

## Exploring self-defining memories in schizophrenia

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Previous studies have shown that patients with schizophrenia are impaired in recalling specific events from their personal past. However, the relationship between autobiographical memory impairments and disturbance of the sense of identity in schizophrenia has not been investigated in detail. In this study the authors investigated schizophrenic patients' ability to recall self-defining memories; that is, memories that play an important role in building and maintaining the self-concept. Results showed that patients recalled as many specific self-defining memories as healthy participants. However, patients with schizophrenia exhibited an abnormal reminiscence bump and reported different types of thematic content (i.e., they recalled less memories about past achievements and more memories regarding hospitalisation and stigmatisation of illness). Furthermore, the findings suggest that impairments in extracting meaning from personal memories could represent a core disturbance of autobiographical memory in patients with schizophrenia.

**Keywords:** Schizophrenia; Self-defining memories; Specificity; Meaning making; Autobiographical memory.

Among the many cognitive deficits encountered in patients with schizophrenia, researchers have increasingly turned their attention to autobiogra-

phical memory, notably because its impairment could constitute an important step in the comprehension of this pathology (Cuervo-Lombard

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et al., 2007; D'Argembeau, Raffard, & Van der Linden, 2008; Danion et al., 2005; Elvevag, Kerbs, Malley, Seeley, & Goldberg, 2003; Neumann, Blairy, Lecompte, & Philippot, 2007; Riutort, Cuervo, Danion, Peretti, & Salame, 2003; Wood, Brewin, & McLeod, 2006). The central idea of this approach is that one's sense of self depends on memories of one's past experiences and the capacity to consciously remember these experiences (Conway, 2005). Bleuler (1911) argued that the central defect or abnormality in schizophrenia was best described as a disturbance of continuity of the self, resulting from an initial splitting "*zerspaltung*" of its unity. More recently in his phenomenological analysis of schizophrenia, Blankenburg (1991) stressed the disturbance of the temporal dimension of the self as the core feature of the pathology. These theoretical propositions resulted from clinical observations that patients with schizophrenia frequently experience perplexity concerning their identity, which can take the form of derealisation, depersonalisation, or disorganisation (Liddle, 1987). The representation of self as an entity extended in time is closely related to the ability to remember one's personal past and ability to project oneself into the future (Wheeler, Stuss, & Tulving, 1997). A recent study showed that patients with schizophrenia present difficulties in generating specific mental images of their personal past and future (D'Argembeau et al., 2008), thus providing evidence for disturbances of the temporal dimension of the self in schizophrenia.

The relationship between autobiographical memories and the self has been detailed in recent models of autobiographical memory (Conway, 2005; Conway & Pleydell-Pearce, 2000; Conway, Singer, & Tagini, 2004). Conway and Pleydell-Pearce (2000) have argued that autobiographical memories are transitory mental constructions generated from episodic memories and conceptual autobiographical knowledge. In this model the construction of autobiographical memories is influenced by the individual's goals and self-images and, reciprocally, self-images are grounded in memories for personal experiences (Conway, 2005; Conway et al., 2004). The self and memories have to form a coherent system, in which beliefs and knowledge about oneself are supported by memories of past experiences. A coherent sense of self is constructed in terms of narratives; that is, through the various stories that we and others tell about ourselves (Gallagher, 2000). In other words, the ability to consciously

recollect memories, to identify them as related to one's own personal past, and to link them to one's goals and desires allows the construction of a coherent personal narrative oriented to the present and the future. In agreement with this view, Addis and Tippett (2004) demonstrated that impairments in autobiographical memory for childhood and early adulthood events in patients with Alzheimer disease are related to changes in the strength and quality of identity.

There is substantial evidence that autobiographical memory is impaired in patients with schizophrenia. First, they generate fewer autobiographical memories compared to normal participants (Elvevag et al., 2003) and they have difficulties in recalling specific autobiographical memories; that is, memories for unique episodes that occurred at a specific time and place (Cuervo-Lombard et al., 2007; D'Argembeau et al., 2008; Danion et al., 2005; Neumann et al., 2007; Riutort et al., 2003; Wood et al., 2006). Second, they exhibit an abnormal reminiscence bump, which peaks earlier than in healthy individuals (Cuervo-Lombard et al., 2007). In healthy individuals the reminiscence bump is characterised by an increase in recall of autobiographical memories of events that occurred at the age of 10 to 30 (Conway, 2005; Conway & Rubin, 1993). As proposed by Conway (2005), most memories from this period are those of "self-defining" experiences, which play a critical role for the development and consolidation of the self (Conway, 2005). Whereas controls have a predominant memory for events occurred at the age of 21 to 25, as the sense of self fully developed, participants with schizophrenia exhibited a gap concerning the reminiscence bump, which occurred at the age of 16 to 25 when identity is not fully constituted and achieved. As memories from the reminiscence bump have a privileged relation to the self and are highly accessible, they represent self-representations providing constraints on what the self can currently be, and what it might become in the future (Conway, 2005). Thus, an abnormal reminiscence bump in schizophrenia, peaking in the 16- to 25-year period for patients vs the 21- to 25-year period for healthy individuals, could lead to impairments in the ability to construct and organise a coherent and stable identity (Cuervo-Lombard et al., 2007).

