

Toward an Understanding of Anticipatory Pleasure Deficits in Schizophrenia: Memory, Prospec-tion, and Emotion Experience

Janelle M. Painter and Ann M. Kring
University of California, Berkeley

Anticipatory pleasure deficits have been observed in people with schizophrenia. Less is known about the extent to which interrelated processes that comprise anticipatory pleasure, including memory, prospec-tion, and emotion experience are disrupted. We asked people with ($n = 32$) and without ($n = 29$) schizophrenia or schizoaffective disorder to provide memory and prospec-tion narratives in response to specific cues. Half of the prospec-tions followed a memory task, and half followed a control task. People with schizophrenia generated memories similar in content and experience as controls even as they described them less clearly. However, people with schizophrenia were less likely to explicitly reference the past in their prospec-tions, and their prospec-tions were less detailed and richly experienced than controls, regardless of the task completed before prospec-tion. People with schizophrenia reported similar levels of positive emotion (current and predicted) in positive prospec-tions that followed the memory task, but less positive emotion than controls in positive prospec-tions that followed the control task. Taken together, these results suggest that people with schizophrenia experience difficulties drawing from past experiences and generating detailed prospec-tions. However, asking people with schizophrenia to recall and describe memories prior to prospec-tion may increase the likelihood of drawing from the past in prospec-tions, and may help boost current and predicted pleasure.

General Scientific Summary

People with schizophrenia experience difficulty anticipating future pleasure. This study supports the notion that the “feeling” part of anticipatory pleasure is intact when people with schizophrenia are first asked to generate memories. Thus, recalling and describing positive memories before thinking about the future may help people with schizophrenia to *experience* greater anticipatory pleasure.

Keywords: schizophrenia, memory, prospec-tion, emotion, narratives

Much of the pleasure we experience in life occurs in antici-pation of good things that have yet to come. Drawing from wide swaths of theory and research, we and others have argued that anticipatory pleasure involves a set of interrelated processes, including retrospec-tion and memory (i.e., drawing upon our past experiences), prospec-tion (i.e., simulating mental representations of what the future may look like), current pleasurable emotion experience (i.e., feeling good now while we think about the future), and predicted pleasure experience (i.e., pre-dicting how good we will feel when the future event actually happens; Gilbert & Wilson, 2007; Kring & Caponigro, 2010;

Schacter & Addis, 2007). For example, consider anticipatory pleasure for a slice of apple pie: You may recall the last time you had that pie (i.e., memory), draw from this past experience when envisioning yourself eating pie in the future (i.e., prospec-tion), feel good while thinking about a piece of future pie, and make a prediction about how good you will feel when you actually have the pie. Together, these processes comprise what we refer to as *anticipatory pleasure*.

A growing body of research indicates that people with schizo-phrenia have deficits in anticipatory pleasure, both with respect to current pleasure during anticipation and predicted future pleasure (see Kring & Caponigro, 2010; Kring & Elis, 2013 for reviews), even though people with schizophrenia do not exhibit emotion experience deficits in the presence of evocative materials (see Cohen & Minor, 2010, and Kring & Moran, 2008, for meta-analysis and review). It may be the case that people with schizo-phrenia experience difficulties with these aspects of anticipatory pleasure because they are less able to draw from past experiences when prospec-tion about the future. Further, people with schizo-phrenia may have difficulty generating detailed and richly expe-rienced prospec-tions about the future, which may in turn impact current and predicted pleasure. In the present study, we sought to extend our understanding of anticipatory pleasure deficits in schizophrenia by investigating processes that comprise antici-pa-

This article was published Online First March 7, 2016.

Janelle M. Painter and Ann M. Kring, Department of Psychology, University of California, Berkeley.

Janelle M. Painter is now at the VA Puget Sound Health Care System, Seattle, Washington.

This study was supported in part by National Institutes of Health Grant 1R01MH082890 to Ann M. Kring.

Correspondence concerning this article should be addressed to Janelle M. Painter, Veterans Affairs Puget Sound Health Care System, 1660 South Columbian Way (S-116), Seattle, WA 98108. E-mail: janelle.painter@va.gov

tory pleasure: memory, prospection, and emotion experience (current and predicted).

Memory and Prospection

Theory and research indicates that people's prospectives are related to, and draw from, personal (autobiographical) memories (see Buckner & Carroll, 2007; Schacter, Addis, & Buckner, 2007; Szpunar, 2010, for reviews). First, similar brain regions (a hippocampal-cortical network; Buckner & Carroll, 2007) are recruited when people think about their personal past and future (e.g., Addis, Wong, & Schacter, 2007; Botzung, Denkova, & Manning, 2008; Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007). Second, people with lesions in hippocampal-cortical regions have trouble generating both memories and prospectives (Hassabis, Kumaran, Vann, & Maguire, 2007; Klein, Loftus, & Kihlstrom, 2002). Third, individual differences in the ways in which memories are recounted are similar to the ways in which people prospect. Finally, Schacter and Addis (2007) have theorized that prospection requires a system that can "flexibly extract, recombine, and reassemble" (p. 778) details from past experiences (also see Schacter et al., 2007). Thus, prospectives should draw from and even explicitly reference the past (Addis, Pan, Vu, Laiser, & Schacter, 2009; Painter & Kring, 2015).

Other studies suggest that the extent to which memories and prospectives are related varies depending on whether or not they involve emotion. For example, Williams et al. (1996) found that people's positive and negative memories and prospectives were rated as less specific than their neutral memories and prospectives. D'Argembeau and Van der Linden (2004) found that participants rated their negative memories and prospectives as less vivid, less clear, and having less of a sense of (p)reexperiencing compared with their positive memories and prospectives. Painter and Kring (2015) found that people's prospectives, but not memories, varied by emotion. In sum, memories and prospectives are related to one another, but the relationship between these two processes may vary depending upon emotion.

