

RECOLLECTION OF EMOTIONAL MEMORIES IN SCHIZOPHRENIA: AUTONOETIC AWARENESS AND SPECIFICITY DEFICITS

Aurore NEUMANN & Pierre PHILIPPOT
Université catholique de Louvain

Episodic memory impairments seem to play a crucial role in schizophrenia. Most of the studies that have demonstrated such a deficit have used neutral material, leaving the recollection of emotional memories in schizophrenia unexplored. An overview is presented of a series of studies investigating the influence of emotion on episodic and autobiographical memory in schizophrenia. These experiments share a common experimental approach in which states of awareness accompanying recollection are considered. Results show that schizophrenia impairs conscious recollection in episodic and autobiographical memory tasks using emotional material. Schizophrenia is also associated with a reduction of the specificity with which autobiographical memories are recalled. An hypothesis in terms of a fundamental executive deficit underlying these impairments is proposed.

Cognitive deficits are now viewed as one of the major disabilities of people suffering from schizophrenia. Among these deficits, the impairment of episodic memory, including the memory for personal episodes, is particularly marked. Indeed, patients with schizophrenia typically fail in tasks requiring the explicit and conscious retrieval of information from memory. In this paper, we will first review the experimental evidence regarding the impairment of episodic memory in schizophrenia. Next, we will examine how emotion effects episodic and autobiographical memory in this condition. We will then develop a rationale and present evidence pertaining to the relationships between the specificity of personal memories and conscious awareness. Finally, we will discuss the influence of emotion on the recollection of autobiographical memories and associated state of awareness in schizophrenia.

Both authors are affiliated with the Faculté de Psychologie at the Université de Louvain.

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Correspondence regarding this paper should be addressed to Aurore Neumann or Pierre Philippot, Faculté de Psychologie, Université de Louvain, place du Cardinal Mercier, 10, 1348 Louvain-la-Neuve. E-mail: Aurore.Neumann@psp.ucl.ac.be or Pierre.Philippot@psp.ucl.ac.be

Impairment of episodic memory in schizophrenia

According to Tulving (1985), the main characteristic of episodic memory is its dependence on auto-noetic awareness, i.e., the kind of awareness that is experienced by normal individuals who consciously recollect events by reliving them mentally. In contrast, noetic awareness is the knowledge that an event has occurred, however, in the absence of any conscious recollection of the context of its occurrence. It conveys a more abstract sense of the past, based on feelings of familiarity. The distinction between the different states of awareness is investigated with an experiential approach in which auto-noetic and noetic awareness are operationally defined in terms of the Remember/Know procedure (Gardiner, Java, & Richardson-Klavehn, 1996; Tulving, 1985). In a recognition task that is conducted some time after the completion of a learning session, participants are instructed to report their subjective state of awareness as they recognise each item. They are instructed to make a "Remember" response if they are consciously aware of what happened or has been experienced during the learning session. For example, they might remember something about the physical appearance of the item or something that happened during the learning session, or they might remember that they associated the target item with another item, with a mental image, or with something of personal significance. The participants are instructed to give a "Know" response if recognition is accompanied by feelings of familiarity without any specific memories of the learning episode. In this case, participants know that the item was included in the study list, but have no memories of what happened when they first learned the item. Finally, participants have to give a "Guess" response if they neither consciously recollect nor simply know, but just guess that the item was on the study list.

Using this procedure, a series of studies has demonstrated that, compared to control participants, the recognition performance of patients with schizophrenia is associated with lower levels of Remember, but not of Know responses (Danion, Rizzo, & Bruant, 1999; Huron & Danion, 2002; Huron et al., 1995; Sonntag et al., 2003). This indicates that schizophrenia impairs episodic memory in its critical feature, auto-noetic awareness, whereas noetic awareness is spared.

Most of the studies that have used the Remember/Know procedure to investigate episodic memory in schizophrenia have used neutral stimuli, leaving unexplored the states of awareness that accompany memory for emotional events. Because schizophrenia is also associated with large emotional disturbances, which dramatically interfere with behaviour control and social interaction, (Taylor & Liberzon, 1999), an important question pertains to how emotion and episodic memory interact in schizophrenia. The answer to

this question is crucial for developing cognitive models of schizophrenia integrating the emotional features of this disease.

Emotional disturbances, such as flat affect and inappropriate displays of affect are among the core symptoms of schizophrenia. An inappropriate affect display is one that is discordant with the content of the patient's speech, or an unpredictable and sudden change in affect. Flat affect, that is little or no affective expression, is also often described in patients with schizophrenia. Interestingly, it seems that patients with schizophrenia experience emotions similarly to healthy individuals, but that the expression of these emotions is blunted (Bleuler, 1911). Experimental evidence supports this notion: studies have shown that patients with schizophrenia experience as many positive and negative emotions as normal controls, but they are less facially expressive (Gaebel & Woelwer, 1992; Kring, Kerr, Smith, & Neale, 1993; Kring & Neale, 1996). Similarly, studies that have investigated self-reports of emotion during exposure to emotional film clips have found that patients with schizophrenia report experiencing the same types of emotion as controls (Flack, Laird, & Cavallaro, 1999; Kring et al., 1993; Kring & Neale, 1996).

In contrast to the research on expression of emotion in schizophrenia, studies that have investigated the influence of emotion on memory performance are relatively rare, and their findings do not provide a consistent pattern of results. Most of these studies have used emotional words to investigate the impact of the emotional valence of to-be-learned words on recall performance. Kayton and Koh (1975) have found that patients recalled unpleasant words to the same extent as pleasant words, indicating an emotionally undifferentiated recall. Another experiment has observed a quicker forgetting of positive than negative words (Calev & Edelist, 1993). Using free recall and recognition tasks, Mathews and Barch (2004) have observed that patients with schizophrenia demonstrate patterns of memory for emotional words similar to normal participants, with a better performance for negative than positive words. Other studies reported an intact emotionality effect and a preservation of the Pollyanna tendency (Danion, Kazès, Huron, & Karchouni, 2003; Neumann, Philippot, & Danion, 2006a), which is a better recall of positive than negative events, an effect often observed in normal individuals (Boucher & Osgood, 1969; Bradley & Mathews, 1983, 1988). Finally, Koh, Grinker, Marusz, and Forman (1981) did not find this Pollyanna tendency in the patient group. In sum, no conclusion can be drawn from this discrepant pattern of results.