Using the remember-know-guess paradigm it has also been found that patients with schizophrenia report fewer Remember responses and

more Know responses than controls, thus demonstrating impairments of conscious recollection of personal events in schizophrenia (Cuervo-Lombard et al., 2007; Danion et al., 2005; Riutort et al., 2003). Furthermore, Danion et al. (2005) observed that healthy individuals showed an increasing proportion of Remember responses associated with temporal details (“when”) as the memories became more recent (especially for events experienced after the age of 19), whereas patients with schizophrenia did not. According to the authors, these results suggest that schizophrenia is characterised by a disrupted sense of self over time, with this disruption becoming worse in late adolescence when symptoms of schizophrenia typically emerge.

Although it is now well established that autobiographical memory is impaired in schizophrenia in terms of specificity and conscious awareness, little is known about how people with schizophrenia construct their sense of self from autobiographical memories. Indeed, previous studies on autobiographical memory used traditional autobiographical memory enquiries such as the Autobiographical Memory Test (AMT: Williams & Broadbent, 1986) or other cue-word techniques that do not explicitly explore memories that are highly relevant to personal identity. Recently some studies have started to investigate the link between autobiographical memory and the self in healthy individuals by examining a particular type of memories named self-defining memories (Singer & Moffitt, 1991). Self-defining memories (SDMs) are “those memories that help you to define most clearly how you see yourself and that help explain who you are to another person” (Singer, 2005, p. 22). These memories are vivid, evoke strong emotion at the time of recollection, are linked to other memories with similar narrative themes, and revolve around the most central goals and conflicts of an individual’s life (Blagov & Singer, 2004).

The examination of people’s self-defining memories is a particularly relevant approach to understanding the relation between the self and autobiographical memory in several clinical populations, such as people with depression (Moffitt, Singer, Nelligan, Carlson, & Vyse, 1994) or post-traumatic stress disorder (Sutherland & Bryant, 2005). Self-defining memories represent exemplar memories of experiences that individuals draw on to inform their sense of

identity. Self-defining memories can also play mood-regulation and directive functions for the self (Bluck & Gluck, 2004; Pillemer, 2003). First, healthy (non-depressed) individuals use self-defining memories for mood-regulation purposes, a process called mood memory repair. This process consists of maintaining positive moods and repairing negative moods by retrieving positive memories (the mood-incongruent effect; Joormann & Siemer, 2001; Josephson, Singer, & Salovey, 1996; Rusting & DeHart, 2000). Second, self-defining memories provide life lessons that assist individuals in optimal adjustment and personal growth. This dimension of meaning making consists of taking the additional step of ascribing meaning to memories by extracting lessons about the self, important relationships, or life in general (Singer & Blagov, 2000–2001; Thorne, McLean, & Lawrence, 2004). Therefore, memories affect the self through the process of meaning making and the incorporation of life lessons into a personal story. This capacity to learn from experience by ascribing meaning to memories is associated with higher levels of social cognition and personal adjustment (Blagov & Singer, 2004).

In summary, autobiographical memory in schizophrenia has been thoroughly studied in terms of specificity, subjective states of awareness, and distribution of memories across the lifetime. However, previous studies of autobiographical memory in schizophrenia used traditional autobiographical memory enquiries that did not explicitly explore memories that are highly relevant to personal identity. Furthermore, the dimension of meaning making that plays a fundamental role in the construction of self and in social adjustment has never been explored. Accordingly, the purpose of this study was to investigate the recollection of self-defining memories in patients with schizophrenia by applying the method originally developed by Singer and Moffitt (1991). According to recent models of narrative identity and autobiographical memory (Conway & Pleydell-Pearce, 2000; McAdams, 2001), drawing meaning from an event requires the capacity for abstract thinking (Thorne et al., 2004) and the ability to engage in active self-reflection to link the self to past experiences (McAdams, 2001). Moreover McAdams (2001) also suggested that impairments in metacognition—that is, the capacity to think about one’s own

thinking and the thinking of others—could cause an inability to create narratives and then lead to extracting larger meaning from personal memories. Although few data exist in schizophrenia, recent studies (Lysaker, Buck, Taylor, & Roe, 2008; Lysaker, Dimaggio, Buck, Carcione, & Nicolo, 2007) have shown that patients with schizophrenia have difficulties in constructing a coherent sense of their life and portray meaningful connections between their own self and others. Consistent with the notion that metacognition is involved in the incorporation of life lessons into a personal life story, Lysaker et al. (2008) have reported that two factors contribute to a decrease in the quality of self-experience expressed within personal narratives of schizophrenia: the internalisation of stigmatising beliefs about mental illness, and deficits in metacognitive processes. Thus, based on the fact that self-reflection and metacognition are impaired in persons with schizophrenia (Brüne, 2005) and that meaning making crucially depends on these processes, our hypothesis is that participants with schizophrenia would report fewer meaning-making elements than controls when recalling self-defining memories.

