Performance of Schizophrenia Patients on Time-, Event-, and Activity-Based Prospective Memory Tasks

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Abstract

The present study aimed to determine whether individuals with long-term schizophrenia have impaired prospective memory (PM), the ability to remember to perform intended actions in the future. Three PM tasks (time-, event-, and activity-based) were administered to 60 schizophrenia patients and 60 matched controls. Patients performed significantly more poorly than controls on all three tasks. The between-group difference was disproportionately larger on the time-based task, a task that required a prefrontal lobe process called self-initiated retrieval. To examine the relationship between PM and prefrontal lobe functions, subjects were also administered the Design Fluency Test (DFT), the Tower of London (TOL), and the Wisconsin Card Sorting Test (WCST). For patients, performance on the event-based task was found to correlate significantly with performance on the DFT, and performance on the time-based task was found to correlate significantly with performance on the TOL. Results of this study support the importance and contribution of prefrontal lobe processes in prospective remembering and have implications for the assessment and treatment of individuals with schizophrenia.

Keywords: Prospective memory, schizophrenia, prefrontal lobe function, rehabilitation.

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Memory impairment is one of the most common cognitive problems in schizophrenia patients (Gourovitch and Goldberg 1996). This type of impairment is usually long-term, debilitating, and difficult to treat (Chen and McKenna 1996). Schizophrenia patients have been found to be impaired on their ability to recall, recognize, and learn both visual and verbal materials (e.g., Gold et al. 1992*a*, 1992*b*; Tamlyn et al. 1992; Paulsen et al. 1995). These findings have been postulated to result from neuropathological abnormalities in the temporal-hippocampal area (Goldman et al. 1996).

Most, if not all, studies that have examined the nature and extent of memory impairment in schizophrenia patients have focused on a type of memory that involves the ability to recall or recognize past information, retrospective memory (Chen and McKenna 1996). Although this type of memory is important and has been researched extensively in both the experimental and the applied literature, researchers have become increasingly interested in studying another type of memory, prospective memory (PM; Brandimonte et al. 1996; Shum et al. 1999). Kvavilashvili and Ellis (1996) defined PM as "remembering to do something at a particular moment in the future or the timely execution of a previously formed intention" (p. 25). Examples of PM include remembering to attend a doctor's appointment and remembering to take medication at the right time.

The roots of PM research can be traced to studies on aging, where most of the applicable theoretical constructs and assessment procedures were developed. There are two main reasons for recent interest in PM. First, it is considered to be different from and more complex than retrospective memory. According to Glisky (1996), PM involves at least four components: (1) forming and organizing an intention, (2) remembering the intention over a delay period, (3) monitoring when and how to execute the intention, and (4) performing the intention and remembering that it has been carried out. Because these components are closely related to executive functions, and based on evidence from neuroimaging studies (e.g., Burgess et al. 2001; Okuda et al. 1998), PM is thought to involve the prefrontal rather than the medial-temporal-hippocampal areas of the brain.

Second, PM has been considered to have important implications for the management and rehabilitation of clinical patients (Shum et al. 2002). Many everyday activities require not only recalling or recognizing information learned in the past but also carrying out an intended action at the right time in the right context. Because prospective

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forgetting can sometimes result in life-threatening hazards (e.g., forgetting to turn off electrical appliances), a better understanding of the nature and processes underlying PM impairment can enable mental health professionals to better assess and manage such deficits.

Einstein and McDaniel (1990) identified two subtypes of PM, time- and event-based; these subtypes have received considerable attention in the literature. While time-based PM involves remembering to perform an action at a specific time (e.g., telephoning someone at 3 p.m.), event-based PM involves remembering to perform an action when an external cue appears (e.g., passing on a message when a particular person is seen). Using a dual-task experimental paradigm, Einstein et al. (1995) administered a time-based and an event-based prospective task to groups of younger and older subjects. They found that for both groups, performance on the event-based task was better than performance on the time-based task. Furthermore, older subjects performed more poorly than younger subjects on the time- but not the event-based tasks. According to Einstein et al. (1995), difference in performance between the time- and event-based tasks was due to the greater demand placed by the time-based tasks on the prefrontal lobe (the need to self-initiate the retrieval of an intention because of the absence of an external cue). Furthermore, they argued that the impairment of the older subjects on the time-based task is due to functional deterioration of the prefrontal lobe.