Nearly all of the studies described above have investigated the ability of patients with schizophrenia to recollect emotional material without paying attention to the subjective experience associated with these memories. Because consciousness plays an important role in memory deficits of patients

with schizophrenia (Danion et al., 1999) it is crucial to investigate the different states of awareness accompanying the recollection of emotional memories in schizophrenia. Moreover, a series of studies conducted by Ochsner (2000) on normal individuals suggests that the use of the Remember/Know procedure could cast a new light on the relationship between emotion and memory. Indeed, in three consecutive studies, Ochsner has demonstrated that Remember, but not Know responses were more frequent for emotional than for neutral events, underlining the importance of the ability to consciously re-experience an emotional event during its recall.

Influence of emotion on episodic memory in schizophrenia

Two recent studies have investigated the issue of the subjective experience associated with the recollection of emotional events in schizophrenia (Danion et al., 2003; Neumann et al., 2006a). Using a Remember/Know procedure (Gardiner et al., 1996; Tulving, 1985) in patients with schizophrenia and normal controls, Danion et al. (2003) have investigated the influence of the emotional valence of words on the subjective states of awareness accompanying recognition performance. During a learning session, 24 patients with schizophrenia and 24 normal controls were presented with a set of positive, negative, and neutral words. Participants were asked to memorise the words and to perform an orienting task that required them to rate them in terms of pleasantness. In a test session, participants were presented with a mixed set of studied and non-studied words. They were asked to recognise the previously studied words from the study list and to report their subjective state of awareness during recognition. They were invited to make a Remember judgment if they could consciously recollect some details of what happened during the study presentation and a Know response if recognition was accompanied by feelings of familiarity but no memories of the item's earlier presentation. Results showed that, despite a global reduction of Remember responses in the patient group, as compared to normal controls, autonoetic awareness was modulated by the emotionality of the words, in the same way in patients and in controls. Indeed, in both groups, the proportion of Remember responses was higher for positive than for negative words which, in turn, was higher than for neutral words. Importantly, the size of this emotionality effect was similar in both groups, as indicated by a non significant interaction between group and word valence.

In a study by Neumann et al. (2006a), the material was characterised by a separation between stimulus (i.e., a neutral picture) and its emotional connotation (i.e., a sentence describing the stimulus in a positive or a negative way). This dissociation made it possible to ask the participants to qualify the

subjective state of awareness associated with recognition of the picture and, then, with recognition of the related valence. During the study phase, neutral pictures associated with emotional sentences were presented to patients with schizophrenia and normal controls. Participants were asked to rate the stimuli according to their subjective feelings of pleasantness or unpleasantness. In the test session, the originally neutral pictures were presented without the emotional sentences. Participants were asked to recognise the target pictures among distractors and to indicate whether they “remembered”, “knew” or “guessed” having seen the picture in the previous session. Participants were also asked to report whether they found the item pleasant or unpleasant at the time of encoding.

The main results were that patients with schizophrenia exhibited poorer recognition of pictures and of emotional valence. Patients provided less Remember responses but more Know responses than normal controls, indicating an autonoetic awareness deficit. However, like controls, patients recognised more pictures when the associated sentence was positive rather than negative. As in Danion et al. (2003), the effect of emotional valence on memory performance was similar in both groups.

In conclusion, both studies have shown that despite poorer recollection, and fewer remember responses, patients with schizophrenia, like controls, consciously recollected positive stimuli better than negative stimuli. Thus these preliminary results indicate that the influence of the emotional valence on episodic memory is preserved in schizophrenia.

However, these two studies present some limitations. The first concerns the type of materials that were used, i.e., words or neutral pictures that were associated with sentences, that probably induces only weak emotional responses, if any. Autonoetic awareness might be modulated differently by stimuli eliciting stronger emotional responses. Another limitation of these studies is their focus on episodic memory, and more particularly, on the ability to recognize stimuli previously encoded in an experimental room. A crucial question left unexplored, concerns the influence of emotion on the recollection of real-life situations, implicating the self, such as autobiographical memories.

Autobiographical memory disturbances in schizophrenia

There is now preliminary evidence that autobiographical memory (i.e., memory for personal events and facts) is also disturbed in schizophrenia (Baddeley, Thornton, Chua, & McKenna, 1995; Feinstein, Goldberg, Nowlin, & Weinberger, 1998; Riutort, Cuervo, Danion, Peretti, & Salamé, 2003; Tamlyn et al., 1992). Patients with schizophrenia generate fewer autobiographical memories than healthy individuals. Studies have shown that

both personal episodic and semantic memory are impaired in schizophrenia (Feinstein et al., 1998; Riutort et al., 2003). Poorest performance is often observed for memories of early adulthood (i.e., after the onset of the disease), while memories from childhood are best preserved (Elvevag, Kerbs, Malley, Seeley, & Goldberg, 2003; Feinstein et al., 1998; Riutort et al., 2003). Finally, patients with schizophrenia tend to report overgeneral memories instead of specific episodes that happened at a specific time and place (Williams & Broadbent, 1986). Indeed, when asked to recall specific memories (e.g., "*when my daughter and I went to a nice restaurant last Saturday night*"), patients with schizophrenia tend to recall categoric events such as events that refer to repeated occasions (e.g., "*Every time I go to a restaurant with my daughter*"), or events that lasted longer than a day (e.g., "*The holiday with my daughter in Spain last year*") (Harrison & Fowler, 2004; Iqbal, Birchwood, Hemsley, Jackson, & Morris, 2004; Riutort et al., 2003).

An overgeneral retrieval style of autobiographical memory has been described in other clinical populations presenting emotional disorders. This is the case for patients with depression (e.g., Brewin, Renolds, & Tata, 1999; Brittlebank, Scott, Williams, & Ferrier, 1993; Goddard, Dritschel, & Burton, 1996; Kuyken & Dalgleish, 1995), post-traumatic stress disorder (McNally, Lasko, Macklin, & Pitman, 1995), acute stress disorder (Harvey, Bryant, & Dang, 1998), and borderline personality disorder (Jones et al. 1999). Moreover, reduced levels of specific memories seem to be associated with interpersonal problem solving (Goddard et al., 1996), feelings of hopelessness (Williams et al., 1996), and with a worst prognostic of depression (Dalgleish, Spinks, Yiend, & Kuyken, 2001). Brittlebank and colleagues (1993) have found that overgenerality was correlated with chronicity in depression, suggesting that the overgeneral memory bias might be a trait marker vulnerability for depression. Finally, there is growing evidence of a specific link between impairment in autobiographical memory specificity and an history of past traumatic experiences (e.g., de Decker, Hermans, Raes, & Eelen, 2003; Hermans et al., 2004; Kuyken & Brewin, 1995). In this perspective, Williams (1996) has proposed that individuals that have experienced traumatic events during childhood develop an overgeneral retrieval style in order to avoid the reactivation of some painful feelings associated with these personal specific experiences. Over time, this generic retrieval mode would generalise to all emotional situations, becoming a stable retrieval style. In this perspective, the phenomenon of overgeneral memory could be the result of an adaptative, protective strategy, developed to avoid aversive arousal of acute emotions associated with specific memories.