Earlier studies (Cuervo-Lombard et al., 2007; Danion et al., 2005; Riutort et al., 2003) have shown that schizophrenia is associated with abnormalities in the specificity and temporal distribution of autobiographical memories. However, it is not known whether similar disturbances are present in the specific case of self-defining memories. In this study we aimed to examine this issue. Following previous studies about autobiographical memory in schizophrenia, we expected that patients with schizophrenia would recall fewer specific memories than healthy individuals (Cuervo-Lombard et al., 2007; D'Argembeau et al., 2008; Danion et al., 2005; Neumann et al., 2007; Riutort et al., 2003; Wood et al., 2006) and would show an abnormal and early reminiscence bump (Cuervo-Lombard et al., 2007; Elvevag et al., 2003). It should be noted that the specificity of autobiographical memory is also related to depression (Raes et al., 2006; Williams & Broadbent, 1986) and this influence of depression has also been observed for self-defining memories (Moffitt et al., 1994). In this study we thus decided to match patients with schizophrenia and healthy controls with regard to depressive symptoms in order to eliminate this potentially confounding variable. With regard to memory content, taking into account the model of stigma-

tisation about illness in schizophrenia (Thornicroft, Rose, Kassam, & Sartorius, 2007), we expected that patients with schizophrenia would report more contents about illness and failure than the control group. Finally, it has been shown that healthy participants present significant emotional responses following the retrieval of autobiographical memories (e.g., Schaefer & Philippot, 2005) and self-defining memories in particular (Sutin & Robins, 2005). In this study we explored whether these emotional reactions are affected in schizophrenia by assessing variations in affective states following the retrieval of each self-defining memory.

## METHOD

### Participants

Participants were 20 inpatients and outpatients (3 women) who fulfilled the DSM-IV criteria for schizophrenia (APA, 2000). Diagnosis was established as determined by the patient edition of the Structured Clinical Interview for DSM-IV procedures, SCID I-V (First, Spitzer, Gibbon, & Williams, 1995) by a senior psychiatrist belonging to the research team of this study. Severity of symptoms was rated by the same clinician, blind to the individual's memory task performance with the Positive and the Negative Syndrome Scale (Kay, Fiszbein, & Opler, 1987). Exclusionary criteria were: (a) known neurological disease, (b) developmental disability or (c) substance abuse in the past month, (d) non-native French speakers. Participants were recruited from the University Department of Adult Psychiatry in Montpellier. All patients were clinically stable at the time of assessment according to the current treating psychiatrist and were taking long-term neuroleptic treatment, administered in a standard dose (70% atypical, 30% typical, and 15% both typical and atypical). Patients treated with benzodiazepines or lithium were excluded.

The mean duration of illness was 12.6 years ( $SD = 9.6$ ). Mean level of positive and negative symptoms as assessed by the Positive and Negative Syndrome Scale (Kay et al., 1987) were 16.5 ( $SD = 5.2$ ) and 20.7 ( $SD = 4.8$ ), respectively. The comparison group consisted of 20 healthy participants (3 women) with no history of psychiatric or neurological disorders. Patients and controls were matched for age ( $M = 36.7$  years,  $SD = 11.0$  vs  $M = 34.1$  years,  $SD = 11.6$ ), education ( $M = 11.1$

years,  $SD = 2.6$  vs  $M = 12.3$  years,  $SD = 2.3$ ), pre-morbid IQ, as estimated by the French adaptation of the National Adult Reading Test (fNART; Mackinnon & Mulligan, 2005;  $M = 110$ ,  $SD = 6.2$  vs  $M = 110$ ,  $SD = 5.3$ ), and levels of depressive symptoms, as assessed by the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1998;  $M = 9.2$ ,  $SD = 7.5$  vs  $M = 6.6$ ,  $SD = 5.8$ ) (all  $ps > .10$ ). All participants provided written informed consent after procedures had been fully explained. Note that two participants of the control group were excluded because of their high score on the BDI-II, which could have been a confounding factor for the specificity measure (Moffitt et al., 1994).

## Materials

*The Positive and Negative Syndrome Scale.* The Positive and Negative Syndrome Scale (PANSS) is a 30-item rating scale (Kay et al., 1987) completed by clinically trained research staff at the conclusion of chart review and a semi-structured interview. It is one of the most widely used semi-structured interviews for assessing the wide range of psychopathology in schizophrenia. For this study, four of the analytically derived PANSS factor component scores were utilised: Total, General Psychopathology, Positive, and Negative.