In addition to the time- versus event-based distinction, Kvavilashvili and Ellis (1996) proposed activity-based PM. This type of PM is similar to event-based PM in that it involves the retrieval of an intended action based on the appearance of an external cue. However, activity-based PM is considered less demanding than either time- or event-based PM because the external cue coincides with the end of an ongoing activity and thus does not require the interruption of the activity. Examples of an activity-based PM task include switching off the oven after cooking or turning off the light when leaving a room.

Given that schizophrenia patients show impairment on neuropsychological tests of prefrontal lobe functions such as planning and cognitive flexibility (Gourovitch and Goldberg 1996), and prefrontal cortex abnormalities on functional brain imaging (Weinberger et al. 1991), we expected that these patients would exhibit PM impairment. A computer-assisted search of data bases (MEDLINE, PsychINFO, EMBASE) supplemented by cross-referencing of review papers published over the past 5 years, however, suggested that the nature and extent of PM in schizophrenia had not been systematically examined. The first aim of the present study was, therefore, to determine whether patients with long-term schizophrenia show impairment of the three types of PM reviewed above, adapting the paradigm developed by Einstein et al. (1995).

We also anticipated that the study of PM task performance in schizophrenia would enhance the understanding of the basic processes underlying PM (Graf and Uttl 2001). Based on the literature reviewed above, the following hypotheses could be formed. Although all three PM tasks require the basic processes of encoding and planning, they differ in other task requirements. If Einstein et al. (1995) were correct and if schizophrenia is related to prefrontal dysfunction, schizophrenia patients suffering from varying degrees of prefrontal dysfunction would perform differently on the three PM tasks. In addition, compared with normal controls, schizophrenia patients would perform more poorly on one or more of the three PM tasks. Specifically, the clinical group would show more problems on the PM task that places the most demand on the prefrontal lobe—namely, the time-based task.

A second aim of the study was to clarify the contribution of different prefrontal lobe processes to PM. To this end, performance on three commonly used tests of executive function (the Design Fluency Test [DFT], the Wisconsin Card Sorting Test [WCST], and the Tower of London [TOL]) was correlated with performance on the three PM tasks. Because the three tests measure three different processes (spontaneous flexibility, reactive flexibility, and planning), it was expected that performance on the three PM tasks, which place varying requirements on the prefrontal lobe, would correlate differently with these three tests of executive function.

Method

Subjects. Two groups of subjects took part in the study. The first group comprised 42 male and 18 female schizophrenia inpatients from the long-term psychiatric rehabilitation unit of a university-affiliated hospital in Hong Kong. Inclusion criteria for the patient group were as follows: (1) primary education and ability to understand the essence and requirements of the study; (2) age between 20 and 50 years; (3) language Cantonese and heritage Chinese; (4) diagnosis of schizophrenia according to *DSM–IV* (APA 1994); (5) duration of illness of at least 2 years; (6) availability of at least one informant to provide and corroborate demographic and clinical data; and (7) current antipsychotic medication less than 800 mg/day chlorpromazine equivalent, calculated according to standard guidelines (Taylor et al. 1999). Exclusion criteria were (1) electroconvulsive therapy (ECT) in the past 12 months; (2) history of alcohol and/or substance abuse; (3) recent alcohol and/or substance abuse; (4) significant medical condition requiring ongoing treatment; (5) current antidepressant or benzodiazepine medication; and (6) use of benzhexol, the only oral anticholinergic used in Hong Kong, exceeding 6 mg/day.

Prior to the commencement of the study, a comprehensive diagnostic assessment was conducted by the second author to confirm the clinical diagnosis of schizophrenia according to *DSM–IV.* This assessment included chart review and interview of patients and, wherever possible, their relatives. The following sociodemographic and clinical variables were collected from the patients or extracted from the notes: age, sex, length of illness, and age of onset.

The second group of subjects comprised 42 men and 18 women recruited from a vocational training center (Hong Kong College of Technology) in Hong Kong. No one in this group had a history of psychiatric or neurological disorder. Controls were paired with patients in terms of sex, age, and educational level.