Thus, an important issue when investigating autobiographical memory impairment in schizophrenia is the possible contribution of comorbid depression, and of an history of traumatic experience to their overgeneral retrieval

style. Another related issue pertains to the relationships between psychotic symptomatology and the overgeneral retrieval style. In this perspective, a recent study has investigated possible associations between negative symptomatology, avoidance of traumatic experiences and autobiographical memory in patients with schizophrenia (Harrison & Fowler, 2004). Trauma was operationalised by the posttraumatic symptoms resulting from their psychosis, including the experience of having psychotic symptoms and of being hospitalised. The level of avoidance of these negative experiences was measured by the Impact of Events Scale-Revised (IES-R; Weiss & Marmar, 1997). The main findings were that patients with schizophrenia who avoided traumatic memories of the psychotic illness had more negative symptoms. Patients with more negative symptoms were found to retrieve fewer specific memories. But no significant correlations were found between negative symptoms and the retrieval of overgeneral memories, or between avoidance and the autobiographical memory retrieval style. Another study was designed to investigate the autobiographical memory retrieval style of patients presenting a post-psychotic depression (PPD) after a first episode of psychosis (Iqbal et al., 2004). Using the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986), the authors observed that PPD patients recalled more general memories than non PPD patients, particularly positive memories. There was no difference in the retrieval of specific memories. However, in contrast to previous research, the specific memories reported by PPD patients were mostly negative. This surprising result, which is inconsistent with the *avoidance strategy* hypothesis (Williams, 1996), replicate the findings of another study conducted on depressed adolescents (Swales, Williams, & Wood, 2001). Finally, the severity of the post-psychotic depression (PPD) was not associated with the proportion of general and specific memories recalled. In the same field of research, Kaney, Bowen-Jones and Bentall (1999) have compared the performance of 20 patients suffering from persecutory delusions, 20 depressed patients and 20 normal controls on the Autobiographical Memory Test (AMT, Williams & Broadbent, 1986). Intriguingly, results showed that the deluded participants generated fewer specific memories than the other groups. This pattern of results is not accounted for by comorbid depressive symptomatology as the deluded patients were considerably less depressed than the depressed controls.

From this brief review of the literature, we can conclude that overgenerality in schizophrenia does not seem to be due, at least only, to comorbid depression. Indeed, the studies described above did not find a clear association between the severity of the depressive symptomatology and overgeneral memory (Iqbal et al., 2004; Kaney et al., 1999). To the same extent, the lack of specificity does not seem to be the result of a coping strategy to avoid some painful experiences. Patients with schizophrenia were found to be more

specific for negative than for positive cues (Iqbal et al., 2004; Kaney et al., 1999), and no significant correlations were found between avoidance and autobiographical memory retrieval style (Harrison & Fowler, 2004).

However, these conclusions have to be taken cautiously because of the limited number of studies, their correlational design, and the diversity of the populations considered (deluded patients versus PPD patients versus schizophrenics' patients). In addition, there are numerous other factors that can contribute to the overgeneral memory bias in schizophrenia that have not been explored. For example, because overgenerality has been first discovered in a group of suicide attempters (Williams & Broadbent, 1986), and has been found to be correlated with feelings of hopelessness (Williams et al., 1996), future studies should control for suicidal ideations. In the same perspective, future research should pay attention to possible effects of the severity of the pathology and of neuroleptics medication on autobiographical memory performance in schizophrenia.

Specificity of personal memories and conscious awareness

Another possibility is that schizophrenic patients' lack of specificity in the retrieval of their own personal memories is related to their difficulties to consciously recollect past events. It might be that common resources are required, on the one hand, for the recollection of contextual details supporting auto-noetic awareness in episodic memory tasks and, on the other hand, for the recollection of specific details of personal events during autobiographical memory tasks. This is exactly what Ramponi, Barnard, and Nimmo-Smith (2004) investigated in a study comparing the performance of dysphoric patients and control participants in a Remember/Know judgment task, and in an autobiographical memory task. That study tested two hypotheses. First, those participants who provide fewer specific memories should also report fewer Remember responses in a Remember/Know task. Second, the combination of a less differentiated self-schema and of a rumination tendency should account for the impairment in both tasks. Undifferentiated schema refers to depressogenic negative themes, often reported in depression, leading to overgeneralised thinking, such as "I always failed" (e.g., Beck, 1976; Teasdale, 1991). These simplified recurrent thoughts form the basis of depressive rumination (Nolen-Hoeksema, 1991). The literature on depression contains many empirical evidence that rumination may disrupt controlled or executive processing required during memory tasks (e.g., Park, Goodyer, & Teasdale, 2004; Teasdale, 1991; Watkins & Brown, 2002; Watkins & Teasdale, 2001). In this line, if common executive processes are necessary for the recollection of specific autobiographical memories and of contextual details leading to auto-

noetic awareness in episodic recall, then a disruption of these strategic controlled processes by rumination may be responsible on a failure on both tasks (Ramponi et al., 2004).

To test these hypotheses, the Autobiographical Memory Test (AMT, Williams & Broadbent, 1986) was administrated to dysphoric patients and normal controls. During a recognition task using a Remember/Know procedure (Gardiner, 1988; Tulving, 1985), participants were also asked to recognise previously learned neutral words among distractors. Differentiation of affect-related schematic models was measured with the Levels of Emotional Awareness Scale (LEAS, Lane & Schwarz, 1987). Finally, the extent to which participants were prone to rumination was assessed using the Response Style Questionnaire (RSQ, Nolen-Hoeksema, Morrow, & Fredrickson, 1993). Results supported both hypotheses: dysphoric participants provided fewer specific autobiographical memories and fewer Remember responses than control participants. The proportion of responses of both types was significantly correlated. Finally, the degree of schematic differentiation and the extent to which participants were prone to rumination both predicted the level of specificity and of Remember judgements.