Memory and Schizophrenia

Several studies report autobiographical memory deficits in schizophrenia (e.g., Danion et al., 2005; McLeod, Wood, & Brewin, 2006; Ranganath, Minzenberg, & Ragland, 2008; Riutort, Cuervo, Danion, Peretti, & Salamé, 2003). Other studies suggest that people with schizophrenia do not have difficulties recalling autobiographical memories per se, but rather have trouble describing these memories clearly. For example, Raffard, D'Argembeau, Lardi, Bayard, Boulenger, and Van der Linden (2010) found that people with schizophrenia did not differ from controls in the number of autobiographical memories recalled, but their descriptions of those memories were less coherent. Difficulties with recalling and describing autobiographical memories may also vary by emotional valence. Gruber and Kring (2008) found that people with schizophrenia recounted positive and negative emotion memories that were less linear, clearly presented, and relevant to the prompted emotion cue word than were the memories recounted by controls. Docherty and colleagues found that people with schizophrenia exhibit greater language disturbance when recounting stressful compared with nonstressful memories (Docherty, Hall, &

Gordinier, 1998; Docherty & Hebert, 1997), suggesting that people with schizophrenia have difficulties in the way in which they talk about their emotional memories.

Together, these studies suggest that people with schizophrenia may have difficulties recalling and describing autobiographical memories, which may in turn impact other processes involved in anticipatory pleasure. However, presenting more specific or salient cues may boost recall and descriptive clarity of memories for people with schizophrenia. Indeed, Potheegadoo, Cordier, Berna, and Danion (2014) used specific questions when asking about memories (e.g., "Can you describe the sounds in your memory?") and found that people with and without schizophrenia included comparable phenomenological details (e.g., sensory, temporal, contextual, emotional, cognitive) in their autobiographical memories. We thus reasoned that people with schizophrenia might provide equally detailed and richly experienced autobiographical memories as controls if they were prompted with specific rather than general cues.

Prospection and Schizophrenia

To our knowledge, only two studies have examined prospection in schizophrenia. Raffard, Esposito, Boulenger, and Van der Linden (2013) found that people with schizophrenia reported experiencing less sensory, self-referential, and other-referential experience from their positive and negative prospectives in response to emotional pictures compared with people without schizophrenia, and that their prospectives were rated as less specific. D'Argembeau, Raffard, and Van der Linden (2008) asked people with and without schizophrenia to generate memories and prospectives in response to cues depicting feelings in general, nonspecific situations (e.g., "a situation in which you feel guilty about something," "a situation in which someone smiled at you"). Consistent with Raffard and colleagues, the prospectives (and memories) of people with schizophrenia were rated as less specific than those of controls. Moreover, people with schizophrenia provided fewer specific prospectives than specific memories, suggesting that the link between memory and prospection may not be as strong for people with schizophrenia. Although the cues in these studies contained emotional stimuli (e.g., pictures, words, situations), the authors did not comprehensively assess emotion differences by including neutral comparison conditions; thus, it remains unclear whether prospectives vary by emotion in schizophrenia.

Together, these two studies suggest that people with schizophrenia have difficulty generating detailed and richly experienced prospectives. Because healthy people appear to spontaneously draw from their memories during prospection (Painter & Kring, 2015), we reasoned that people with schizophrenia might have less difficulty with prospection if they were first explicitly cued to recall and describe memories (compared with first describing routine task instructions). Further, to the extent that memory and prospection are part of anticipatory pleasure, we reasoned that people with schizophrenia may be able to experience current and predicted pleasure similarly as do controls if they recall and describe positive memories before generating positive prospectives.

Present Study

Our primary aim was to examine whether people with schizophrenia exhibit difficulties in processes that comprise anticipatory pleasure (memory, prospection, current, and predicted positive emotion). We also sought to examine whether deficits in current and predicted positive emotion might be minimized when memory is explicitly cued prior to prospection. A secondary exploratory aim was to examine if memory and prospection vary depending upon whether they are emotional, and if this varies by group.

We tested two hypotheses related to memory: (1a) Given known difficulties with autobiographical memory, people with schizophrenia will explicitly reference the past in their prospectations less frequently than controls; (1b) Given evidence that people with schizophrenia are better able to recall and describe autobiographical memories when they are given more specific cues, we hypothesized that people with schizophrenia will generate comparable content, clarity, and experience in their memories as controls when they are prompted with specific, salient cues.

We tested two hypotheses related to prospection: (2a) To the extent that prospection is associated with memory, both groups will generate more detailed, clearly rendered, and richly experienced prospectations when they first recall and describe memories compared with when they first describe routine task instructions; (2b) Yet given deficits in autobiographical memory, people with schizophrenia will generate prospectations that are less detailed and richly experienced than controls regardless of whether they first recall and describe memories.

Finally, we tested two hypotheses related to positive emotion experience and positive prospectations: (3a) To the extent that memory is associated with prospection, people with schizophrenia will report comparable positive emotion experience (i.e., current and predicted) in their positive prospectations that are preceded by a memory task—that is, by first recalling and describing positive memories, people with schizophrenia may not exhibit deficits relative to controls in pleasurable feelings; (3b) Given prior research showing deficits in the feeling components of anticipatory pleasure, people with schizophrenia will report less positive emotion experience in their positive prospectations compared with controls when prospectations are preceded by describing routine task instructions.

Method

Participants

Thirty-two people with either schizophrenia ($n = 20$) or schizoaffective disorder ($n = 12$; not in a current mood episode) and 29 people without schizophrenia recruited from community advertisement and referrals participated. Diagnoses were confirmed using the Structured Clinical Interview for DSM-IV (SCID-I/P; First, Spitzer, Gibbon, & Williams, 2002a), and the absence of diagnoses for the control group were confirmed using the SCID nonpatient version (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 2002b). Controls with family history of schizophrenia or bipolar disorder and more than two depressive episodes were not invited to participate. People who met any of the following exclusion criteria were not invited to participate: (a) IQ below 70 (Wechsler Test of Adult Reading; Wechsler, 2001); (b) history of severe head trauma,

stroke, or neurological disease; (c) current mood episode; and (d) SCID confirmed substance abuse within the last month or dependence within the last 6 months.

