Prospective memory and its correlates and predictors in schizophrenia: An extension of previous findings

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Abstract

BACKGROUND: Prospective memory (PM) is the ability to remember to do something in the future without explicit prompts. Extending the number of subjects and the scope of our previously published study, this investigation examined the relationship between PM and socio-demographic and clinical factors, activities of daily living (ADL) and frontal lobe functions in patients with chronic schizophrenia.

METHODS: One hundred and ten Chinese schizophrenia patients, 60 from the previous study and 50 additional patients recruited for this study, and 110 matched healthy comparison subjects (HC) formed the study sample. Patients' clinical condition and activity of daily living were evaluated with the Brief Psychiatric Rating Scale (BPRS) and the Functional Needs Assessment (FNA). Time- and event-based PM tasks and three tests of prefrontal lobe functions (Design Fluency Test [DFT], Tower of London [TOL], Wisconsin Card Sorting Test [WCST]) were also administered.

RESULTS: Patients' level of ADL and psychopathology were not associated with PM functions and only anticholinergic medications (ACM) showed a significant negative correlational relationship with PM tasks. Confirming the findings of the previous study, patients performed significantly more poorly on all two PM tasks than HC. Performance on time-based PM task significantly correlated with age, education level and DFT in HC and with age, DFT, TOL and WCST in patients. Patients' performance on the event-based PM correlated with DFT and one measure of WCST. In patients, TOL and age predicted the performance on time-based PM task; DFT and WCST predicted the event-based task.

CONCLUSIONS: Involving a large sample of patients with matched controls, this study confirmed that PM is impaired in chronic schizophrenia. Deficient PM functions were related to prefrontal lobe dysfunction in both HC and patients but not to the patients' clinical condition, nor did they significantly affect ADL. ACMs determined certain aspects of PM.

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1. Introduction

Prospective memory (PM), defined as "memory for activities to be performed in the future" (Einstein & McDaniel, 1990), is gaining attention in research and clinical practice (Kliegel, McDaniel, & Einstein, 2007; McDaniel & Einstein, 2007; West, 2007). Of the various aspects of PM, time- and event-based subtypes of PM (Einstein & McDaniel, 1990; Kvavilashvili & Ellis, 1996) are addressed in this study. Time-based PM refers to remembering to carry out an intention at a specific moment. Event-based PM is defined as remembering to perform an intended action triggered by an external event.

To date a number of studies have addressed PM and its correlates in schizophrenia (Elvevag, Maylor, & Gilbert, 2003; Henry, Rendell, Kliegel, & Altgassen, 2007; Kondel, 2002; Kumar, Nizamie, & Jahan, 2005, 2007; Meissner, Hacker, & Heilemann, 2001; Ritch, Velligan, Tucker, Dicocco, & Maples, 2003; Shum, Ungvari, Tang, & Leung, 2004; Twamley et al., 2007; Wang et al., 2007; Woods, Twamley, Dawson, Narvaez, & Jeste, 2007). Despite the widely different methods in these studies to assess PM, schizophrenia patients were found to perform significantly worse than healthy comparison subjects (HC) in PM tasks in all investigations that had a HC group. Therefore, PM deficits were proposed to be trait-dependent characteristics of the illness (Kumar et al., 2005; Wang et al., 2007).

However, there were methodological limitations in the above-mentioned studies. Sample sizes were relatively small ranging from 10 (Kondel, 2002) to 72 subjects (Twamley et al., 2007). The selection of subjects (e.g., the sampling method or inclusion/exclusion criteria used) was not elaborated in the studies published so far with one exception (Shum et al., 2004). Two studies did not include HC groups (Kondel, 2002; Ritch et al., 2003). Two studies (Kumar et al., 2005, 2007) examined drug-free, acutely ill psychotic patients and nearly one-third of them could not recall the PM task. The PM impairment found in these studies, therefore, could be confounded by retrospective memory. Except for two studies (Ritch et al., 2003; Twamley et al., 2007), the impact of PM deficit on patients' activity of daily living (ADL) was not measured. None of the studies have examined the relationship between clinical symptoms measured by standard rating scales and PM in schizophrenia, nor has there been exploration of the potential impact of psychotropic drugs on PM functions.

In clinical practice, it is expected that PM has a major impact on patients' ADL and quality of life. Due to the devastating effects of psychopathology and the social stigma associated with schizophrenia, a sizeable proportion of patients are unemployed, socially isolated and lead a disorganized life (Shen, 2002). Impairment of PM could make any rehabilitative efforts difficult as patients could not follow through steps towards any organized meaningful activity. In addition, problems related to deficient PM, such as missing appointments or take medication, could lead to early relapse and further functional impairment. To date, only two studies have addressed the relationship of PM with ADL. Ritch et al. (2003) found that secondary verbal memory and sum score of time- and event-based PM predicted more than 29% of the variance of ADL scores in 50 schizophrenia patients. Twamley et al. (2007) also found that better performance on PM tests predicted higher functional capacity measured by a standardized ADL scale in 72 schizophrenia patients.

In a previous study (Shum et al., 2004) we assessed three subtypes (time-, event-, and activity-based) of PM based on the paradigm designed by Einstein, McDaniel, Richardson, Guynn and Cunfer (1995) and their association with prefrontal lobe functions in 60 schizophrenia patients and 60 matched HC. As an extension of the previous study, the primary objective of this investigation was to clarify the relationships between PM and a host of socio-demographic and clinical variables and ADL as these associations were not addressed in our preliminary study. The secondary objective was to confirm the results of our preliminary study concerning the relationship between time-and event-based PM and frontal lobe tests using a larger sample thereby increasing the power of the investigation. We focused on time-and event-based PM because these are the most frequently investigated aspects of PM, particularly in subjects with schizophrenia. In this report activity-based PM was not included because of the ceiling effect associated with the task used in our previous study and the inappropriateness of conducting correlational and regression analyses on data with limited or no variation.

The first hypothesis was that psychopathology, psychotropic drugs and ADL would be significantly associated with the patients' performance on PM tasks. This is because these factors are related to impaired cognitive functions in schizophrenia patients (Lindenmayer, Khan, Iskander, Abad, & Parker, 2007; O'Grada & Dinan, 2007). The second hypothesis was that patients with long-term schizophrenia would perform significantly worse on both types of PM compared to matched HC. The third hypothesis was that performance on prefrontal lobe functions would be significantly correlated with performance on PM tasks confirming the results of our previous study (Shum et al., 2004).