The possibility that overgenerality and conscious recollection deficits are intimately related is also in agreement with the model of autobiographical memory of Conway and Pleydell-Pearce (2000). According to this model, autobiographical memories are generated at different levels of specificity from the autobiographical knowledge base. The ability to specify personal events is intrinsically related to autonoetic awareness. Indeed, the recollection of highly specific details, such as the sensory-perceptual details of a particular situation, should be associated to the capacity of mentally relive these events. In other words, the experience of conscious recollection emerges when specific details are accessed in the autobiographical knowledge base (Conway & Pleydell-Pearce, 2000). In contrast, the subjective feeling of simply knowing that an event has occurred should be sufficient for the recall of more general, abstract memories (Conway & Pleydell-Pearce, 2000).

The predictions made by the Conway and Pleydell-Pearce model (2000) have been recently test by Danion and collaborators (2005) in schizophrenia. In that study, an adaptation of the autobiographical memory inquiry (Piolino, Desgranges, Benali, & Eustache, 2002) was administrated to 22 patients with schizophrenia and 22 normal controls. Participants were asked to recall specific autobiographical memories and to indicate the subjective states of awareness associated with the recall of what happened, when and where. Results showed that the memories provided by the patients with schizophrenia were less specific than those of healthy individuals, and this across all lifetime periods. Patients were also found to provide lower levels of Remember responses than controls. More directly relevant to the present

concern, the proportion of Remember responses was significantly correlated with the level of specificity in both the patient group and the control group. In fact, the autobiographical memories recollected by control participants were most strongly associated with conscious recollection. This was not the case for patients with schizophrenia. In conclusion, the results of that study are congruent with the model of Conway and Pleydell-Pearce (2000) and with the results of Ramponi and colleagues (2004). They provide preliminary evidence that the autonoetic awareness impairment of patients with schizophrenia is effectively related to their overgeneral memory bias. As Ramponi and collaborators (2004) did for depression, Danion et al. (2005) suggest that a fundamental deficit of executive processes may be responsible of the pattern of results displayed by the patients with schizophrenia. According to these authors, the voluntary retrieval of specific autobiographical memories and the construction of consciously recollect memories would involve executive processes. As a consequence, the impairment of executive functions, consistently reported in schizophrenia (for a review, see Keefe, 2000), may be responsible for low levels of specific memories and of Remember responses.

The fact that the retrieval of specific memories depends on central executive resources is in agreement with the model of autobiographical memory of Conway and Pleydell-Pearce (2000). This theoretical approach states that there are two modes of accessing autobiographical memories. An automatic mode, labelled 'direct retrieval', occurs when a representation from the event-specific level of the autobiographical knowledge base is automatically activated by a cue, and linked to the current goals of the individual. This mode of retrieval is almost instantaneous, and requires little cognitive resources. In contrast, when the retrieval of a specific memory is deliberate, as in studies constraining participants to voluntarily retrieve a specific memory, a 'generative' mode of accessing memories is activated. This 'generative retrieval' is a time consuming and an effortful process involving executive processes (Conway & Pleydell-Pearce, 2000). It is considered as a staged, hierarchical process in which an intermediate or generic description is first recollected. This intermediate description is then used to search for more specific events by comparison with the retrieval target. If the retrieval process is too demanding, because of insufficient executive resources, the process of specification is prematurely disrupted leading to the recollection of a general memory.

Recent studies provide evidence that voluntarily accessing specific personal information necessitates executive resources (for a review, Williams et al., 2005, in press). First, Winthorpe and Rabbitt (1988) have found that elderly participants who had reduced working memory resources displayed low levels of specificity in the recollection of personal events from their

lives. In the same perspective, Goddard, Dritschel, and Burton (1998) have demonstrated that when using a secondary task, participants provided more categoric memories. In a study comparing the effect of performing the AMT (Williams & Broadbent, 1986) with and without a secondary task, Williams and colleagues (2005) have observed that participants retrieved more categoric memories in the dual task condition. This was true only when the retrieval of the memory was generative, thus when executive resources were engaged (Conway & Pleydell-Pearce, 2000).

Support for the assumption of executive implications in the retrieval of specific memories are also provided by the work of Dalgleish (2004), who found strong correlations between the proportion of overgeneral memories recalled and the number of errors on executive tasks, such as verbal fluency task and the block design task (WAIS-R; Wechsler, 1981). Dalgleish (2004) suggests that this pattern of results may be due to 'goal neglect' during the task: because of reduced executive capacities, depressed patients would only focus on the main task (e.g., to recollect memories) and would forget the secondary instructions (e.g., to be specific), leading to overgeneral memories. To verify this hypothesis, in another study depressed participants were instructed to recollect overgeneral memories from their past. The idea was that if overgenerality is a secondary 'goal neglect', then a reverse version of the task should lead to more specific memories. Results confirmed this assumption, showing that overgenerality is reversible when asking people to be generic. Based on these observations, Dalgleish (2004) concluded that reduced executive capacities induce an overgeneral retrieval style because of secondary goal neglect. Another possible explanation is that limited executive resources may be responsible of the lack of inhibition of more accessible generic responses.

If growing empirical evidence in favour of the possible role of reduced executive functioning in overgeneral memory is coming from the literature on depression, this precise issue still remains to be tested in schizophrenia. There is now converging evidence, stemming from neuropsychological studies (for a review, see Keefe, 2000), that executive functions are dramatically impaired in schizophrenia. Taking this into account, there is an urge for investigating to what extent this central executive deficit contributes to reduced specificity in the recollection of autobiographical memories in schizophrenia. This important issue requires, not only correlational studies but also the use of paradigms allowing to examine directly the effects of allocating executive resources on concurrent tasks, on the retrieval of autobiographical memories in patients with schizophrenia.

Influence of emotion on the recollection of autobiographical memories and associated conscious awareness in schizophrenia

Another major aspect for the understanding of the complex relationships between consciousness and autobiographical memory in schizophrenia consists in the influence of emotion on these processes. The only study (Danion et al., 2005) that has investigated possible links between the subjective experience of recollection and autobiographical memory performance in schizophrenia did not control for the valence of the memories reported. On the other hand, schizophrenia research that has addressed the influence of emotion on memory and states of awareness, was conducted on episodic tasks, leaving unexplored the subjective experience associated with the recollection of emotional autobiographical memories. While there is preliminary evidence that the influence of emotional valence on episodic memory is preserved in schizophrenia (Danion et al., 2003; Neumann et al., 2006a), it has not been examined whether this observation could be generalised to autobiographical memory.