All but two people with schizophrenia were taking antipsychotic medications at clinically determined dosages, with 23 receiving atypical antipsychotics, four receiving typical antipsychotics, one receiving both types of antipsychotic medications, one receiving a norepinephrine dopamine reuptake inhibitor, and one receiving a mood stabilizing medication.

Procedure

Participants attended two sessions scheduled 1 week apart, completing clinical interviews during the first session. During both sessions, participants generated five prospection narratives. To test our hypothesis about whether participants generated more detailed and richly experienced prospectations if they are prompted to recall and describe personal, autobiographical memories before prospection, participants completed one of two tasks before each prospection task: (a) a memory task, and (b) a control task. Participants were randomly assigned to one of two orders such that half the participants completed the control task before the prospection task during Session 1, and half completed the memory task before the prospection task during Session 1.¹

Control task. Participants generated routine task instructions to help another person complete five commonly experienced activities (e.g., “Tell me each of the steps that Sally would need to take in order to get food from a vending machine”; the complete cue list is available upon request). Each activity had five distinct steps. These activities were modeled and extended from the Wechsler Individual Achievement Test (Wechsler, 2009). The control task was designed to be similar in complexity and imaginative ability as the memory task, but differed in that it did not require participants to explicitly access personal memories or to generate a narrative story. Each control activity was scored based on the inclusion (or omission) of the five steps necessary to complete each task, with scores thus ranging from 0 to 5 per activity. Performance on the five activities was summed, providing a control task total score ranging from 0 to 25.

Memory and prospection tasks. The memory and prospection tasks followed a standardized interview protocol. The interview contained specific cues referencing common life experiences (e.g., a birthday, an argument; the complete cue list is available upon request). We developed three matched cue lists, each containing five cues that varied by emotional valence (two positive, two negative, one neutral). The lists were counterbalanced across the three narrative tasks (two prospection tasks, one memory task), so that each participant received each of the cue lists only once throughout the study.

Memory task. During one of the sessions (randomly assigned), participants generated five (two positive, two negative, one neutral) memory narratives in response to specific cues. Participants were instructed to think about a specific event in the past that occurred at a particular time and place and lasted no longer than 1 day. They were then given a practice trial whereby they were asked to generate a narrative about “a specific time in the past you listened to music or the radio.” Interviewers provided feed-

¹ Preliminary analyses revealed no order effects.

back on the practice trial (e.g., “Exactly, now do the same for the rest of the narratives” or “Good, but for the rest of this task please tell me about a *specific* time in the *past you* experienced the following events”) and then began the memory task. For each cue, participants were prompted to “Picture a specific time in the past you [cue]. Tell me about it in as much detail as possible, as if you were telling me a story.”

Prospection task. Participants completed the prospection task twice. During both sessions, participants generated five (two positive, two negative, one neutral) prospection narratives in response to specific cues. The prospection task followed the control task in one session and the memory task in the other session (order was counterbalanced across participants). Participants were instructed to think about a specific event in the future that will occur at a particular time and place and lasts no longer than 1 day. They were then given a practice trial whereby they were asked to generate a narrative about “a specific time in the future you will listen to music or the radio.” Participants received feedback as in the memory task and then began the prospection task. For each cue, participants were prompted to “Picture a specific time in the future you will [cue]. Tell me about it in as much detail as possible, as if you were telling me a story.”

If participants did not generate a prospection narrative in response to the cue (e.g., they could not think of a future event or they talked about a past or current event), they were prompted with the cue again. If, after the second attempt, participants were unable to generate a prospection narrative, the interviewer went on to the next cue and the prospection was considered missing. Fourteen prospection narratives (of 320) from people with schizophrenia were missing, and one prospection narrative (of 290) from controls was missing.

Narrative experience questionnaire. After participants completed a memory or prospection narrative, they rated their sensory and contextual experience of the narrated event using a 1 (*none*) to 7 (*a lot*) Likert scale. Consistent with previous studies (e.g., D’Argembeau & Van der Linden, 2004, 2006), participants were asked to rate the visual, sound, and smell/taste of the event (combined into a composite *sensory experience* index), as well as the clarity of location, spatial arrangement of objects, and spatial arrangement of people (combined into a composite *contextual experience* index). In addition, participants reported on their *current emotion experience*, *predicted emotion experience* (for prospection narratives), and *recalled emotion experience* (for memory narratives) on a 1 (*positive*) to 7 (*negative*) scale.

Narrative coding. Memory and prospection narratives were audio recorded, transcribed, and coded by trained research assistants. Variables from the two positive narratives and two negative narratives within each narrative task were averaged into a positive and negative composite score, respectively.²

To assess whether our cues conformed to our a priori valence designations, we counted the number of positive and negative emotion words in the transcribed narratives using the Linguistic Inquiry and Word Count (LIWC; Pennebaker, 2001) text analysis program. LIWC checked each word in a narrative against an internal dictionary of more than 2,300 words and word stems (406 positive emotion words and 499 negative emotion words).

To assess the content of memory and prospection narratives, we coded four variables: past reference, time/place, sociality, and

elaborative detail. To assess the manner in which the narratives were described, we coded one variable: clarity.

Past reference was rated dichotomously (present/absent) and coded only for prospection narratives. This variable assessed whether a prospection narrative included an explicit reference to a personal past experience. For example, a participant who stated “My husband and I always cook dinner together on Friday nights, so I imagine that next Friday we will go to the grocery store, pick out the ingredients we’ll need, and then go home and cook dinner together” is an example of an explicit past experience and thus was coded as containing a past reference. By contrast, “I’ve always wanted to go to Hawaii, so I hope to take a vacation with my family there in the next year” is not an explicit past experience and thus was not coded as containing a past reference.

Time/place measured whether the participant provided information about “when” (e.g., next week) and “where” (e.g., at my friend’s house) the event took place. Memory and prospection narratives were coded for level of time/place on a 3-point scale (2 = inclusion of a time and place indicator, 1 = inclusion of either a time or place indicator, 0 = omission of a time and place indicator).