*Positive and Negative Affective States.* This self-reported adjective checklist (PANAS; Watson, Clark, & Tellegen, 1988). contains two 10-item subscales designed to measure positive (active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, and strong) and negative (afraid, ashamed, distressed, guilty, hostile, irritated, jittery, nervous, scared, and upset) affect. Each item is rated on a 5-point scale. It has been translated and validated in French (Gaudreau, Sanchez, & Blondin, 2006).

*Self-defining memories questionnaire.* Participants responded to a questionnaire (Moffitt, Singer, Nelligan, Carlson, & Vyse, 1994; Singer & Moffitt, 1991) that elicited descriptions of three self-defining memories. The first page of the questionnaire described features of a self-defining memory, adapted from Singer and Moffitt (1991). A self-defining memory was defined as at least 1 year old, a memory of a specific event in one's life that helps oneself and significant others to understand who one is as a person, leads to strong feelings, and has been thought about many times.

The instructions for the self-defining memory questionnaire were adapted from Singer and Moffitt (1991). The instructions were as follows:

You are asked to think about a specific event in your past that you feel is still important and helps you define who you are. The memory is at least one year old and is very clear and familiar to you. This is a memory that helps you understand who you are as an individual and might be a memory you would tell someone if you wanted that person to understand you in a basic way. It may be a memory that is positive or negative, or both, in how it makes you feel. The only important aspect is that it leads to strong feelings. It is a memory that you have thought about many times. It should be familiar to you like a picture you have looked at a lot or song you have learned by heart.

Note that Singer and Moffitt did not ask explicitly for specific events, but the specificity instruction was subsequently added by other authors (Thorne et al., 2004). Memory specificity was not emphasised in the current study (see Discussion).

On each of the next three pages of the questionnaire participants were asked to describe a self-defining memory, including a caption for the event, their age at the time of the event, where they were, whom they were with, what happened, and how they and any other person present responded to the event. Participants were provided with one page to describe each memory.

## Procedure

Control participants completed all experimental measures in one experimental session. For patients with schizophrenia all data were obtained in two experimental sessions, completed on two consecutive days. The first day consisted of the same experimental session as control participants. The order of tasks administration for this session was (a) PANAS at baseline (i.e., before recall of self-defining memories; SDMs), (b) recall of the three SDMs and completion of the PANAS directly after each SDM, (c) fNART and BDI-II. The second session for participants with schizophrenia consisted of the PANSS.

## Scoring

*Self-defining memories.* Each self-defining memory was scored by the interviewer (S.R.) for specificity, meaning making, and content, following the criteria proposed by Singer and Blagov (2000–2001) and Thorne and McLean (2001).

*Specificity.* Each memory was coded as non-specific (0) or specific (1). A memory was rated as specific if it described an event that happened at a particular place and time and lasted less than a day. Non-specific memories included categoric (summaries or categories of repeated events) and extended (descriptions of events that are longer than a day) memories.

*Meaning making.* Meaning making refers to what the reporter learns or understands from the event. To count a SDM as involving meaning making, the reporter must explicitly reflect back on the event (e.g., “I learned a lesson . . .” or “After that event, I came to understand that . . .”). Each memory was coded for the absence (0) or presence (1) of meaning making.

*Content.* We used the Manual for Coding Events in Self-Defining Memories (Thorne & McLean, 2001). This protocol has been used in previous studies (e.g., Blagov & Singer, 2004; Thorne et al., 2004) and allows the scoring of SDMs for event content according to seven categories:

1. Life-threatening events concerned deaths, accidents, assaults (“Life-threatening events”). These are events in which issues of life and death, or physical well-being, structure the narrative. In this study we decided not to include hospitalisations or episodes of severe illness in this category, and to create another category relative to these events. Given that schizophrenia is associated with high risk of relapses and rehospitalisations, exploring these events in the construction of the self in patients with schizophrenia seemed particularly interesting.
  2. Exploration/recreation events are narratives that centre on recreational activities, such as hobbies, parties, leisure activities, travelling, vacation, or sports (“Exploration/Recreation”). Emphasis is on recreation, play, or exploration.
  3. Narratives of disrupted relationships included break-ups, divorce, separation, and interpersonal conflict (“Disrupted relationships”).
  4. Achievement events emphasise one’s own or group/family effortful attempts at mastery or accomplishment with regard to physical, material, social, or spiritual goals. Event must involve effortful striving to achieve a goal, skill, or direction in life (“Achievement”).
  5. Guilt/Shame events revolve around the issue of doing right or wrong (“Guilt/Shame”). Narrative must explicitly use the term “guilt”, “shame”, or “ashamed”.
  6. Drug, alcohol, tobacco use are events that are centred on the use of these things for recreational, thrill, or possibly suicidal purposes (“Drug, alcohol, tobacco abuse”).
  7. The seventh category was any event that was not classifiable (“Not classifiable”).
- Considering the fact that these seven categories were developed by sorting a sample of 600 written self-defining memory narratives that mainly came from college students, we decided to add two categories that are more specifically linked to our clinical sample and could lead to significant disturbances in self-representation (Bolton, Gooding, Kapur, Barrowclough, & Tarrier, 2007; Cuervo-Lombard et al., 2007; Lysaker et al., 2008):
8. Hospitalisation/stigmatisation of illness (“Hospitalisation/Stigmatisation”).
  9. A category involving failure (“Failure”). People with schizophrenia suffer from inflexible negative perceptions of self, negative responses to others, and negative responses to circumstances that act to limit personal growth and potentially constructive adaptations (Bolton et al., 2007). Accordingly, we decided to explore events concerning failures (e.g., “I have failed in my final exam”), which may play a central role in the social construct of self in patients with schizophrenia.
- A second independent rater (C.L.), blind to diagnosis, coded responses for each self-defining memories. The agreement between the two raters was very good (the Kappa coefficient was .91 for specificity, .95 for meaning making, and .93 for contents). When the two ratings differed, the final rating was made following discussions between the two raters.