The mean age of the patients was 31.1 ± 7.1 years (range: 20–47 years). The duration of illness was 7.7 ± 4.1 years (range: 2–15 years), and the mean level of education was 10.2 ± 2.5 years (range: 6–16 years). The mean age of the control group was 30.6 ± 7.1 years (range: 18–45 years). The patient and control groups did not differ with respect to age; $t(118) = -0.385$, $p > 0.05$. The mean level of education in the control group was 10.5 ± 2.2 years (range: 6–16 years), which was not significantly different from that of the patient group; $t(118) = 0.584$, $p > 0.05$.

Instruments. Patients and controls were administered three neuropsychological tests of prefrontal lobe functions (DFT, WCST, and TOL) and three PM tasks.

DFT (Jones-Gotman and Milner 1977). In the DFT, subjects are required to generate as many different meaningless designs as possible. The DFT measures the prefrontal lobe function of spontaneous flexibility, or the ability to retrieve ideas (Eslinger and Grattan 1993). The test takes about 15 minutes to administer, and there are two conditions. The 5-minute free-response condition does not have any restriction imposed on design generation. In the 4-minute fixed-response condition, subjects are required to produce designs that contain exactly four lines. The interrater agreement and rater consistency of the DFT are satisfactory, and the test has been found to be sensitive to injuries to the frontal lobe (Spreen and Strauss 1998). Measures are the number of novel output scores for the two conditions.

WCST (Heaton et al. 1993). The WCST assesses the prefrontal lobe function of reactive flexibility, or the ability to shift cognitive strategies in response to the changing demands of an external situation (Eslinger and Grattan 1993). It requires the subject to match cards that contain sets of geometric designs varying in color, form, and number with four key cards. The subject is not told which aspect of the key cards to match but is given feedback (i.e., told whether the placement is correct or incorrect) following the placement of each card. The criterion for correct matching starts with color and changes after ten consecutive correct responses, although the subject is not informed of this change. Testing terminates after the achievement of six categories of correct matching (color, form, number, color, form, and number) or after placement of all 128 cards. The time required to administer the WCST is 15 to 30 minutes. The psychometric properties of the WCST have been found satisfactory, and it has been shown to be sensitive to frontal lobe injury (Spreen and Strauss 1998). In this study, the measures obtained were as follows: (1) number of categories completed, (2) number of trials to complete the first category, (3) total correct number, (4) total number of errors, and (5) perseverative errors.

TOL (Shallice 1982). The TOL was used to examine the prefrontal lobe process of planning (Lezak 1995). The present study employed a version of the TOL developed by Tunstall (1999), who increased the number of wooden disks from three to four to overcome a commonly observed ceiling effect in the original version. The four-disk TOL has satisfactory psychometric properties and is sensitive in detecting planning impairment in children with traumatic brain injury (Shum et al. 2000). In the TOL, subjects are presented with four colored disks (white, yellow, blue, and black) on three pegs and asked to achieve a given arrangement in a stated number of moves by shifting the disks one at a time from one peg to another. The same initial position is set for each of the ten graded problems, with three attempts allowed per problem. The measure obtained for this test is a total score ranging from 0 to 30.

PM Tasks. Three PM tasks (time-, event-, and activity-based) were developed for this study based on a dual-task experimental paradigm (Einstein et al. 1995). Subjects were asked to engage in an ongoing task while performing another action that depended upon the experimental condition. The ongoing task was a three-choice (A, B, or C) general knowledge task presented on an IBM-compatible computer screen. Participants were required to read the questions that appeared, one at time, on the center of the screen and to respond by pressing the corresponding answer key on the keyboard. Participants were given feedback for each question, and their cumulative correct score was displayed at the bottom of the screen. This task was programmed using Visual BASIC and lasted 25 minutes in each of the three conditions. Subjects were told that they were to undertake the ongoing task by themselves, with the research assistant (RA) next door.

