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BRIEF REPORT

Remembering the past and imagining the future in schizophrenia

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Abstract

It has been suggested that patients with schizophrenia experience a distorted sense of continuity of self across time. However, temporal aspects of self-processing have received little empirical attention in schizophrenia. In this study, the authors investigated schizophrenic patients' ability to generate specific mental images of their personal past and future. Results showed that patients recalled fewer specific past events than healthy controls, and were even more impaired in generating specific future events. These deficits were associated with levels of positive symptoms, but were not associated with negative symptoms or with performances on verbal fluency tasks. It is suggested that schizophrenic patients' failures to project themselves into specific past and future episodes might be related to difficulties in retrieving contextual details from memory, as well as disturbance of the sense of subjective time.

Keywords: schizophrenia, self, memory, future thinking

It has been suggested that schizophrenia is associated with disturbance in the sense of continuity of self across time (Danion et al., 2005). The representation of self as an entity extended in time is closely related to the ability to remember one's personal past, and the ability to project oneself into the future (Atance & O'Neill, 2001; Buckner & Carroll, 2007; Conway, 2005; Klein, Loftus, & Kihlstrom, 2002; Schacter & Addis, in press; Suddendorf & Corballis, 1997, in press; Tulving, 2005). Healthy individuals are usually able to remember past events in considerable detail, for instance "seeing" in their mind the location where an event took place, and remembering what they thought or felt at the time. Likewise, they can construct detailed representations of episodes that might happen in their personal future. In both cases, the mental generation of specific circumstances gives rise to the subjective feeling of re-experiencing the past, or pre-experiencing the future, which undoubtedly plays an important role in representing the self as temporally extended (D'Argembeau & Van der Linden, 2004, 2006; D'Argembeau, Van der Linden, Verbanck, & Noël, 2006).

Although growing evidence indicates that patients with schizophrenia are impaired in recalling specific events from their personal past (Danion et al., 2005; Feinstein, Goldberg, Nowlin, & Weinberger, 1998; Neumann, Blairy, Lecompte, & Philippot, in press; Riutort, Cuervo, Danion, Peretti, & Salame, 2003; Wood, Brewin, & McLeod, 2006), little attention has been paid to the study of the patients' ability to envision specific future events. Therefore, the primary goal of this study was to investigate schizophrenic patients' capability to generate specific images of their personal past and future, with the aim of contributing to a better understanding of disturbances of the temporal dimension of self in schizophrenia. An ancillary goal was to explore the relationship between patients' deficits and clinical symptomatology. Research suggests that negative and positive symptoms are associated with distinct types of memory deficits, with negative symptoms being related to deficits in memory efficiency (i.e., in the amount of acquired information) and positive symptoms to impairments

in memory for the context in which information was acquired (Brébion, Gorman, Malaspina, & Amador, 2005). Insofar as accessing contextual details is crucial for generating specific images of the personal past and future (D'Argembeau & Van der Linden, 2004, 2006; D'Argembeau et al., 2006; Raes et al., 2006), patients' deficits should therefore be related to positive symptomatology. Finally, numerous studies have reported that patients with schizophrenia are impaired on verbal fluency tasks, suggesting that they present general deficits in strategic retrieval processes (Bokat & Goldberg, 2003; Henry & Crawford, 2005). Consequently, in this study, phonemic and semantic fluency tasks were administered to investigate whether potential deficits in generating specific past and future events are related to general retrieval difficulties.