A recent study of Neumann, Blairy, and Philippot (2006b) has addressed this issue. Using the Remember/Know procedure (Gardiner et al., 1996; Tulving, 1985), this study investigated the subjective states of awareness accompanying recognition of emotional episodic and autobiographical memories in patients with schizophrenia. The second aim of that study was to explore the influence of emotion on memory in schizophrenia, when emotional stimuli other than words are used, such as stimuli eliciting stronger emotional responses. To this aim, during a learning session, pictures from the International Affective Picture System (IAPS; Lang, Greenwald, Bradley, & Hamm, 1993) were presented to 20 patients with schizophrenia and 20 normal controls. Participants were asked to rate the pictures on a 10 points scale according to their subjective feelings of pleasantness and unpleasantness. They were also asked to recall specific personal memories evoked by the pictures.

In a test session, participants were asked to recognise the target pictures among distractors and to indicate the subjective states awareness associated with their recognition. They were also asked to retrieve the autobiographical memories provided during the learning session when the associated picture was presented. In fact, the retrieval of the autobiographical memory generated during the first session was considered as recognition of the picture associated with autonoetic awareness. Indeed, it constitutes direct evidence that they remembered something that happened during the first session when they saw the pictures.

Results confirmed that schizophrenia is associated with an episodic memory deficit in the recognition of emotional events (Danion et al., 2003; Neumann et al., 2006a), and extends it to emotionally arousing material.

Indeed, patients with schizophrenia exhibited a deficit in pictures recognition and provided less Remember responses but more Know responses than control participants. Concerning the generation of autobiographical memories, patients recalled fewer memories, and provided fewer specific memories but more general memories than controls participants. So, in agreement with previous research, this study confirmed the impairment of autobiographical memory (Baddeley et al., 1995; Elvevag et al., 2003; Feinstein et al., 1998; Tamlyn et al., 1992), and the overgeneral retrieval style (Harrison & Fowler, 2004; Iqbal et al., 2004; Riutort et al., 2003) in schizophrenia. Further, consistently with the studies of Ramponi et al. (2004) and of Danion et al. (2005), the number of Remember responses was significantly correlated with the number of specific memories provided in both patient and control groups. Indeed, almost all the specific memories provided by the patients with schizophrenia and by the controls during the learning session were recalled again twenty four hours later during the recognition session when the associated picture was presented.

Concerning the influence of the emotional valence on picture recognition, the pattern of results differed between groups. Indeed, patients with schizophrenia better recognised positive than negative pictures, while normal individuals better recognised negative than positive pictures. This was true for Remember and Know responses. Finally, the influence of the valence on the recall of personal events differed between groups. Indeed, patients with schizophrenia recalled more positive general memories than negative general memories. In contrast, normal controls recalled more negative than positive memories. The pattern of results of the control group is in agreement with a study of Ochsner (2000) that have used the same emotional material. Indeed, in a series of three experiments using the Remember/ Know procedure to investigate the subjective states of awareness accompanying recognition of pictures from the IAPS (Lang et al., 1993), Ochsner has found a better performance for negative than for positive pictures.

Contrary to research investigating the influence of emotion on episodic memory (Danion et al., 2003; Neumann et al., 2006a), the pattern of results of patients in this last study differ from the one of the control group. Interestingly, in the two studies using weak emotional material (Danion et al., 2003; Neumann et al., 2006a), memory performance of the patients with schizophrenia is modulated by valence in the same way as in controls. But, when using stronger emotional arousing material, the pattern of results differs between control and patient groups (Neumann et al., 2006b).

Recent models of autobiographical memory on the one hand (Conway & Pleydell-Pearce, 2000), and of emotions on the other (for a review, Philippot, Bayens, Douilliez, & Francart, 2004) offer an explanation of the pattern of results exhibited by patients with schizophrenia. As developed above, when

the retrieval of an autobiographical memory is deliberate, as in the study of Neumann et al. (2006b), the access to specific details of an event is associated with conscious recollection (Conway & Pleydell-Pearce, 2000). In contrast, the recollection of more general memories can occur with a simple feeling of familiarity. The overgeneral retrieval style and the impairment of auto-noetic awareness displayed by the patients' group is in agreement with this perspective. Specifying personal emotional events, such as autobiographical memories, is also an effortful, time consuming process involving executive processes. This slow and effortful process requires the inhibition of the emotional features of the information to be specified (Conway & Pleydell-Pearce, 2000; Philippot et al., 2004). Indeed, in the absence of inhibition, the parallel activation of intense emotions would disrupt and might eventually abort the process of specification. In favour of this view, several authors have hypothesised reciprocal inhibitory interactions between emotional and executive systems in the brain (Drevets & Raichle, 1998). Neuroimaging studies have shown that brain regions associated with emotional processing, like amygdala and ventral medial portions of the prefrontal cortex were deactivated during complex cognitive tasks (e.g., Gusnard, Akbudak, Shulman, & Raichle, 2001; Simpson, Drevets, Snyder, Gusnard, & Raichle, 2001).

In this perspective, clinical populations that present an overgeneral retrieval style, such as patients with schizophrenia, might suffer from a deficit in their capacity to regulate emotional arousal and its impact on high level processes required by generative retrieval. Therefore, the executive impairment of patient with schizophrenia might be responsible for the lack of regulation of the emotions activated during memory search. In such condition, the process of specification of emotional memories is likely to be disrupted by the emotional arousal triggered by the memory. Consequently, patients with schizophrenia tend to report overgeneral memories, without conscious recollection.

Further research is needed in order to investigate the interactions between conscious awareness, emotions, and the recollection of specific memories in schizophrenia. A crucial issue left unexplored by the studies described above, is the relationship between the specificity of the recollection and the intensity of the emotional material to be specified in schizophrenia. Future studies should investigate whether patients with schizophrenia tend to report more general events when situations described reactive more emotional responses than when specifying more neutral episodes of their lives.