*Changes in positive and negative affect.* For each self-defining memory, changes in affect were computed by subtracting PANAS ratings made before retrieval from PANAS ratings made after retrieval. This was done separately for positive and negative affect.

*Number of words.* In order to assess retrieval fluency of each participant, we measured the number of words produced for each SDM.

## Statistical analyses

For each participant, *Specificity* was assessed by the number of specific memories and *Meaning making* was assessed by the number of integrated memories (in both cases, scores ranged from 0 to 3). Violations of normality and/or homogeneity of variance were observed for both measures. Therefore group differences in the number of specific memories and the number of integrated memories were analysed with Mann-Whitney *U* tests. Correlations between Specificity (i.e., number of specific self-defining memories) and PANSS scores of patients with schizophrenia were evaluated with Spearman correlations. A 2 (group: patients with schizophrenia vs control participants)  $\times$  2 (valence: positive vs negative) analysis of variance (ANOVA) was performed to assess changes in affect following the retrieval of self-defining memories. An independent-samples *t*-test was conducted to compare number of words produced across the SDMs for patients and controls. Correlations between Specificity, Meaning making, clinical variables, and number of words were evaluated with Spearman correlations.

For content and estimation of the reminiscence bump, recalled events were defined as the statistical unit. Chi-square tests were used to compare proportions between patients and controls. The reminiscence bump was estimated using 5-year intervals, following Cuervo-Lombard et al. (2007).

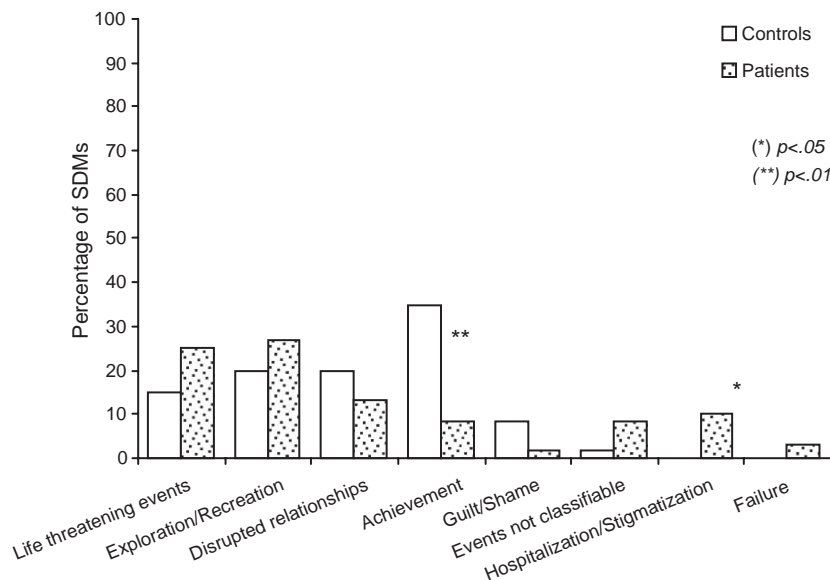
## RESULTS

Patients with schizophrenia ( $M = 1.50$ ,  $SD = 1.10$ ) did not differ from control participants ( $M = 1.95$ ,  $SD = 1.00$ ) concerning the number of specific self-defining memories reported ( $U = 153$ ,  $p = .20$ ). By contrast, a group difference was noted for Meaning-making ( $U = 72$ ,  $p < .001$ ). Patients with schi-

zophrenia produced fewer integrated self-defining memories ( $M = 0.10$ ,  $SD = 0.30$ ) than control participants ( $M = 1.25$ ,  $SD = 1.07$ ). There was no correlation between Specificity and PANSS scores (all  $ps > .10$ ) in patients with schizophrenia. A 2 (group)  $\times$  2 (affect: positive vs negative) ANOVA did not reveal any significant group difference concerning changes in affect following the retrieval of self-defining memories,  $F(1, 38) = 0.31$ ,  $p = .58$ . Changes in affect were slightly more pronounced for negative affect ( $M = 1.18$ ,  $SD = 2.57$ ) than for positive affect ( $M = 0.13$ ,  $SD = 2.26$ ) but the difference did not reach statistical significance,  $F(1, 38) = 3.16$ ,  $p = .08$ . The interaction between group and valence was not significant either,  $F(1, 38) = 1.67$ ,  $p = .20$ .