Sociality was rated on a 3-point scale (2 = active, 1 = passive, 0 = alone). A memory or prospection narrative was rated as “active” if it included an explicit and active social interaction. If the narrative included other people, but there was no active social engagement, the narrative was rated as “passive.”

Elaborative detail was rated on a 3-point scale (2 = elaborated, 1 = moderately elaborated, 0 = general) and measured the degree to which participants developed and expanded upon relevant information in order to create a comprehensive and detailed memory or prospection narrative. A rating of “elaborated” indicated that the narrative contained thorough and detailed descriptive information throughout the narrative; “moderately elaborated” indicated that the narrative included somewhat expanded and detailed descriptive information in some but not all of the narrative; and “general” indicated that the narrative was overly general and not very descriptive with respect to the essentials of the story.

Clarity was rated on a 3-point scale (2 = clear, 1 = moderately clear, 0 = unclear) and measured the participant’s ability to describe a memory or prospection narrative clearly and directly. A narrative was rated “clear” if it was organized and easy to understand; “moderately clear” if the narrative was relatively understandable, but at times the content was difficult to understand or follow; and “unclear” if the narrative was difficult to follow, disorganized, or unintelligible.

Clinical ratings. For people with schizophrenia, we assessed general symptoms using the Brief Psychiatric Rating Scale (Lukoff, Nuechterlein, & Ventura, 1986) and negative symptoms using the Clinical Assessment Interview for Negative Symptoms (CAINS; Kring, Gur, Blanchard, Horan, & Reise, 2013). The CAINS provides two negative symptom subscales, the Motivation and Pleasure (MAP) scale (range of scores: 0–36) and the Expression (EXP) scale (range of scores: 0–12), with higher scores

² Prior to averaging the two positive narratives and two negative narratives into composite positive and negative scores for each condition, paired sample *t* tests confirmed that individual positive and negative cues conformed to our a priori valence designation with respect to emotion words and reported emotion experience.

indicating greater impairment. Means on the CAINS MAP and EXP scales (see Table 1) were comparable with those in the CAINS validation sample (Kring et al., 2013).

Data Analytic Plan

To test our hypotheses about memory and prospection, we used mixed effect ANOVAs with Diagnostic Group (schizophrenia, control) as a between-subject factor and Valence (positive, negative, neutral) and Condition as within-subjects factors. Depending on the analysis, the Condition factor had up to three levels: memory task, prospection task following the memory task, and prospection task following the control task. Dependent variables included self-report (sensory experience, contextual experience, and current, predicted, and recalled emotion experience) and coded (positive and negative emotion words, past reference, time/place, sociality, elaborative detail, clarity) variables. To test our hypotheses about current and predicted positive emotion experience and positive prospections, we used independent samples *t* tests. In cases when sphericity was violated, we used the Huynh-Feldt correction for degrees of freedom when estimates of sphericity were greater than 0.75, and the Greenhouse-Geisser correction when estimates of sphericity were less than 0.75 (Girden, 1992). We examined planned comparisons of all pairwise valence combinations (positive vs. negative, negative vs. neutral, positive vs. neutral) using Bonferroni adjustment of significance level ($p = .017$) for multiple comparisons. Effect sizes are reported as partial eta squared (η_p^2).

Results

Demographic information and clinical ratings are reported in Table 1. Independent sample *t* tests and chi-square tests results

Table 1
Demographic and Clinical Variables for Schizophrenia and Control Groups

Variable	Schizophrenia	Control	<i>p</i> value
Sex (M/F)	17/15	16/13	.87
Diagnosis (SZ/SA)	20/12	—	
Age (years)	48.56 (10.25)	47.59 (10.53)	.72
Years of education	15.19 (2.97)	15.88 (2.21)	.31
WTAR	104.19 (12.95)	105.03 (9.81)	.78
Ethnicity (<i>n</i>)			.90
African American	6	8	
Asian American	5	4	
Caucasian	15	11	
Hispanic/Latino	3	4	
Other	2	2	
Number of hospitalizations	6.44 (4.87)	—	
BPRS total score	42.34 (11.06)	—	
CAINS MAP	14.94 (4.91)	—	
CAINS EXP	4.91 (3.19)	—	

Note. Tabled values are means with standard deviations in parentheses unless otherwise noted. M = male; F = female; SZ = schizophrenia; SA = schizoaffective disorder; WTAR = Wechsler Test of Adult Reading; BPRS = Brief Psychotic Rating Scale; CAINS = Clinical Assessment Inventory for Negative Symptoms; MAP = Motivation and Pleasure; EXP = Expression.

revealed no differences between people with and without schizophrenia on any of the demographic variables.³

Preliminary Analyses

Rater agreement. Raters, blind to the diagnostic status of the participants, achieved high agreement for the narrative variables, with Intraclass Correlation Coefficients (Fleiss & Shrout, 1978; Case 2 formula) ranging from 0.70 to 0.89. Given the good level of rater agreement, we collapsed scores across raters.

Emotion manipulation check. We evaluated whether our cues conformed to our a priori valence classification in two ways. First, we examined participants' reported *current* emotion experience following each narrative using a 2 (group) \times 3 (condition) \times 3 (valence) mixed effect ANOVA. Only the valence main effect was significant, $F(1.71, 97.64) = 115.10, p < .01, \eta_p^2 = 0.67, 90\% \text{ CI } [0.57, 0.73]$. All follow-up pairwise comparisons were significant ($ps < 0.01$); that is, for all participants, positive memories and prospections were experienced more positively ($M = 2.34, SD = 0.99$) than negative and neutral; neutral memories and prospections ($M = 2.91, SD = 0.98$) were experienced more positively than negative; and negative memories and prospections ($M = 4.49, SD = 1.06$) were experienced more negatively than positive and neutral.