Discussion

A series of studies investigating the influence of emotion on episodic and autobiographical memory have been presented. These studies share a com-

mon experimental approach in which states of awareness accompanying recollection are considered. This review shows that schizophrenia is associated with a deficit of conscious recollection in both episodic (Danion et al., 1999; Danion et al., 2003; Huron et al., 1995; Huron & Danion, 2002; Sonntag et al., 2003) and autobiographical (Danion et al., 2005; Neumann et al., 2006b) memory tasks. Whether memory is influenced by emotion in the same way in patients with schizophrenia as in healthy individuals is less clear. It seems that the emotionality effect is preserved in schizophrenia for emotional words (Danion et al., 2003). A preservation of the Pollyanna tendency was also found when using words as emotional material (Danion et al., 2003; Neumann et al., in revision). However, when emotional stimuli other than words are used, such as stimuli eliciting stronger emotional responses, emotion seems to influence memory differently in schizophrenia (Neumann et al., 2006b). Because of the paucity of the studies on this topic, it is not possible to draw definitive conclusions. However, the hypothesis that the impact of emotion on memory and consciousness depend on the type of emotional events recollected provides an interesting insight for future investigations.

This review also shows that, as in many other clinical populations suffering from emotional disorders (for a review, van Vreeswijk & de Wilde, 2004), the impairment of autobiographical memory of patients with schizophrenia is characterised by an overgeneral memory bias (Harrison & Fowler, 2004; Iqbal et al., 2004; Riutort et al., 2003). Several possible mechanisms underlying overgeneral memory in schizophrenia have been proposed. It is important to note that these different explanations are not mutually exclusive. Firstly, several studies have addressed the hypothesis that the autobiographical memory deficit displayed by patients with schizophrenia might result from a comorbidity with depression or/and a past history of trauma (Harrison & Fowler, 2004; Iqbal et al., 2004; Kaney et al., 1999). Results from these studies have shown that while these factors may contribute to a certain degree to memory bias in schizophrenia, they cannot fully explain the pattern of results.

Moreover, these hypotheses do not take into account the impairment of consciousness consistently reported and often considered as a central feature of schizophrenia (Andreasen, 1999; Danion et al., 1999; Frith, 1992). In favour with this last assumption, and supporting the model of Conway and Pleydell-Pearce (2000), there are preliminary evidence suggests that overgeneral memory biases are related to autonoetic awareness impairments (Danion et al., 2005; Neumann et al., 2006b, Ramponi et al., 2004). The possibility that a fundamental deficit of executive functions is responsible for the reduced levels of specificity and of Remember responses displayed by the patients with schizophrenia has been discussed. While recent studies have shown that limited executive capacities induce the recollection of overgeneral memories in normal participants and in depressed patients (Dalglish,

2004; Williams et al., 2005), this issue remains to be tested in schizophrenia.

To conclude, if this review leaves numerous questions unanswered, it also points to the need for future research to explore the links between several processes that have been considered separately until very recently. Indeed, the understanding of the complex pattern of cognitive impairments exhibited by patients with schizophrenia will not be possible without an integration of the relationship between the emotional, mnemonic, and executive processes underlying these deficits.

References

- Aleman, A., Hijman, R., de Haan, E.H.F., & Khan, R.S. (1999). Memory impairment in schizophrenia: a meta-analysis. *American Journal of Psychiatry*, 156, 1358-1366.
- Andreasen, N.C. (1999). A unitary model of schizophrenia. *Archives General of Psychiatry*, 56, 781-787.
- Baddeley, A.D., Thornton, A., Chua, S.E., & McKenna, P. (1995). Schizophrenic delusions and the construction of autobiographical memory. In D.C. Rubin (Ed.), *Remembering our past: studies in autobiographical memory* (pp. 384-428). Cambridge: Cambridge University Press.
- Beck, A.T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.
- Bilder, R.M., Goldman, R.S., Robinson, D., Reiter, G., Bell, L., Bates, J.A., Pappadopulos, E., Willson, D.F., Alvir, J.M., Woerner, M.G., Geisler, S., Kane, J.M., & Lieberman, J.A. (2000). Neuropsychology of first-episode schizophrenia: initial characterization and clinical correlates. *American Journal of Psychiatry*, 157, 549-559.
- Bleuler, E. (1911). *Dementia Praecox ou groupe des schizophrénies*. Paris: E.P.E.L.
- Boucher, J., & Osgood, C.E. (1969). The Pollyanna hypothesis. *Journal of Verbal Learning & Verbal Behavior*, 8, 1-8.
- Bradley, B., & Mathews, A. (1983). Negative self-schemata in clinical depression. *British Journal of Clinical Psychology*, 22, 173-181.
- Bradley, B., & Mathews, A. (1988). Memory bias in recovered clinical depression. *Cognition and Emotion*, 2, 235-245.
- Brewin, C.R., Reynolds, M., & Tata, P. (1999). Autobiographical memory processes and the course of depression. *Journal of Abnormal Psychology*, 108, 511-517.
- Brittlebank, A.D., Scott, J., Williams, J.M.G., & Ferrier, I.N. (1993). Autobiographical memory in depression: State or trait marker? *British Journal of Psychiatry*, 162, 118-121.
- Calev, A., & Edelist, S. (1993). Affect and memory in schizophrenia: negative emotion words are forgotten less rapidly than other words by long-hospitalized schizophrenics. *Psychopathology*, 26, 229-235.
- Conway, M.A., & Pleydell-Pearce, C.W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107, 261-288.

