



Associative interference does not affect recognition memory in schizophrenia

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Abstract

Studies of schizophrenia suggest a specific impairment in binding different parts of a memory event into a cohesive whole, a finding that may account for the reported preferential deficits in associative recognition memory relative to item recognition. As a further test of this hypothesis and to exert greater control over task differences, we used a recognition memory interference test in which participants encoded landscape pictures that had each been divided into three segments. During encoding, subjects were presented with one segment from each of the landscapes. Then, an interference generating task followed consisting of the presentation of the second segment from half of the landscapes. Finally, a forced-choice recognition memory test consisted of the presentation of each encoding picture stimulus concurrently with the related third segment that had never been presented before. Thus, for half of the stimuli, additional related information was encoded and this is known to interfere with recognition memory. However, an impaired ability to bind this related information should reduce the interfering effect of associated stimuli. Thirty-five schizophrenia patients and 37 healthy controls were administered this memory interference task. A significant interaction between groups and recognition conditions was found with a significant interference effect observed for controls (performance dropping from 76% to 62%) but not for patients (performance remaining unchanged from 66% to 68%). These results provide further support for faulty associative memory processing in schizophrenia.

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1. Introduction

Understanding memory impairments has long been a topic central to the investigation of cognitive func-

tioning in schizophrenia. Beyond the reports of diffuse cognitive impairments across a multitude of domains, deficits on tasks of episodic memory appear to have clinical significance for several reasons, including the greater magnitude of these deficits compared to those reported for other cognitive functions (Heinrichs and Zakzanis, 1998; Saykin et al., 1991) and their predictive value in determining both future functional out-

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come (Green, 1996) and treatment resistance (Jooper et al., 2002; Lawrie et al., 1995). The study of episodic memory in schizophrenia is also notably facilitated by past work in psychology and neuroscience, which has provided us with a comprehensive framework to understand the cognitive architecture of memory and its neural correlates. This knowledge is critically important as it provides us with a diversity of well-defined systems and processes that can be discriminated and used to identify both memory and brain dysfunctions in schizophrenia. A better understanding of the fundamental memory processes selectively affected in schizophrenia could facilitate the identification of specific brain-behavior associations while also providing very useful information for cognitive remediation strategies.

To identify distinct processes whose malfunction may serve to limit memory processing in schizophrenia, several researchers have eschewed the use of standardized neuropsychological test batteries and have instead relied on experimental tasks borrowed from cognitive psychology. These tasks allow the isolation of specific memory processes and hence can provide a sensitive measure of the integrity of such processes. The use of these experimental tasks has led to a number of intriguing findings. In particular, several studies have documented a greater impairment on associative (pair, source, or temporal order) recognition memory tasks relative to item recognition tasks (Danion et al., 1999; Huron et al., 1995; Keefe et al., 2002), suggesting that processes related to these types of materials and/or some processes inherent to associative recognition could be more affected than other memory processes. For instance, a study by Danion and collaborators (Danion et al., 1999) featured an associative recognition test in which subjects studied the pairing of two common objects (e.g. a camera being placed next to a handkerchief). Later, subjects were presented with a typed list of object pairs, with half of these pairs in their previous combination (intact pairs) and the remaining half consisting of pairings of old objects but rearranged to form a new pair. Subjects had to discriminate the intact pairs from the rearranged ones. These judgments proved to be much more difficult for the subjects with schizophrenia than for the healthy controls, suggesting that in schizophrenia the ability to associate separate aspects of events into a cohesive,

memorable and distinctive whole is impaired. What made this finding particularly interesting was that both groups did not significantly differ from one another on the measures of item recognition, suggesting that associative recognition was selectively impaired in the patient group. Similar dissociations between item recognition and associative recognition have also been reported in other investigations (Bentall et al., 1991; Elvevåg et al., 2000; Rizzo et al., 1996).

We recently performed a quantitative review of the literature on recognition memory and schizophrenia (Pelletier et al., 2005). An analysis of the data from 84 published studies yielded a significant mean weighted effect size of $d=.76$ for the comparison of overall recognition memory in schizophrenia patients versus controls. Interestingly, our examination of item and associative recognition memory revealed no significant differences in their corresponding mean effect sizes ($d=.72$ and $d=.71$, respectively). These results may appear at first glance to contradict the results of recent studies (Danion et al., 1999; Huron et al., 1995; Keefe et al., 2002). However, it is likely that several methodological issues partly account for the reported dissociation of spared item recognition memory and impaired associative recognition. First, the item memory tests administered in several of the experiments mentioned above were often easier than the majority of the other item memory tests that contributed to the calculations of the combined effect size for recognition memory in our meta-analysis. These easier item memory tests likely suffered from ceiling effects, thus reducing the size of the effect. For example, in the study conducted by Danion and colleagues (Danion et al., 1999), subjects only had to remember ten items during the item memory test, while they had to remember seventy associations during the pair test. As a result, this test may have underestimated the magnitude of the item memory deficit. With respect to source recognition, several empirical studies did not measure item memory and source memory independently. Instead, these studies often combined items remembered and items correctly guessed during item memory measurement, without controlling statistically for the guessed responses (Keefe et al., 2002; Murnane and Bayen, 1996, 1998). However, because healthy subjects relied on guessing to a lesser extent than people with schizophrenia, the ratio of source judgements made on guessed items differed between

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