Descriptions of SDMs contained fewer words for patients ( $M = 193.05$ ,  $SD = 117.34$ ) than for controls ( $M = 348.15$ ,  $SD = 195.05$ ),  $t(1,38) = -3.05$ ,  $p = .004$ . In the patient group a significant positive correlation was noted between Specificity and number of words produced,  $r = .50$ ,  $p = .02$ . In the control group this correlation was in the same direction but did not reach statistical significance,  $r = .31$ ,  $p = .17$ . No correlation was found between the number of words and Meaning making ( $r = .28$ ,  $p = .06$  for patients and  $r = .03$ ,  $p = .09$  for controls). Correlations between PANSS (Positive and Negative) scales and number of words were not significant either despite a statistical tendency ( $r = .39$ ,  $p = .08$ ;  $r = -.03$ ,  $p = .90$ ).

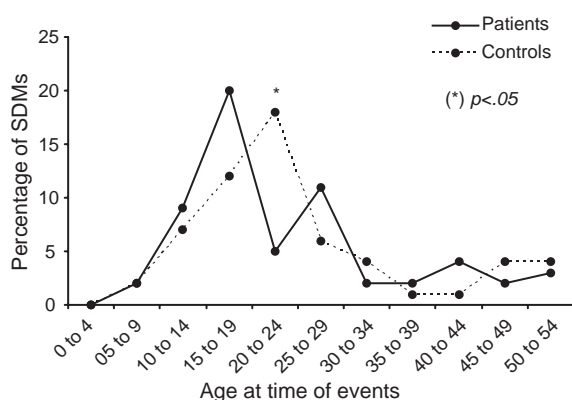
The percentages of self-defining memories according to their content are presented in Figure 1. There was no group difference in the report of self-defining memories characterised by Life threatening events ( $\chi^2 = 1.30$ ,  $df = 1$ ,  $p = .17$ ), Exploration/Recreation ( $\chi^2 = 0.42$ ,  $df = 1$ ,  $p > .05$ ), Disrupted relationships ( $\chi^2 = 0.54$ ,  $df = 1$ ,  $p > .10$ ), Guilt/Shame ( $\chi^2 = 1.58$ ,  $df = 1$ ,  $p > .10$ ), Failure contents ( $\chi^2 = 2.33$ ,  $df = 1$ ,  $p > .10$ ), and Not classifiable events ( $\chi^2 = 1.58$ ,  $df = 1$ ,  $p > .10$ ). Group differences were noted for two content dimensions. First, the proportion of self-defining memories characterised by Achievement content was lower for patients with schizophrenia (8.3%) than for control participants (35%) ( $\chi^2 = 11.05$ ,  $df = 1$ ,  $p < .001$ ). Second, patients recalled a substantial amount of self-defining memories characterised by Hospitalisation/Stigmatisation content (10%), whereas controls did not ( $\chi^2 = 4.3$ ,  $df = 1$ ,  $p < .05$ ). None of the patients with schizophrenia and control participants reported



**Figure 1.** Percentage of self-defining memories according to their content in patients with schizophrenia and control participants.

self-defining memories characterised by Drug, alcohol, tobacco abuse content.

Finally, as illustrated in Figure 2, the density function curve shows that in the case of control participants the reminiscence bump peak was in the 20- to 24-year period ( $\chi^2 = 7.7, df = 1, p < .05$ ), whereas for participants with schizophrenia the bump peak was in the 15–19-year period. These results indicate that patients with schizophrenia exhibited reminiscence bump abnormalities compared to control participants. No significant difference was observed for the other periods (05 to 09 years:  $\chi^2 = 2.0, df = 1, p = .15$ ; 10 to 14 years:  $\chi^2 = 0.28, df = 1, p = .59$ ; 15 to 19 years:  $\chi^2 = 2.7, df = 1, p = .09$ ; 25 to 34 years:  $\chi^2 = 1.7, df = 1, p = .19$ ; 30 to 34 years:  $\chi^2 = 0.7, df = 1, p = .40$ ; 35 to 39 years:  $\chi^2 = 0.34, df = 1, p = .55$ ; 40 to 44 years:  $\chi^2 = 1.8, df = 1, p = .17$ ; 45 to 49 years:  $\chi^2 = 0.70, df = 1, p = .40$ ; 50 to 54 years:  $\chi^2 = 0.15, df = 1, p = .69$ ).