- Dalgleish, T. (2004). *Emotional autobiographical memories, depression, and goal neglect*. Keynote address at the First European CERE conference on emotions. University of Amsterdam, May.
- Dalgleish, T., Spinks, H., Yiend, J., & Kuyken, W. (2001). Autobiographical memory style in seasonal affective disorder and its relationship to future symptom remission. *Journal of Abnormal Psychology, 110*, 335-340.
- Danion, J.M., Rizzo, L., & Bruant, A. (1999). Functional mechanisms underlying impaired recognition memory and conscious awareness in patients with schizophrenia. *Archives of General Psychiatry, 56*, 639-644.
- Danion, J.M., Cuervo, C., Piolino, P., Huron, C., Riutort, M., Peretti, C.S., & Eustache, F. (2005). Conscious recollection in autobiographical memory: an investigation in schizophrenia. *Consciousness and Cognition, 14*, 535-547.
- Danion, J.M., Kazès, M., Huron, C., & Karchouni, N. (2003). Do patients with schizophrenia consciously recollect emotional events better than neutral events? *American Journal of Psychiatry, 160*, 1879-1881.
- de Decker, A., Hermans, D., Raes, F., & Eelen, P. (2003). Autobiographical memory specificity and trauma in inpatient adolescents. *Journal of Clinical Child and Adolescent Psychology, 32*, 22-31.
- Drevets, W.C., & Raichle, M.E. (1998). Reciprocal suppression of regional cerebral blood flow during emotional versus higher cognitive process: implications for interactions between emotion and cognition. *Cognition and Emotion, 12*, 353-385.
- Elvevag, K., Kerbs, M., Malley, J.D., Seeley, E., & Goldberg, T.E. (2003). Autobiographical memory in schizophrenia: An examination of the distribution of memories. *Neuropsychology, 17*, 402-409.
- Feinstein, A., Goldberg, T.E., Nowlin, B., & Weinberger, D.R. (1998). Types and characteristics of remote memory impairment in schizophrenia. *Schizophrenia Research, 30*, 155-163.
- Flack, W.F., Laird, J.D., & Cavallaro, L.A. (1999). Emotional expression and feeling in schizophrenia: Effects of specific expressive behaviours on emotional experiences. *Journal of Clinical Psychology, 55*, 1-20.
- Frith, C.D. (1992). *The Cognitive Neuropsychology of Schizophrenia*. East Sussex, England: Lawrence A. Erlbaum Associates.
- Gaebel, W., & Woelwer, W. (1992). Facial expression and emotional face recognition in schizophrenia and depression. *European Archives of Psychiatry and Clinical Neuroscience, 242*, 46-52.
- Gardiner, J.M. (1988). Functional aspects of recollective experience. *Memory and Cognition, 16*, 309-313.
- Gardiner, J.M., Java, R.I., & Richardson-Klavehn, A. (1996). How level of processing really influences awareness in recognition memory. *Canadian Journal of Experimental Psychology, 50*, 114-122.
- Goddard, L., Dritschel, B., & Burton, A. (1996). Role of autobiographical memory in social problem solving and depression. *Journal of Abnormal Psychology, 105*, 609-616.
- Goddard, L., Dritschel, B., & Burton, A. (1998). Gender differences in the dual-task effects on autobiographical memory retrieval during social problem solving. *British Journal of Psychology, 89*, 611-627.
- Gold, J.M., Randolph, C., Carpenter, C.J., Goldberg, T.E., & Weinberger, D.R.

- (1992). Forms of memory failure in schizophrenia. *Journal of Abnormal Psychology, 101*, 487-494.
- Green, M.F. (1996). What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry, 153*, 321-330.
- Gusnard, D.A., Akbudak, E., Shulman, G.L., & Raichle, M.E. (2001). Medial prefrontal cortex and self-referential mental activity: relation to a default mode of brain function. *Proceedings of the National Academy of Sciences, 98*, 4259-4264.
- Harrison, C.L., & Fowler, D. (2004). Negative symptoms, trauma, and autobiographical memory: An investigation of individuals recovering from psychosis. *Journal of Nervous and Mental Disease, 192*, 745-753.
- Harvey, A.G., Bryant, R.A., & Dang, S.T. (1998). Autobiographical memory in acute stress disorder. *Journal of Consulting and Clinical Psychology, 66*, 500-506.
- Heinrichs, W.R., & Zakzanis, K.K. (1998). Neurocognitive deficit in schizophrenia: a quantitative review of the evidence. *Neuropsychology, 12*, 426-445.
- Hermans, D., Van den Broeck, K., Belis, G., Raes, F., Pieters, G., & Eelen, P. (2004). Trauma and autobiographical memory specificity in depressed inpatients. *Behaviour Research & Therapy, 42*, 775-789.
- Huron, C., Danion, J.M., Giacomoni, F., Grangé, D., Robert, P., & Rizzo, L. (1995). Impairment of recognition memory with, but not without conscious recollection in schizophrenia. *American Journal of Psychiatry, 152*, 1737-1742.
- Huron, C., & Danion, J.M. (2002). Impairment of constructive memory in schizophrenia. *International Clinical Psychopharmacology, 17*, 127-133.
- Iqbal, Z., Birchwood, M., Hemsley, D., Jackson, C., & Morris, E. (2004). Autobiographical memory and post-psychotic depression in first episode psychosis. *British Journal of Clinical Psychology, 43*, 97-104.
- Jones, B., Heard, H., Startup, M., Swales, M., & Williams, J.M.G. (1999). Autobiographical memory and dissociation in borderline personality disorder. *Psychological Medicine, 29*, 1397-1404.
- Kaney, S., Bowen-Jones, K., & Bentall, R.P. (1999). Persecutory delusions and autobiographical memory. *British Journal of Clinical Psychology, 38*, 97-102.
- Kayton, L., & Koh, S.D. (1975). Hypohedonia in schizophrenia. *Journal of Nervous and Mental Diseases, 161*, 412-420.
- Keefe, R.S.E. (2000). Working memory dysfunction and its relevance to schizophrenia. In T. Sharma & P. Harvey (Eds), *Cognition in schizophrenia* (pp. 16-50). Oxford: Oxford University Press.
- Koh, S.D., Grinker, R.R., Marusz, T.Z., & Forman, P.L. (1981). Affective memory and schizophrenia anhedonia. *Schizophrenia Bulletin, 7*, 292-307.
- Kring, A.M., Kerr, S.L., Smith, D.A., & Neale, J.M. (1993). Flat affect in schizophrenia does not reflect diminished subjective experience of emotion. *Journal of Abnormal Psychology, 102*, 507-517.
- Kring, A.M., & Neale, J.M. (1996). Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion? *Journal of Abnormal Psychology, 105*, 249-257.
- Kuyken, W., & Brewin, C.R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology, 104*, 585-591.
- Kuyken, W., & Dalgleish, T. (1995). Autobiographical memory and depression. *British Journal of Clinical Psychology, 34*, 89-92.