In the time-based condition, subjects were asked to contact the RA every 5 minutes using an intercom to inform the RA of the cumulative correct score on the general knowledge task. Altogether, five responses were required. Subjects could monitor the time elapsed by pressing the space bar on the computer, causing a digital clock to appear on the screen for 2 seconds. They were allowed to press the space bar at any time and as often as they liked. The measure obtained was the percentage of correct prospective responses at 5, 10, 15, 20, and 25 minutes. Responses within ±20 seconds of these times were counted as correct.

In the event-based condition, subjects were asked to contact the RA using the intercom whenever they saw the word "police" in any of the general knowledge questions of the ongoing task. The word "police" appeared altogether five times, at 2, 8, 12, 16, and 22 minutes. The measure obtained was the percentage of correct prospective responses.

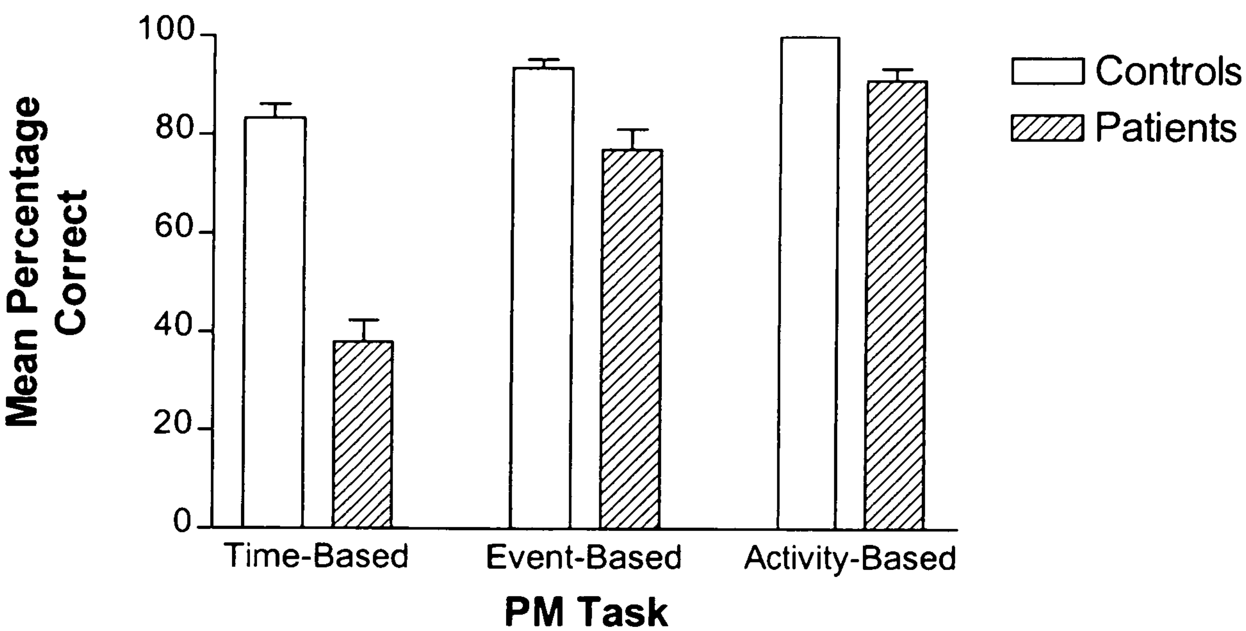
In the activity-based test, the general knowledge task was broken into five 5-minute subsections. At the end of the subsections, the computer screen turned blank and participants were required to contact the RA by pressing the space bar to reactivate the computer. The measure obtained was the percentage of correct prospective responses.

Procedures. All subjects were tested individually. Patients were tested in a quiet and well-lit room in the rehabilitation unit, while controls were tested in a similar room set up at the Department of Psychology, Chinese University of Hong Kong. Subjects were administered the neuropsychological tests first, and after a break, the prospective tasks. Testing usually lasted 2 to 3 hours and was completed within 1 day for all controls. For the patients, testing took place over 2 days within the same week because they could not complete both tests and tasks within the same day. Standardized instructions were used for all participants for each test. For the PM tasks, all subjects were asked to repeat the instructions to ensure that they understood the task. Instructions were repeated and explanations were provided for those participants who seemed uncertain about the exact nature of the tasks. Upon completion of the PM tasks, subjects were again asked to repeat what was required in the task to make sure they understood what was expected of them.