Second, we computed separate 2 (group) \times 3 (condition) by 3 (valence) mixed effect ANOVAs for the number of positive and negative emotion words in the narratives. For positive emotion words, the group main effect was significant, $F(1, 59) = 10.09, p < .01, \eta_p^2 = 0.15, 90\% \text{ CI } [0.04, 0.29]$, indicating that people with schizophrenia used fewer positive words across conditions and valence compared with controls. The valence main effect was also significant, $F(1.72, 101.40) = 81.02, p < .01, \eta_p^2 = 0.58, 90\% \text{ CI } [0.58, 0.74]$; all participants used more positive emotion words in positive narratives ($M = 4.20, SD = 1.32$) than in negative ($M = 2.42, SD = 0.80$) and neutral ($M = 2.50, SD = 0.96$) narratives ($ps < 0.01$). For negative emotion words, only the valence main effect was significant, $F(1.45, 85.38) = 124.93, p < .01, \eta_p^2 = 0.68, 90\% \text{ CI } [0.58, 0.74]$, with all participants using more negative emotion words in negative narratives ($M = 1.89, SD = 0.80$) than in positive ($M = 0.53, SD = 0.31$) and neutral ($M = 0.59, SD = 0.43$) narratives ($ps < 0.01$).

Word count. We examined whether people with and without schizophrenia differed in the number of words provided in narratives by conducting a 2 (group) \times 3 (condition) \times 3 (valence) mixed effect ANOVA. Neither the group main effect nor any interaction with group was significant, consistent with other narrative studies (e.g., Gruber & Kring, 2008). Further, neither the valence main effect nor any interaction with valence was significant (positive: $M = 235.64, SD = 138.75$; negative: $M = 251.98, SD = 167.86$; neutral: $M = 258.75, SD = 162.72$). However, the condition main effect was significant, $F(1.73, 102.39) = 11.16, p < .01, \eta_p^2 = 0.16, 90\% \text{ CI } [0.06, 0.26]$, with follow-up analyses

³ We found two significant diagnostic group differences: People with schizoaffective disorder had more years of education, $t(30) = 2.83, p < .01$, and higher estimated IQ scores, $t(30) = 2.31, p < .03$, than people with schizophrenia. However, these two variables were not significantly correlated with any other study variables. We also found one significant sex difference: Men with schizophrenia scored higher on the CAINS EXP scale than women with schizophrenia, $t(30) = 3.43, p < .01$.

indicating that all participants' memory narratives ($M = 312.75$, $SD = 224.02$) contained more words than prospection narratives ($M = 216.82$, $SD = 130.39$), consistent with previous studies (e.g., Painter & Kring, 2015).

Control task. To examine whether people with and without schizophrenia differed in describing routine task instructions, we examined the effect of group on the total number of steps included across the five control task activities. We found no difference between people with ($M = 19.66$, $SD = 4.37$) and without ($M = 21.31$, $SD = 3.78$) schizophrenia on the control task. Thus, people with and without schizophrenia were equally proficient at providing step-by-step instructions to help another person complete five routine tasks.

Past Reference in Prospections

To test our first hypothesis regarding memory—that people with schizophrenia would explicitly reference the past in their prospections less frequently than controls—we conducted a 2 (group) × 2 (condition: prospection following memory task, prospection following control task) × 3 (valence) mixed effects ANOVA. Consistent with our hypothesis, we found a significant group main effect, $F(1, 57) = 4.26$, $p < .05$, $\eta^2_p = 0.07$, 90% CI [0.00, 0.19], indicating that people with schizophrenia explicitly referenced the past less frequently than controls in their prospections, whether preceded by the control task or the memory task. We also found a significant condition main effect, $F(1, 57) = 16.31$, $p < .01$, $\eta^2_p =$

0.22, 90% CI [0.08, 0.36], indicating that both groups explicitly referenced the past more frequently when their prospections followed the memory task. Thus, even though people with schizophrenia explicitly referenced the past in their prospections less frequently than controls overall, they nevertheless did so more frequently when they first recounted memories.

Content, Clarity, and Experience in Memories

We examined whether people with and without schizophrenia differed in the content, clarity, and experience of memories using separate 2 (group) × 3 (valence) mixed effect ANOVAs (see Table 2). Consistent with our second hypothesis about memory, these analyses revealed no interactions with group for coded content or reported experience. That is, people with schizophrenia generated memories with comparable content (time/place indicators, sociality, elaborative detail) and experience (reported sensory and contextual experience) as did people without schizophrenia when memories were prompted with specific cues. However, we found a significant group main effect for clarity, $F(1, 59) = 5.47$, $p < .02$, $\eta^2_p = 0.09$, 90% CI [0.01, 0.21]. Despite providing specific cues, people with schizophrenia described their memories less clearly than controls.

With respect to our secondary exploratory aim to examine the role of emotion, we found significant valence main effects for sociality, $F(1.70, 100.05) = 4.12$, $p < .03$, $\eta^2_p = 0.07$, 90% CI [0.01, 0.15], and reported sensory experience, $F(2, 118) = 13.12$,

Table 2
Descriptive Statistics for Coded and Self-Reported Memory and Prospection Variables