Method

Participants

Sixteen patients (9 women) who met the DSM-IV criteria for schizophrenia participated in the study. They had no history of traumatic brain injury, epilepsy, alcohol and substance abuse, or other neurological conditions. All patients were clinically stable at the time of assessment. They were receiving long-term neuroleptic treatment, administered in a standard dose. We excluded patients treated with benzodiazepines or lithium. The mean duration of illness was 14.3 years ($SD = 12.3$). Mean level of positive and negative symptoms as assessed by the Positive and Negative Syndrome Scale (Kay, Fiszbein, & Opler, 1987) were 15.6 ($SD = 5.9$) and 18.7 ($SD = 5.7$), respectively. The comparison group consisted of 16 healthy participants (9 women) with no history of psychiatric or neurological disorders. Patients and controls were matched for age ($M = 36$ years, $SD = 11.8$ vs. $M = 30$ years, $SD = 5.8$), education ($M = 12.1$ years, $SD = 2.9$ vs. $M = 11.5$ years, $SD = 2$), premorbid IQ, as estimated by the French adaptation of the National Adult Reading Test (Mackinnon &

Mulligan, 2005) ($M = 108$, $SD = 6.2$ vs. $M = 111$, $SD = 5.3$), and levels of depressive symptoms, as assessed by the Beck Depression Inventory-II (Beck, Brown, & Steer, 1996) ($M = 10.4$, $SD = 9.5$ vs. $M = 7.1$, $SD = 7$) (all $p > 0.05$). All participants provided written informed consent after procedures had been fully explained.

Materials and procedure

The ability to generate specific images of the personal past and future was assessed with an adaptation of the autobiographical memory and future cuing tasks (Williams et al., 1996). In the memory task, participants were asked to recall past events in response to a series of cues; in the future task, they were asked to imagine events that might reasonably happen to them in the future. For both tasks, it was emphasized that the generated events should be specific (i.e., events that occur at a particular time and place, and that do not last longer than a day), and some examples were provided to illustrate what would, or would not be considered as a specific event. The cues consisted of short sentences describing general situations or feelings that could potentially be associated with a variety of specific events (e.g., “a situation in which you feel guilty about something,” “a situation in which someone smiles at you,” “a situation in which you feel angry,” “a situation in which you feel relaxed”; see Williams et al., 1996). Two sets of 10 cues (each containing 5 positive and 5 negative cues) were used (A and B), and the assignment of sets A and B to the memory and future tasks was counterbalanced across participants. The order in which participants completed the two tasks was also counterbalanced. For both tasks, the cues were written on cards that were presented one by one, alternating positive and negative cues. Participants were given 60 s to generate a specific event in response to each cue; if their first response was not a specific event, they were prompted again to recall or imagine a specific episode (e.g., “Can you think of a specific episode?”). All responses were audiotaped, and then transcribed for scoring.

Participants' responses to each cue were scored by the interviewer (S.R.) following the criteria described by Williams, Teasdale, Segal, and Soulsby (2000). When participants did not respond or when they gave a response that did not refer to any event, this was scored as an omission. The remaining responses were then categorized as one of three types: specific (events that happen at a particular time and place and do not last longer than a day; e.g., "I imagine it is Christmas Eve, we are at home and my children give me a present ... this is a present I have wanted for a long time, this is something important for me"), extended (descriptions of a particular time period that lasts longer than a day; e.g., "I imagine next summer, my wife and children will be gone on holidays for a week and I will be alone at home"), and categoric (responses that summarize a number or category of events; e.g., "I am going to take an apartment and I don't have many friends, so I think I will be often alone, I see that as a generality"). A random selection of 25% of the responses was scored by a second independent rater who was blind to both hypotheses and participants' clinical status; there was good agreement between the two raters, both for the past (93%) and the future (92%).

Finally, validated French adaptations of phonemic and semantic fluency tasks were administered (Cardebat, Doyon, Puel, Goulet, & Joanette, 1990). In the phonemic task, participants were allowed 2 minutes to generate as many words as possible beginning with the letter *P*. In the semantic task, they had to generate as many names of animals as possible for 2 minutes.