- Lane, R.D., & Schwartz, G.E. (1987). Levels of emotional awareness: A cognitive-developmental theory and its application to psychopathology. *American Journal of Psychiatry*, 144, 133-143.
- Lang, P.J., Greenwald, M.K., Bradley, M.M., & Hamm, A.O. (1993). Looking at pictures: affective, visceral, and behavioral reactions. *Psychophysiology*, 30, 261-273.
- McNally, R.J., Lasko, N.B., Macklin, M.L., & Pitman, R.K. (1995). Autobiographical memory disturbance in combat-related posttraumatic stress disorder. *Behaviour Research and Therapy*, 33, 619-630.
- Mathews, J.R., & Barch, D.M. (2004). Episodic memory for emotional and non-emotional words in schizophrenia. *Cognition and Emotion*, 18, 721-740.
- Neumann, A., Blairy, S., & Philippot, P. (2006b). Deficit of specificity in the recollection of emotional memories in schizophrenia. (Manuscript in revision).
- Neumann, A., Philippot, P., & Danion, J.M. (2006a). Impairment of autonotic awareness for emotional events in schizophrenia. (Manuscript submitted for publication).
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, 100, 569-582.
- Nolen-Hoeksema, S., Morrow, J., & Fredrickson, B.L. (1993). Response styles and the duration of episodes of depressed mood. *Journal of Abnormal Psychology*, 102, 20-28.
- Ochsner, K.N. (2000). Are affective events richly recollected or simply familiar? The experience and process of recognizing feelings past. *Journal of Experimental Psychology: General*, 129, 242-261.
- Palmer, B.W., Heaton, R.K., Paulsen, J.S., Kuck, J., Braff, D., Harris, M.J., Zisook, S., & Jeste, D.V. (1997). Is it possible to be schizophrenic yet neuropsychologically normal? *Neuropsychology*, 11, 437-446.
- Park, R.J., Goodyer, I.M., & Teasdale, J.D. (2002). Categorical overgeneral autobiographical memory in adolescents with depressive disorders. *Psychological Medicine*, 32, 267-276.
- Philippot, P., Bayens, C., Douilliez, C., & Francart, B. (2004). Cognitive regulation of emotion. In P. Philippot & R.S. Feldman (Eds), *The regulation of emotion* (pp. 71-99). New York: Laurence Erlbaum Associates.
- Piolino, P., Desgranges, B., Benali, K., & Eustache, F. (2002). Episodic and semantic remote autobiographical memory in ageing. *Memory*, 10, 239-257.
- Ramponi, C., Barnard, P., & Nimmo-Smith, I. (2004). Recollection deficits in dysphoric mood: An effect of schematic models and executive mode? *Memory*, 12, 655-670.
- Riutort, M., Cuervo, C., Danion, J.M., Peretti, C.S., & Salamé, P. (2003). Reduced levels of specific autobiographical memories in schizophrenia. *Psychiatry Research*, 117, 35-45.
- Saykin, A.J., Shtasel, D.L., Gur, R.E., Kester, D.B., Mozley, L.H., Stafiniak, P., & Gur, R.C. (1994). Neuropsychological deficits in neuroleptic naive patients with first-episode schizophrenia. *Archives of General Psychiatry*, 51, 124-131.
- Simpson, J.R., Drevets, W.C., Snyder, A.Z., Gusnard, D.E., & Raichle, M.E. (2001). Emotion induced changes in human medial prefrontal cortex: During anticipatory anxiety. *Proceedings of the National Academy of Sciences*, 98, 688-693.
- Sonntag, P., Gokalsing, E., Olivier C., Robert, P., Burglen, F., Kauffmann-Muller, F.,

- Salamé, P., & Danion, J.M. (2003). Impaired strategic regulation of contents of conscious awareness in schizophrenia. *Consciousness and Cognition*, 12, 190-200.
- Swales, M.A., Williams, J.M.G., & Wood, P. (2001). Specificity of autobiographical memory and mood disturbance on adolescents. *Cognition and Emotion*, 15, 321-333.
- Tamlyn, D., McKenna, P.J., Mortimer, A.M., Lund, C.E., Hammond, S., & Baddeley, A.D. (1992). Memory impairment in schizophrenia: its extent, affiliations and neuropsychological character. *Psychological Medicine*, 22, 101-115.
- Taylor, S.F., & Liberzon, I. (1999). Paying attention to emotion in schizophrenia. *British Journal of Psychiatry*, 174, 6-8.
- Teasdale, J.D. (1991). Cognitive vulnerability to depression: An investigation of two hypotheses. *British Journal of Cognitive Psychology*, 26, 113-126.
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychologist*, 26, 1-12.
- Van Vreeswijk, M.F., & de Wilde, E.J. (2004). Autobiographical memory specificity, psychopathology, depressed mood and the use of the Autobiographical Memory Test: a meta-analysis. *Behaviour Research and Therapy*, 42, 731-743.
- Watkins, E., & Brown, R.G. (2002). Rumination and executive function in depression: an experimental study. *Journal of Neurology Neurosurgery and Psychiatry*, 72, 400-402.
- Watkins, E., & Teasdale, J.D. (2001). Rumination and overgeneral memory in depression: Effects of self-focus and analytic thinking. *Journal of Abnormal Psychology*, 110, 353-357.
- Wechsler, D. (1981). *The Wechsler Adult Intelligence Scale-Revised*. San Antonio, TX: The Psychological Corporation.
- Weiss, D.S., & Marmar, C.R. (1997). The Impact of Events Scale-Revised. In J. Wilson, & T. Keane (Eds), *Assessing Psychological Trauma and PTSD* (pp. 399-411). New York: Guildford.
- Williams, J.M.G. (1996). Depression and the specificity of autobiographical memory. In D.C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 244-267). Cambridge: Cambridge University Press.
- Williams, J.M.G., & Broadbent, K. (1986). Autobiographical memory in attempted suicide patients. *Journal of Abnormal Psychology*, 95, 144-149.
- Williams, J.M.G., Ellis, N.C., Tyers, C., Healy, H., Rose, G., & MacLeod, A.K. (1996). The specificity of autobiographical memory and imageability of the future. *Memory and Cognition*, 24, 116-125.
- Williams, J.M.G., Chan, S., Crane, C., Barnhofer, T., Eade, J., Wallace, P., & Healy, H. (in press). *Retrieval of Autobiographical Memories: the mechanisms and consequences of truncated search*. *Cognition and Emotion*.
- Winthorpe, C., & Rabbitt, P.A. (1988). Working memory capacity, IQ, age, and the ability to recount autobiographical events. In M.M. Gruneberg, P.E. Morris, & R.N. Sykes (Eds), *Practical aspects of memory: Current research and issues II* (pp. 175-179). Chichester: John Wiley & Sons.

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