Results

An alpha level of 0.05 was used for all statistical tests in this section. The mean percentage of correct responses for patients and controls on the three PM tasks is shown in figure 1. For both groups, performance on the activity-based task was better than performance on the event-based task, which, in turn, was better than that on the time-based task. Furthermore, patients' scores were lower than those of the controls on all three tasks; the between-group difference was particularly prominent on the time-based task. These percentages were analyzed with a 2 × 3 (group × type of task) mixed analysis of variance (ANOVA) with type of task (time-, event-, and activity-based) serving as the repeated measure. The main effects for group ($F(1, 118) = 65.61$, $p < 0.05$) and type of task ($F(2, 236) = 94.90$, $p < 0.05$) were both statistically significant. In addition, the two-way (group × type of task) interaction was also significant ($F(2, 236) = 27.21$, $p < 0.05$). Post hoc analyses were carried out to identify the

Figure 1. Mean percentage of correct responses for patients and controls on three PM tasks



Note.—PM = prospective memory

source of this interaction. While patients performed significantly worse than controls on all three PM tests, the difference between the two groups was disproportionately larger on the time-based task.

To examine whether performance on the time-based PM task was related to the frequency with which patients monitored the time compared with controls, the mean number of times patients and controls monitored the clock for each of the 1-minute intervals (averaged across the five 5-minute periods) was calculated and is displayed in figure 2. Both groups of subjects monitored the clock more in the 4th and 5th minutes—the intervals closest to the target time. In addition, controls monitored more in the 3rd, 4th, and 5th minutes than patients did. The correlation between performance on time-based PM tasks and the frequency of time checks for each of the 1-minute intervals is summarized in table 1. As expected, significant relationships were found between these two variables, with a stronger relationship demonstrated for the later time intervals.

Time-monitoring data were analyzed with a 2 × 5 (group × interval) mixed ANOVA, with interval (1st, 2nd, 3rd, 4th, and 5th) serving as the repeated measure. The main effects for group ($F(1, 118) = 12.85$, $p < 0.05$) and interval ($F(4, 472) = 94.85$, $p < 0.05$) were statistically significant. In addition, the two-way (group × interval) interaction was also significant ($F(4, 472) = 29.22$, $p < 0.05$). Post hoc analyses were conducted to explore the source of this interaction. Patients monitored significantly less than controls in the 3rd, 4th, and 5th intervals but not in the 1st and 2nd intervals.

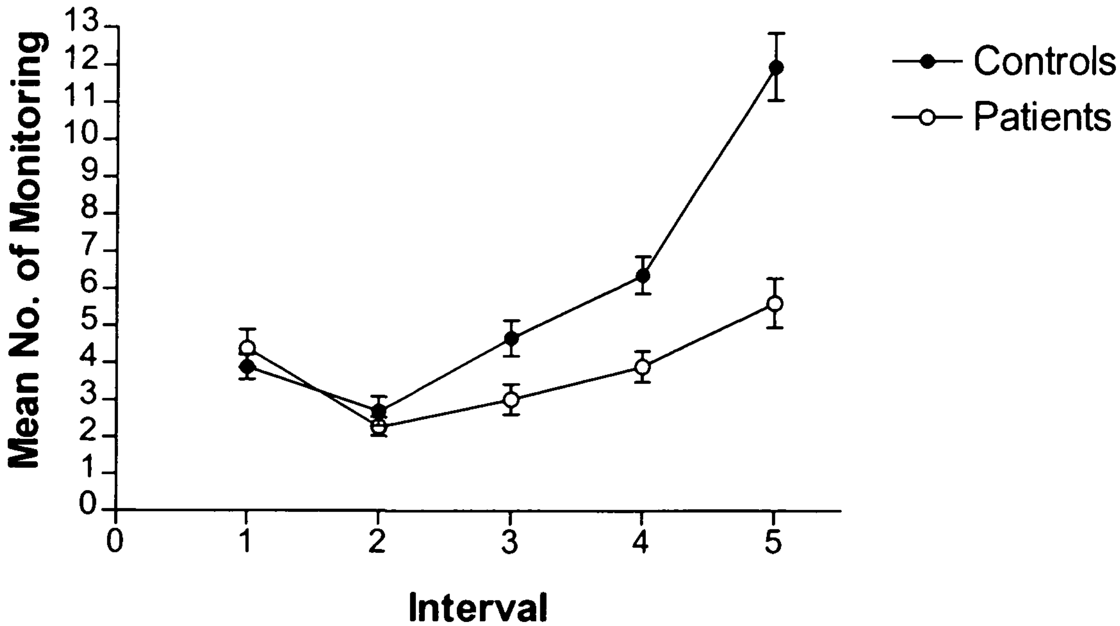
The performance of patients and controls on the eight measures of the three prefrontal lobe tests is summarized in table 2. As expected, controls scored significantly better than patients.