**Figure 2.** Density function curves of all recalled events for control participants and patients with schizophrenia.

## DISCUSSION

Self-defining memories play an important role in the creation and maintenance of a coherent sense of self. Investigation of this type of memories in schizophrenia may thus shed light on disturbances of identity that are associated with this pathology. From this perspective, the present study aimed at comparing the specificity, meaning making, content, and temporal distribution of self-defining memories between patients with schizophrenia and healthy individuals. The results showed that memory specificity did not differ between the two groups. However, patients with schizophrenia produced fewer integrated memories and also differed from controls in terms of memory contents (i.e., they recalled fewer memories about past achievements and more memories regarding hospitalisation and stigmatisation of illness). Finally, patients exhibited an early reminiscence bump compared to controls.

Perhaps the most interesting finding of this study is that people with schizophrenia extracted meaning from their memories less frequently than healthy controls. Although memory descriptions contained fewer words in individuals with schizophrenia than in controls, this was unrelated with meaning making. This finding indicates that



defects in meaning-making processes are not simply due to impairments in fluency retrieval. A considerable amount of evidence shows that patients with schizophrenia present significant metacognitive deficits (Lysaker et al., 2007). Metacognition refers to the capacity to think about thinking and the knowledge of one's cognitive processes. It allows individuals to differentiate their own mental states from the mental states of others, to self-reflect and to revise ideas of what they thought or felt (Frith, 1992). This capacity to decentre from our own beliefs is fundamental to adapting to the environment and to gaining insight from the consequences of our behaviours. Patients with schizophrenia present deficits in these metacognitive processes (Brüne, 2005). For example, schizophrenia is the psychiatric disorder in which the awareness of pathology (or insight) is most frequently altered. Studies published on this subject over the two last decades stressed the specificity of this phenomenon in schizophrenic disorders, taking into account both its prevalence and its clinical consequences in comparison to other mental disorders (Pini, Cassano, Dell'Osso, & Amador, 2001). It is likely that schizophrenic patients' difficulties in extracting meaning from their autobiographical memories result, at least in part, from deficits in metacognition. The lack of meaning making in self-defining memories probably has serious consequences, both in terms of the sense of personal identity and in terms of social adaptation. As already noted, meaning making from self-defining memories plays a major role in the creation and maintenance of personal identity, through the creation of personal narratives. Abnormalities of self and identity in schizophrenia may thus result in part from defects in the meaning-making process. In addition, people who can step back from the key memories of their life and extract a moral or a lesson from these experiences show higher levels of social cognition, better adjustment, and higher levels of maturity (Singer, 2004). An inability to extract meaning from important past experiences may thus contribute to social adjustment difficulties of patients with schizophrenia.

Contrary to our expectation, numbers of specific self-defining memories did not differ between patients with schizophrenia and healthy controls. This might at first sight seem inconsistent with previous studies that investigated autobiographical memory specificity in schizophrenia (Cuervo-Lombard et al., 2007; D'Argembeau

et al., 2008; Danion et al., 2005; Neumann et al., 2007; Riutort et al., 2003; Wood et al., 2006). However, it should be noted that the procedure used in the present study differs from previous ones in at least two important ways. First, contrary to previous studies we explicitly probed memories that involve essential themes and concerns for the self. It might be that specificity deficits observed in previous studies are not present for more self-relevant memories. Another (more plausible) explanation rests on the fact that the self-defining memory inquiry we used in this study did not emphasise memory specificity: although the instructions asked for a specific memory, specificity was not explicitly defined and no example was given to illustrate what would or would not be considered as a specific memory. By contrast, in previous studies the interviewer made sure that patients understood correctly what one means by specific memory and directly probed patients during retrieval to encourage them to be specific (e.g., "Can you think of a specific episode?"). Considering these issues, it seems reasonable to claim that whereas previous studies assessed participants' *ability* to retrieve specific events, the present study assessed more the *spontaneous tendency* to retrieve specific events. In agreement with this view, there were only 65% of specific memories in our control group, whereas previous studies that focused on memory specificity showed that healthy individuals typically produce more than 80% of specific memories (e.g., D'Argembeau et al., 2008; Wood et al., 2006).

Surprisingly few studies of autobiographical memory in schizophrenia have paid attention to the contents of memories, in spite of the interest of such information for our understanding of the disease. In a recent study, Cuervo-Lombard et al. (2007) used five categories of event—Relationships, Births/Deaths, Work/Education, Home/Leisure, Illness—and found that patients with schizophrenia recalled fewer events relative to births and deaths, and more events relating to work and education compared to controls. However, the authors did not explicitly ask participants to recall personal events that revolve around important concerns and conflicts in one's life. In this study we thus explored possible differences in contents of memories that relate more closely to the self and identity. "Failure" contents did not differ between groups, whereas "achievement" contents did, with patients producing fewer narratives involving past achievements. The differences

in the contents of self-defining memories may partly relate to schizophrenic patients' life experiences. Stigmatisation, social withdrawal, and cognitive impairments that occurred in the early stages of the disease would certainly prevent patients from experiencing as many successful and positive experiences compared to healthy individuals. Therefore fewer self-defining memories are centred on achievement themes due to less life experience to construct them. This could also be related to abnormalities in the dopaminergic system in schizophrenia, which leads to a decreased sensitivity to rewards from the environment or a decrease of expected rewards (Shepard, Holcomb, & Gold, 2006). In fact recent findings provide confirmatory evidence that reward-driven learning may be more severely impaired in schizophrenia than punishment-driven learning (Waltz, Frank, Robinson, & Gold, 2007), suggesting a failure to integrate positive emotional experience in memory consolidation processes (Herbener, Rosen, Khine, & Sweeney, 2007).