Variable	Schizophrenia (SZ)			Control (CT)			Significant comparison(s)
	Memory	Past/Prospection	Control/Prospection	Memory	Past/Prospection	Control/Prospection	
Time/Place							Prospection
Positive	1.16 (.51)	1.12 (.49)	1.27 (.50)	1.48 (.43)	1.38 (.53)	1.47 (.05)	• Group: SZ < CT
Negative	1.25 (.81)	.78 (.39)	.83 (.62)	1.29 (.59)	.86 (.53)	.78 (.43)	• Valence: negative < positive, neutral
Neutral	1.25 (.62)	1.23 (.63)	1.13 (.78)	1.48 (.69)	1.52 (.57)	1.28 (.70)	
Sociality							Memory
Positive	1.30 (.68)	1.38 (.57)	1.15 (.68)	1.66 (.40)	1.40 (.62)	1.45 (.60)	• Valence: negative > positive, neutral
Negative	1.67 (.59)	1.18 (.70)	1.38 (.45)	1.78 (.37)	1.24 (.58)	1.43 (.56)	
Neutral	1.34 (1.29)	1.00 (.91)	1.20 (.89)	1.41 (.82)	1.31 (.93)	1.28 (.96)	
Elaboration							Prospection
Positive	1.25 (.68)	.75 (.54)	.80 (.67)	1.47 (.52)	.93 (.62)	1.05 (.71)	• Valence: negative < positive, neutral
Negative	1.16 (.76)	.63 (.63)	.67 (.58)	1.33 (.64)	.69 (.57)	.81 (.71)	
Neutral	1.06 (.91)	.70 (.70)	.77 (.77)	1.31 (.66)	.86 (.64)	.90 (.77)	
Clarity							Memory
Positive	1.91 (.20)	1.85 (.30)	1.93 (.22)	1.97 (.13)	1.93 (.22)	1.98 (.09)	• Group: SZ < CT
Negative	1.84 (.30)	1.78 (.49)	1.87 (.22)	2.00 (.00)	1.97 (.26)	1.98 (.09)	Prospection
Neutral	1.84 (.45)	1.93 (.25)	1.93 (.25)	2.00 (.00)	1.93 (.26)	1.97 (.19)	• Condition: Control/Prospection > Past/Prospection
Sensory							• Group × Valence: SZ < CT negative only
Positive	4.24 (1.56)	4.37 (1.35)	3.89 (1.57)	4.78 (1.29)	4.75 (1.27)	5.17 (1.20)	Memory
Negative	3.61 (1.41)	3.30 (1.38)	3.17 (1.14)	3.91 (1.25)	3.83 (1.39)	3.93 (1.29)	• Valence: negative < positive, neutral
Neutral	4.16 (1.36)	4.10 (1.59)	4.02 (1.61)	4.83 (1.45)	4.74 (1.58)	5.15 (1.45)	Prospection
Context							• Group: SZ < CT
Positive	5.71 (1.03)	5.15 (1.64)	5.10 (1.51)	6.18 (.088)	5.24 (1.38)	5.83 (.98)	• Valence: negative < positive, neutral
Negative	5.55 (1.23)	4.48 (1.51)	4.89 (1.52)	5.80 (.97)	4.81 (1.85)	4.78 (1.53)	Prospection
Neutral	5.77 (1.68)	5.29 (1.78)	5.26 (1.56)	6.10 (1.18)	5.49 (1.81)	5.45 (1.73)	• Valence: negative < positive, neutral

Note. Tabled values are means with standard deviations in parentheses; Past/Prospection = prospections following the memory task; Control/Prospection = prospections following the control task.

$p < .01$, $\eta_p^2 = 0.18$, 90% CI [0.08, 0.27]. Pairwise comparisons indicated that all participants' negative memory narratives were coded as more social than either their positive or neutral memory narratives ($ps < 0.05$). In addition, all participants reported experiencing fewer sensory details in their negative memories than their positive or neutral memories ($ps < 0.05$). That we found no significant Group \times Valence interactions suggests that the content, clarity, and experience of memories varied by emotion in similar ways for people with and without schizophrenia.

Content, Clarity, and Experience in Prospecctions

To test our hypotheses about prospecctions, we conducted separate 2 (group) \times 2 (condition: prospecction following memory task, prospecction following control task) \times 3 (valence) ANOVAs for content, clarity, and experience variables (see Table 2).

Inconsistent with our first prospecction hypothesis, we found no significant condition main effects or interactions with condition for content (time/place, sociality, elaborative detail) or reported experience (sensory, context) variables. Thus, generating and talking about memories prior to prospecction was not associated with more detailed prospecction content or experience for either group. However, we found a significant condition main effect for clarity, $F(1, 57) = 3.87$, $p < .05$, $\eta_p^2 = 0.06$, 90% CI [0.04, 0.18]. Contrary to expectations, all participants generated prospecctions with *less* clarity after the memory task than after the control task.

Consistent with our second prospecction hypothesis, we found two significant group main effects (see Figures 1 and 2). People with schizophrenia included fewer time and place indicators, $F(1, 57) = 4.09$, $p < .05$, $\eta_p^2 = 0.07$, 90% CI [0.01, 0.19], and reported less sensory experience, $F(1, 59) = 8.60$, $p < .01$, $\eta_p^2 = 0.13$, 90% CI [0.02, 0.26], compared with controls.

Relevant to our secondary exploratory aim regarding emotion, we found four significant valence main effects: time/place, $F(1.89, 107.49) = 26.43$, $p < .01$, $\eta_p^2 = 0.32$, 90% CI [0.19, 0.41], elaborative detail, $F(1.85, 105.59) = 5.58$, $p < .01$, $\eta_p^2 = 0.09$, 90% CI [0.02, 0.17], reported sensory experience, $F(2, 118) = 45.92$, $p < .01$, $\eta_p^2 = 0.44$, 90% CI [0.32, 0.52], and reported

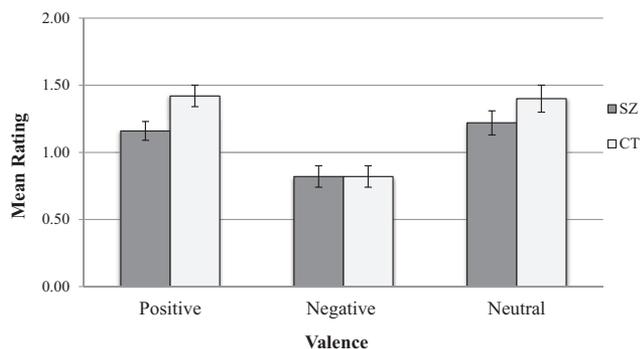


Figure 1. Mean time/place scores as a function of prospecction (collapsed across condition: past/future, control/future) and valence (positive, negative, neutral) for people with (SZ) and without (CT) schizophrenia. People with schizophrenia provided fewer time and place indicators in their prospecctions than controls, overall ($p < .01$). However, both groups provided fewer time and place indicators in their negative prospecctions than positive and neutral prospecctions ($ps < 0.01$).