The relationships between PM performance and prefrontal lobe test results were examined separately for controls and patients by calculating Pearson correlation coefficients (tables 3 and 4). The performance of controls on the three PM tasks did not correlate significantly with any of the prefrontal lobe test measures. In contrast, patient scores on the three PM tasks were significantly associated with some, but not all, of the prefrontal lobe test measures. Specifically, performance on the time-based task correlated significantly with performance on the TOL, while scores on the event-based task correlated significantly with the two measures of the DFT.

Discussion

The present study aimed to determine whether patients with long-term schizophrenia have impaired PM—that is,

Figure 2. Mean number of times clock was monitored for five 1-minute intervals for patients and controls



Note.—PM = prospective memory

Table 1. Correlation between time-based task performance and time monitoring

	Group	
Interval	Controls (n = 60)	Patients (n = 60)
1st	–0.08	0.44*
2nd	0.39*	0.23
3rd	0.38*	0.44*
4th	0.49*	0.52*
5th	0.50*	0.57*

* $p < 0.05$

impaired ability to remember to do something at a particular moment in the future. It was hypothesized that performance by the two groups on the three types of PM tasks would be significantly different because of the different task requirements. In addition, it was hypothesized that schizophrenia patients would perform significantly worse than matched controls on one or more of the three PM tasks and that patients would have more difficulty with the task that placed the most demand on the prefrontal lobe, the time-based task.

The results obtained supported these hypotheses. For the two groups of subjects, performance on the activity-based task was significantly better than that on the event-based task, which in turn was significantly better than that

Table 2. Mean scores of patients and controls on prefrontal lobe tests

	Controls		Patients		
Measures	Mean	SD	Mean	SD	t(118)
DFT (free response)	13.75	7.67	7.79	9.07	3.89*
DFT (fixed response)	16.13	8.01	6.83	5.77	7.30*
WCST (categories completed)	5.53	1.19	2.75	2.27	8.41*
WCST (trials to complete first category)	16.72	18.00	59.55	49.12	–6.34*
WCST (total correct)	70.43	10.24	60.18	16.66	4.06*
WCST (total errors)	26.12	18.35	60.02	26.19	–8.21*
WCST (perseverative errors)	12.97	9.14	36.84	23.52	–7.33*
TOL (total score)	21.67	2.19	18.97	3.80	4.77*

Note.—DFT = Design Fluency Test; SD = standard deviation; TOL = Tower of London; WCST = Wisconsin Card Sorting Test.

* $p < 0.05$

Table 3. Correlation between prospective memory tasks and prefrontal lobe tests in controls

	Prospective Memory Tasks		
Prefrontal lobe tests	Time-based (n = 60)	Event-based (n = 60)	Activity-based[1]
DFT (free response)	0.22	0.10	—
DFT (fixed response)	0.23	0.07	—
WCST (categories completed)	–0.06	0.02	—
WCST (trials to complete first category)	0.13	0.08	—
WCST (total correct)	–0.21	0.12	—
WCST (total errors)	0.04	0.10	—
WCST (perseverative errors)	–0.10	0.17	—
TOL (total score)	0.22	0.15	—

Note.—DFT = Design Fluency Test; TOL = Tower of London; WCST = Wisconsin Card Sorting Test.

[1] Correlations could not be calculated between prefrontal tests and the activity-based task for controls because controls had perfect performance on the activity-based task.