Results

Specificity of past and future events

Proportions of specific, extended, and categoric responses generated in the past and future tasks are shown in Figure 1. Proportions of specific responses were subjected to an analysis of variance (ANOVA) with group (patients vs. controls) as a between-subjects factor

and time orientation (past vs. future) as a within-subjects factor¹. The ANOVA yielded a significant effect of group, showing that patients reported less specific responses than controls, $F(1, 30) = 20.80, p < 0.001$. The effect of time orientation was not significant, $F(1, 30) = 3.39, p = 0.08$, but there was a significant interaction between group and time orientation, $F(1, 30) = 12.27, p = 0.001$. Although patients reported significantly less specific responses than controls in both tasks, the difference between the two groups was more pronounced for the future, $t(30) = -5.88, p < 0.001, d = 2.15$, than for the past, $t(30) = -2.60, p = 0.01, d = 0.95$. In addition, within-group comparisons showed that patients generated more specific responses for the past than for the future, $t(15) = 3.21, p = 0.006$, whereas there was no significant difference between the two tasks in controls, $t(15) = -1.50, p = 0.16$. Across all participants, the specificity levels of responses for the past and future tasks were significantly related ($r = 0.72, p < 0.001$).

An ANOVA on proportions of extended responses did not reveal any significant main effect or interaction [$F(1, 30) = 1.73, p = 0.20$, for group, $F(1, 30) = 0.41, p = 0.53$, for time orientation, and $F(1, 30) = 1.32, p = 0.26$ for the interaction]. With regard to categoric responses, there was a significant effect of group, $F(1, 30) = 14.35, p < 0.001$, and an interaction between group and time orientation, $F(1, 30) = 4.57, p = 0.04$. Although patients reported significantly more categoric responses than controls in both tasks, the difference between the two groups was more pronounced for the future, $t(30) = 3.87, p < 0.001, d = 1.41$ ($M = 0.17, SD = 0.15$ vs. $M = 0.01, SD = 0.05$) than for the past, $t(30) = 2.43, p = 0.02, d = 0.89$ ($M = 0.11, SD = 0.10$ vs. $M = 0.03, SD = 0.07$).

Relationship between event specificity and verbal fluency and clinical symptoms

In agreement with previous findings (Bokat & Goldberg, 2003; Henry & Crawford, 2005), patients with schizophrenia performed less well than healthy controls on the phonemic

fluency task ($M = 19.6$, $SD = 4.1$ vs. $M = 24.5$, $SD = 6$), $t(30) = -2.71$, $p = 0.01$, and on the semantic fluency task ($M = 26.4$, $SD = 5.9$ vs. $M = 33.6$, $SD = 10.7$), $t = -2.34$, $p = 0.03$.

However, there was no significant correlation between performances on these tasks and the proportions of specific responses generated during the past or future tasks, either in patients or in controls (all $p > 0.17$).

With regard to clinical symptoms, the proportions of specific responses generated by the patients were negatively related to positive symptoms, both for the past ($r = -0.72$, $p = 0.001$) and the future ($r = -0.50$, $p = 0.04$; see scatterplots on Figure 2). On the other hand, there was no significant correlation between negative symptoms and the proportions of specific responses (all $p > 0.16$).

Discussion

Although schizophrenia has been hypothesized to be associated with disturbance in the sense of continuity of self across time, temporal aspects of the self have received little empirical attention. The present results suggest that, in addition to being impaired in recalling specific events from their personal past (Danion et al., 2005; Feinstein et al., 1998; Neumann et al., in press; Riutort et al., 2003; Wood et al., 2006), patients with schizophrenia present with even more pronounced difficulties in generating specific events that might happen to them in the future. These deficits were not related to performances on verbal fluency measures, suggesting that they were not simply due to general retrieval difficulties (Bokat & Goldberg, 2003; Henry & Crawford, 2005). Of course, this does not preclude the possibility that more specific memory deficits contributed to patients' difficulties in the past and future tasks. In particular, recent findings suggest that autobiographical memory specificity is related to the ability to retrieve contextual information from memory (Raes et al., 2006). Therefore, it could be that schizophrenic patients' failures to generate specific past and future events