We also found that participants with schizophrenia recalled more contents concerning illness (stigmatisation and hospitalisations) than our nonclinical sample. The interesting finding of this study is that these experiences seem to become intimately related to the self, as they consist of an important proportion of SDMs in schizophrenic patients (10%). In accordance with these results, there is some substantial evidence that people with schizophrenia suffer from stigmatisation of their mental disorder (Thornicroft et al., 2007). Furthermore, it has been found that hospitalisation is associated with trauma and high arousal of negative emotions among patients with psychosis (Harrison & Fowler, 2004), and that suicidal ideation and suicide attempts are very common in schizophrenia. Estimates indicate that between 5% and 10% of patients will kill themselves (Bolton et al., 2007). In a review about suicidal behaviour and risk in people with a diagnosis of schizophrenia, Bolton et al. (2007) asked, "We know they kill themselves but do we understand why?" For Bolton et al., perception of defeat represents a central explanatory factor of suicidal behaviour in schizophrenia. Schizophrenia often involves a profound experience of one's identity as diminished, which complicates adaptation to the demands of daily life (Lysaker & Hermans, 2007). This perception of defeat might rely in part on the content of patients' self-defining memories. In particular, it might be hypothesised based on the present results that

patients' reduced access to past experiences of success and increased access to episodes related to their illness contribute to maintaining a negative view of the self in schizophrenia.

Finally, in agreement with previous studies (Cuervo-Lombard et al., 2007), we observed an early and abnormal reminiscence bump for self-defining memories in patients with schizophrenia. The usual reminiscence bump consists of an increase in autobiographical memories for events that occurred when people were aged 10 to 30 years. It has been proposed that the reminiscence bump itself comprises two components (Holmes & Conway, 1999). An early component (between approximately 10 and 20 years old) concerns memories relating to social identity formation, and a later component (between approximately 20 and 30 years) concerns memories relating to the last stage of personal identity development. This last component is a period when individuals' goals and desires are to interact with significant others and to form close personal relationships, which plays a crucial role in the final formation of a coherent and stable self. Conway (2005) thus suggested that many memories of the reminiscence bump period are self-defining memories. Nevertheless, to our knowledge no study has explored the repartition of self-defining memories across the lifespan, in spite of the fact that SDMs are selective records of the most important events of our own life. The current study shows that in healthy individuals the distribution of self-defining memories peaks at ages 20–24. By contrast, patients with schizophrenia showed an impairment of this component of the reminiscence bump, which instead peaked at ages 15–19. These findings thus support the view that schizophrenia is associated with reduced memory for early adulthood experiences that normally plays a crucial role in the formation and stabilisation of a coherent sense of self (Cuervo-Lombard et al., 2007). The fact that there is a gap in the reminiscence bump between patients with schizophrenia and healthy controls which corresponds approximately to the period of the onset of their disease is not that surprising. Adolescence and early adulthood are the peak years for the onset of schizophrenia during which non-specific symptoms such as social withdrawal or depression lead to social and functional decline (Addington et al., 2007). Such experiences (negative symptoms, poorer social functioning) are sources of distress that lead to significant changes in patients' life conditions and likely become an important part of

self-representations. Unfortunately, the small sample size of this study did not allow us to reliably examine the temporal distribution of memories as a function of contents, which would be necessary to establish that the reminiscence bump is disproportionately associated with hospitalisation/stigmatisation contents.

Finally, several limitations of this study should be acknowledged. First, we had a relatively small sample size and we collected only three self-defining memories for each participant. This prevented us from exploring the relationship between the characteristics of SDM and clinical factors such as positive and negative symptoms in more detail. This issue would merit further investigations in future studies. Second, the manual we used for scoring self-defining memories was originally developed for college students (Thorne & McLean, 2001). However Singer, Rexhaj, and Baddeley (2007) recently showed that this content-coding scheme is also valid in other populations (adults aged 50 years). In this study we added a category for “hospitalisation/stigmatisation” in order to include issues that are potentially important in clinical populations. However, the coding of contents in clinical populations should be refined in future studies.

In conclusion, the main results of this study show that patients with schizophrenia extract less meaning from memories of personally important events, recall more contents related to illness and fewer contents related to achievement, and show an earlier reminiscence bump compared to healthy individuals. These differences in self-defining memories may contribute to disturbances of self and identity, as well as difficulties in social adjustment in patients with schizophrenia.

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