Table 4. Correlation between prospective memory tasks and prefrontal lobe tests in schizophrenia patients

	Prospective Memory Tasks		
Prefrontal lobe tests	Time-based (n = 60)	Event-based (n = 60)	Activity-based
DFT (free response)	0.22	0.31*	0.11
DFT (fixed response)	0.19	0.35*	0.09
WCST (categories completed)	0.15	0.15	0.04
WCST (trials to complete first category)	–0.14	–0.14	–0.11
WCST (total correct)	0.08	0.22	0.15
WCST (total errors)	–0.13	–0.20	–0.02
WCST (perseverative errors)	–0.20	–0.20	–0.16
TOL (total score)	0.33*	0.21	0.24

Note.—DFT = Design Fluency Test; TOL = Tower of London; WCST = Wisconsin Card Sorting Test.
* $p < 0.05$

on the time-based task. Although difference in performance between time- and event-based PM tasks has been reported in the literature (e.g., Einstein et al. 1995), few studies have compared performance on these two types of PM tasks with that on an activity-based task. The difference in the performance level of the three tasks could be explained in terms of the processes required by the tasks. The time-based task requires mainly self-initiated retrieval and interruption of an ongoing activity, the event-based task requires mainly interruption of an ongoing activity, and the activity-based task requires neither of these processes (Kvavilashvili and Ellis 1996).

The pattern of mean values and results of the statistical tests on the differences between them (figure 1) are consistent with these hypotheses. However, there was a ceiling effect in performance for the control group (and possibly the patient group as well) on the activity-based task, and this limits the inference that can be drawn from performance under this condition. That is, task difficulty provides a rival explanation to frontal lobe dysfunction, with the better performance on the activity-based task being attributable to its lower difficulty level. Such an interpretation cannot be advanced for the differences in performance on the time-based and event-based tasks because a significant two-way interaction was again obtained when the activity-based task performance was removed from the ANOVA. Thus, performance here is still consistent with the hypothesis. Subsequent work will need to equate the levels of difficulty of the various PM tasks to provide a more appropriate test of the hypothesis in this regard.

Although subjects in both groups were able to understand and recall the instructions and details of the three PM tasks (tested before and after doing the tasks), schizophrenia patients performed significantly worse than controls on all three tasks. This finding suggests that schizophrenia patients have PM impairment and that this impairment is not due to inability to remember the content of a PM task but more likely due to the inability to recognize the PM cue and carry out the intended action at the right time. This is a new finding because, as mentioned in the introduction, PM impairment in chronic schizophrenia patients has not been systematically examined. It is possible, however, that an unknown proportion of differences between patients and controls was due to the sedative effect of psychotropic medication that patients were taking.

The difference in performance between the two groups of subjects was disproportionately larger on the time-based PM task than on the other two tasks. As mentioned earlier, this finding could be due to the greater demand the time-based task has on the prefrontal lobe and the abnormalities found in the prefrontal cortex of schizophrenia patients. This finding is similar to that reported by Einstein et al. (1995), who found that older individuals performed significantly worse on a time-based but not an event-based PM task than younger individuals, and highlights the important role played by the prefrontal lobes in prospective remembering.

Einstein et al. (1995) found that performance on a time-based PM task in normal subjects was related to the number of time checks carried out by the subjects. This relationship was particularly strong during the time interval(s) closest to the target time (i.e., the 5th, 10th, 15th, 20th, and 25th minutes). Einstein et al. (1995) also found that poor performance on time-based PM tasks by older subjects was due to nonstrategic time-monitoring behavior (i.e., not monitoring more during the time intervals closest to the target time). A similar pattern of results was observed in this study. Controls monitored strategically during the time-based task (i.e., increasing the number of time checks during the latter part of the 5-minute interval), and significant relationships were observed between number of time checks and PM performance. In contrast, patients monitored significantly less than controls in the 3rd, 4th, and 5th minutes. These results suggest that the more impaired performance of the patients on the time-based PM task could be explained in terms of poor monitoring, which is considered to be a function of the prefrontal lobe.

Another aim of the present study was to examine the relationship between PM and prefrontal lobe functions. As expected, patients with chronic schizophrenia performed significantly more poorly than controls on the WCST, the DFT, and the TOL. Impairment of prefrontal lobe functions has been found in schizophrenia patients (Gourovitch and Goldberg 1996) and is explained in terms of neuropathological impairment in the prefrontal area.

