized deficit due to reduced attention or motivation?

Wexler et al. (1998) found evidence of a selective deficit of verbal working memory in a subgroup of patients with schizophrenia who were tested on an auditory word serial position test (WSPT). This working memory test requires storage and rehearsal of phonological and sequential information over a delay of up to 9 s. Before patients were tested on the word and a tone serial position test, they were divided into two subgroups based on their ability to perform normally on a tone discrimination test requiring sustained attention and auditory perception. Wexler et al. reasoned that to study verbal working memory in schizophrenia it would be important to first determine whether or not the patients could adequately attend to and perceive auditory stimuli. Patients who performed as well as healthy controls on the tone discrimination test also showed normal performance on the tone serial position test, but showed deficits on the WSPT. The fact that this subgroup performed as well as controls on a tone discrimination task and working memory test that for controls was more difficult than the WSPT argues against their poorer verbal memory being due to a generalized deficit. In contrast, patients who performed poorly on the tone discrimination test had marked deficits on *both* the word and tone serial position tests, which is suggestive of a generalized deficit perhaps due to reduced attention, perception or motivation.

The present study extends this earlier work and provides further evidence for the existence of schizophrenia subtypes having either a verbal memory deficit or a generalized cognitive deficit. As in the Wexler et al. (1998) study, a tonal discrimination test was used to identify a subgroup who performed as well as controls on a test of attention and auditory perception (i.e.,

discriminators or Dsz patients) and a subgroup who performed poorly on this screening test (i.e., non-discriminators or NDsz patients). Use of the WSPT, which requires subjects to remember the order of four spoken words, also permitted an examination of accuracy as a function of the serial position of words in the sequence. Elvevåg et al. (2002) tested patients with schizophrenia on a probed letter recall task, in which participants read a list of letters aloud and then were required to name the letter that occurred in a specific serial position. They reasoned that if poor performance in patients were due to general deficits in motivation or attention, one would expect greater errors distributed fairly equally across serial positions. They did not find this to be the case, but rather found the patients had poorer performance than controls at the list's beginning and middle, items that had to be held in memory the longest. In the present study, it was hypothesized that Dsz patients with verbal memory impairment would show greater deficit for words presented at earlier serial positions because they must be held in memory longer. In contrast, the NDsz patients having a generalized deficit would perform markedly poorer than controls regardless of the serial position of the word.

Although visuospatial working memory deficits have been replicated in both medicated and unmedicated patients with schizophrenia (Carter et al., 1996; Park and Holzman, 1992; Park et al., 1999), the patients in the Wexler et al. (1998) study of verbal working memory were all receiving psychiatric medications. A secondary purpose of this study was therefore to compare the performance of medicated and unmedicated patients on the WSPT.

A further purpose was to compare the Dsz and NDsz subgroups on other tests of verbal and nonverbal cognitive function. Two questions were of particular interest. First, is the verbal memory deficit in Dsz patients specific to working memory or does it extend to learning and recall of verbal information, e.g., as measured by the Wechsler Memory Scale-Revised (WMS-R; Wechsler, 1987)? Second, would NDsz patients show overall poor performance on *both* verbal and nonverbal tests consistent with a generalized deficit in cognitive function, but Dsz patients show a more selective deficit in verbal memory?

Lastly, findings from neuroimaging studies have revealed material-specific laterality effects, with main-

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