resulted, at least in part, from deficits in memory for contextual details, which is known to be significantly impaired in schizophrenia (Achim & Lepage, 2003). Interestingly, we found that the lack of specificity in the past and future tasks was related to positive rather than negative symptoms. As already mentioned, positive symptomatology has been found to be associated with deficits in memory for contextual information (Brébion et al., 2005). These findings thus fit well with the idea that patients' impairments were in part due to difficulties in retrieving contextual details in order to (re)construct specific representations of the personal past or future. However, it is plausible that other mechanisms were also at stake. In particular, though this issue clearly requires further empirical investigation, one may speculate that patients' deficits were in part related to disturbance of the sense of subjective time, which represents a key feature of episodic memory and future thinking (Tulving, 2005). Patients with schizophrenia may experience a discontinuity of subjective time, characterized by a difficulty in relating the present to the past and future, which would perturb self-projection into another time. In other words, schizophrenia may not only be associated with impairments of immediate self-awareness (e.g., an impaired sense of self-agency) (Gallagher, 2000), but also with disturbance of the temporal dimension of self.

It remains to be explained why patients' deficits were more pronounced in the future task than in the past task. The ability to remember the past and ability to imagine the future are intimately related, at least in the sense that accessing information in memory is necessary to imagine what might happen in the future (Atance & O'Neill, 2001; Schacter & Addis, in press; Suddendorf & Corballis, 1997, in press; Tulving, 2005). This relationship is most clearly demonstrated by studies of amnesic patients, which show that patients who are unable to remember their personal past also present considerable problems in imagining what might happen to them in the future (Hassabis, Kumaran, Vann, & Maguire, 2007; Klein et al., 2002; Tulving, 1985). However, although remembering the past and imagining the future

undoubtedly engage common mechanisms (i.e., to retrieve pieces of information from memory), the mental anticipation of future events requires additional processes to flexibly recombine retrieved information into novel future events that are plausible given one's plans, goals, and aspirations for the future (Schacter & Addis, in press; Suddendorf & Corballis, 1997, in press). This view is supported by recent functional brain imaging studies which show that, though there is a striking neural overlap between past and future events representations, the imagination of future events also recruits additional brain regions (Addis, Wong, & Schacter, 2007; Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007). The greater deficit of schizophrenic patients in the future task, relative to the past task, might therefore result from increased demand on processes that flexibly recombine retrieved information into plausible future events. Further research should be conducted to examine this possibility.

Finally, it should also be noted that difficulties in envisioning the future are not specific to schizophrenia; deficits in generating specific representations of the personal past and future are observed in amnesia (Hassabis et al., 2007; Klein et al., 2002; Tulving, 1985) and in depression (Williams et al., 1996). However, it is likely that the specific mechanisms that underlie this common phenomenon are different in each of these conditions. For example, with regard to depression, Williams (2006) recently identified three possible mechanisms that might underlie patients' lack of memory specificity: rumination, reduced executive resources, and avoidance. The underlying mechanisms are probably different (at least in part) in the case of schizophrenia. As we have already suggested, difficulties in retrieving contextual details and/or in flexibly recombining retrieved information, as well as a disturbance of the sense of subjective time probably play a significant role.

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Footnote

¹ An initial ANOVA with group as a between-subjects factor (patients vs. controls) and time orientation (past vs. future) and valence (positive vs. negative) of the cues as within-subjects factors showed a significant main effect of valence, $F(1, 30) = 5.65, p = 0.024$ (with proportions of specific responses being higher for positive than for negative cues), but no group X valence interaction, $F(1, 30) = 0.51, p = 0.48$. Therefore, for the sake of brevity and clarity, we report analyses with data collapsed across positive and negative cues.

Figure captions

Figure 1. Mean proportions (+ SEM) of specific, extended, and categoric responses generated by patients with schizophrenia and healthy controls in the past and future tasks

Figure 2. Correlations between positive symptoms (PANSS +) and proportions of specific responses generated by patients with schizophrenia