For controls, performance on the tests of prefrontal lobe functions did not correlate significantly with performance on the PM tasks. For schizophrenia patients, performance on the time-based PM task correlated significantly with performance on the TOL, a test of planning. Performance on the event-based PM task correlated significantly with performance on the DFT, a test of spontaneous flexibility. The significant relationship between PM task performance and prefrontal test performance in the patients again suggests that the prefrontal lobe is involved in the ability to remember to carry out an intention at a specific time in the future.

The findings of the present study have implications for the advancement of the existing theories of memory. By showing that schizophrenia patients have impaired PM and that performance on PM tasks is related to neuropsychological tests of prefrontal function, the present study provides evidence that PM might be different from retrospective memory. This is important for establishing PM as an independent and worthwhile area of study and for developing a theory or model of PM (Graf and Uttl 2001).

The present study's findings also have implications for the development of more efficient management and rehabilitation of this debilitating illness. Most patients with chronic schizophrenia lead a highly disorganized life. This is partly due to "being lost" in the sequence of daily events, thus leading to the apparent idleness and confusion, coupled with poor adjustment to family and other commitments. In addition to the distracting nature of psychiatric symptoms, poor PM capability probably contributes to this disorganized daily routine. Given that coping with daily demands and success in constructing an orderly life often depend on remembering to do things in the future, PM skills are important for independent living for schizophrenia patients. A better understanding of the nature and extent of such PM impairments in these patients would enable mental health professionals to better assess and manage such deficits (Shum et al. 2002).

To the best of our knowledge, the present study was the first to systematically examine differences between schizophrenia patients and controls with respect to PM. Subsequent research needs to examine the specificity of the effects reported here. Comparison with patient groups for whom frontal lobe dysfunction has thus far not been implicated would assist in ruling out some generalized deficits arising from patient status as an explanation of the differences we observed. Likewise, it would be of interest to compare performance on psychometric tests that have not been related to frontal lobe functions with performance on the tests employed here. In future studies, measuring schizophrenia patients' and controls' understanding of the tasks would also enhance the robustness of the findings. Careful selection of comparison tests may also help to tease out what aspects of frontal lobe functions are particularly important for PM.

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Minority Research Training in Psychiatry

Through a 5-year, $2.5 million grant from the National Institute of Mental Health, the American Psychiatric Institute for Research and Education (APIRE) is seeking through the Program for Minority Research Training in Psychiatry (PMRTP) to increase the number of minority psychiatrists entering the field of psychiatric research.

The program provides medical students with funding for stipends, travel expenses, and tuition for an elective or summer experience in a research environment, with special attention paid to trainees' career development in research. In addition, stipends are available for a limited number of 1- or 2-year postresidency fellowships for minority psychiatrists. Residents may engage in full-year research training during the last year of psychiatric residency or in "year off" research training.

Training takes place at research-oriented departments of psychiatry in major U.S. medical schools and other appropriate sites throughout the country. An individual at the site (the research "mentor") is responsible for overseeing the research training experience.

Administered by the APIRE, the program includes outreach efforts to identify minority medical students and residents who are potential researchers and to put them in touch with advisors who counsel them about careers in psychiatric research. Additional activities assist fellows and alumni in their research career development.

The director of the PMRTP is James Thompson, M.D., M.P.H.; the project manager is Ernesto Guerra. An advisory committee of senior researchers and minority psychiatrists developed guidelines for applicants and criteria for selection. The members of this committee evaluate and select trainees, oversee the research training experiences, and play a role in evaluating the effectiveness of the program.

December 1 is the deadline for applications for residents seeking a year or more of training and for postresidency fellows. For medical students, applications are due 3 months before training is to begin. Summer medical students who will start their training by June 30 should submit their applications by April 1.

For more information about the PMRTP, call the toll-free number, 1-800-852-1390, or 202-682-6225, e-mail eguerra@psych.org, or write to PMRTP at the American Psychiatric Institute for Research and Education, 1400 K Street, NW, Washington, DC 20005.