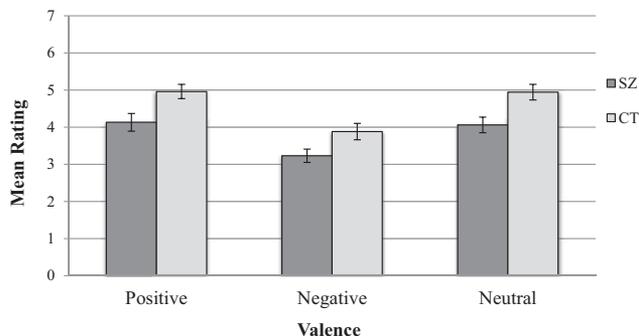


Figure 2. Mean reported sensory experience following prospecction (collapsed across condition: past/future, control/future) and valence (positive, negative, neutral) for people with (SZ) and without (CT) schizophrenia. People with schizophrenia reported less sensory experience in their prospecctions than controls, overall ($p < .01$). However, both groups reported less sensory experience in their negative prospecctions than positive and neutral prospecctions ($ps < 0.01$).

context experience, $F(2, 118) = 9.88$, $p < .01$, $\eta_p^2 = 0.14$, 90% CI [0.05, 0.23]. Follow-up tests indicated that all participants' negative prospecctions included fewer time/place indicators, less elaborative detail, less sensory experience, and less context experience than their positive and neutral prospecctions ($ps < 0.01$). Notably, these valence differences were observed for both groups and regardless of whether the prospecctions followed the control task or the memory task.

We also found a significant Group \times Emotion interaction for clarity, $F(2, 114) = 3.54$, $p < .03$, $\eta_p^2 = 0.06$, 90% CI [0.01, 0.13]. People with schizophrenia recounted less clear prospecctions than controls, but this was true for negative prospecctions only, $t(59) = 2.72$, $p < .01$, $\eta_p^2 = 0.11$, 90% CI [0.02, 0.24].

Emotion Experience and Positive Prospecctions

Consistent with our first hypothesis that people with schizophrenia would not exhibit deficits in experienced positive emotion following positive prospecctions that were preceded by the memory task, we found no group differences in current or predicted positive emotion experience. Stated differently, people with schizophrenia experienced comparable positive emotion following their positive prospecctions if they first recalled and described memories.

Consistent with our second hypothesis that the groups would differ in experienced positive emotion following positive prospecctions that were preceded by the control task, we found that people with schizophrenia reported less current positive emotion, $t(59) = 2.04$, $p < .05$, $\eta_p^2 = 0.07$, 90% CI [0.00, 0.18], and predicted less positive emotion, $t(59) = 2.20$, $p < .03$, $\eta_p^2 = 0.08$, 90% CI [0.00, 0.20]. Although not central to our conceptualization of anticipatory pleasure, we also assessed whether people with and without schizophrenia differed in the use of positive emotion words in prospecctions that were preceded by the control task. Consistent with our findings for current and predicted emotion experience, people with schizophrenia included fewer positive emotion words, $t(59) = 2.80$, $p < .01$, $\eta_p^2 = 0.12$, 90% CI [0.02, 0.25], than controls in positive prospecctions that were preceded by the control task.

Discussion

We sought to examine three interrelated processes that comprise anticipatory pleasure: memory, prospection, and emotion experience. We found that when prompted with specific cues, people with schizophrenia were able to recall and describe personal memories regardless of emotional valence, albeit less clearly. Nevertheless, people with schizophrenia were less likely than controls to explicitly refer to their memories when prospecting, and this may have contributed to our observation that people with schizophrenia generated prospectations that were, in some ways, less detailed and richly experienced compared with controls. Interestingly, people with schizophrenia reported comparable current and predicted positive emotion in their positive prospectations as did controls, but only when they first recalled and described positive memories. Taken together, these results suggest that even though people with schizophrenia were less likely to reference the past in their prospectations, and their prospectations were somewhat less detailed than controls, the “feeling” part of anticipatory pleasure was intact when they were first asked to generate memories. Thus, recalling and describing positive memories before prospectation may help people with schizophrenia to *experience* greater anticipatory pleasure. We consider each of these findings in turn, with an eye toward integration with previous literature and discussion of future directions.

Memories

Based on research showing that people with schizophrenia have difficulty recalling and describing autobiographical memories, we hypothesized and found that people with schizophrenia referenced the past less frequently in their prospectations compared with controls. However, we also found that both groups were more likely to explicitly reference the past in their prospectations when they first recalled and described their memories. Together, these findings suggest that there may be some benefit gained from talking about personal memories before prospectation for people with schizophrenia insofar as it may prompt people to draw from their past while prospecting. Given that prior theory and research indicates that prospectations are created by flexibly recombining fragments of past experiences (Schacter et al., 2007), prompting people to first recall memories may in turn populate prospectations with such fragments from the past.

It is worth emphasizing that we only coded explicit references to the past. However, a participant may have nevertheless referenced the past in a more indirect, less explicit manner. For example, a person might state, “I’ll go to Olive Garden for my next birthday.” In this example, there is no explicit reference to visiting Olive Garden in the past, and thus it would not have been coded as such even if the person had indeed visited this restaurant. Our fairly conservative approach to measuring past references may have thus underestimated how often people draw from the past when prospecting. Future research could extend work in this area by more thoroughly assessing if and how past experiences are integrated into prospectations. For example, it might be fruitful to conduct follow-up interviews to ascertain whether participants previously experienced what they described in their prospectations.

Although people with schizophrenia explicitly referenced the past less frequently in their prospectations than controls, their memories contained similarly detailed content and comparable experi-

ence in response to specific, salient event cues. Further, memories varied by emotion in similar ways for people with and without schizophrenia. That is, both groups included greater social engagement, yet reported less sensory experience in their negative memories compared with positive memories. Consistent with previous autobiographical memory and narrative studies (Gruber & Kring, 2008; Raffard et al., 2010), however, the manner in which people with schizophrenia talked about personal memories was less clear. Taken together, these findings suggest that although people with schizophrenia are able to generate detailed and richly experienced memories no matter the valence, they are less likely to draw from these experiences during prospectation, which may contribute to anticipatory pleasure deficits.

At first glance, our results may seem inconsistent with other studies showing autobiographical memory deficits in schizophrenia (e.g., Danion et al., 2005; McLeod et al., 2006; Ranganath et al., 2008; Riutort et al., 2003). Methodological differences may help to explain these discrepant findings. First, we assessed different aspects of memories, including the content (i.e., time and place, sociality, elaborative detail), clarity, and experience (i.e., reported sensory and content experience). By contrast, other studies have assessed conscious recollection (i.e., “remember,” “know,” “guess”; e.g., Danion et al., 2005) or specificity (e.g., Riutort et al., 2003). Second, we prompted participants with specific cues (e.g., an argument), instead of general cues with open-ended time frames (e.g., a time in childhood) or broad categories (e.g., family), which may have elicited responses more consistent with the domains we coded. These differences make direct comparisons of our results with studies using standardized autobiographical memory tasks or different coding schemes difficult. Nonetheless, our findings suggest that when provided with specific and salient cues, people with schizophrenia can recall and describe memories with comparable content and experience as controls.

Prospectations

Given the relationship between memory and prospectation in healthy people, we reasoned that participants might provide more detailed and richly experienced prospectations following a memory task because they are explicitly cued to recall past experiences. Inconsistent with our hypothesis, we found no differences in the content or experience of prospectations that followed a control task compared with those that followed a memory task for either group. In some ways, it is not surprising that the task completed before prospectation did not influence the content or experience of controls’ prospectations, given that they were more likely to reference the past in both conditions than people with schizophrenia. In other words, controls likely did not need the memory task to “prime” them to draw from the past in their prospectations. Nonetheless, these results suggest that explicitly prompting the generation of memories before prospectation does not elicit more detailed or richly experienced prospectations for people with schizophrenia.

Regardless of the task that preceded prospectation, people with schizophrenia were less likely to include when and where future events would occur, and they experienced fewer sensory details when prospecting than controls. Importantly, the prospectations of people with and without schizophrenia did not differ in word count, so our observed differences in prospectations cannot be accounted for by less speech output. Furthermore, people with

schizophrenia did not differ from controls in memory narratives, and thus it seems unlikely that group differences in prospection are better accounted for by language impairments. Instead, these findings suggest that the link between memory and prospection may not be as strong for people with schizophrenia, which may in turn impact anticipatory pleasure.

Interestingly, the prospectings of people with schizophrenia did not differ from controls in sociality. Given that social functioning difficulties (e.g., Hooley, 2010) and diminished frequency and desire for close relationships (i.e., asociality; Kirkpatrick, Fenton, Carpenter, & Marder, 2006) are well documented in schizophrenia, it was surprising to find that people with schizophrenia were equally as likely to include others in their prospectings as controls. Although we measured the degree of social interaction in narratives (active, passive, or none), assessing the quality of relationships that are included in prospectings could further inform our understanding of asociality. That is, although people with schizophrenia were equally likely to mention other people in their prospectings, they may prospect about less meaningful social relationships than controls. As a result, they may anticipate less pleasure because they do not feel close or connected with the people included in their prospectings, and thus may be less likely to desire, initiate, or engage in future social experiences.

Like our findings for memories, prospectings varied by emotion in comparable ways for people with and without schizophrenia (with one exception). Specifically, we found that negative prospectings differed from positive and neutral prospectings for both groups. These findings are consistent with prior research with healthy people (D'Argembeau & Van der Linden, 2004; Painter & Kring, 2015) and may reflect a type of emotion regulation strategy (Rasmussen & Berntsen, 2013; Painter & Kring, 2015). That is, describing less detailed and richly experienced negative prospectings may reflect a type of avoidance to keep distress associated with thinking about possible future negative events (e.g., worry, hopelessness) at bay.

Interestingly, we observed that people with schizophrenia generated less clear negative (but not positive and neutral) prospectings than did controls. This finding is consistent with studies reporting impairments in narrating about stressful or negative events (Docherty et al., 1998; Docherty & Hebert, 1997). Thus, our findings extend this literature, showing that people with schizophrenia exhibit less clarity in negative prospectings compared with people without schizophrenia. To the extent that describing less detailed and richly experienced negative prospectings reflects an emotion regulation strategy, people with schizophrenia may be less proficient in using this strategy, as they described their negative prospectings less clearly.

Linkages to Current and Predicted Pleasure

We reasoned that participants may report greater current and predicted positive emotion if they are prompted to recall and describe positive memories prior to prospection. Based on our time course model (Kring & Caponigro, 2010), we assessed both current positive emotion while anticipating future events and predicted positive emotion for the future events. Consistent with our hypothesis, we found that people with schizophrenia reported comparable current and predicted positive emotion as controls, but only when they first recalled and described positive memories.

However, without the prior prompting of memories, people with schizophrenia reported less current and predicted positive emotion than controls (consistent with previous studies; see Kring & Caponigro, 2010; Kring & Elis, 2013, for reviews). It is also worth noting that people with schizophrenia included a similar number of positive emotion words as controls in positive prospectings preceded by the memory task, but fewer positive emotion words in prospectings preceded by the control task.

Together, these findings suggest that recalling and describing the past prior to prospection may provide a boost to current and predicted pleasure. Further, even though the prospectings of people with schizophrenia were less detailed and richly experienced than controls', the emotion experience component of anticipatory pleasure was in tact when memories were first recalled and described. Thus, an intervention that asks people to recall and describe memories before prospection may help people with schizophrenia anticipate future pleasure. It remains to be tested, however, whether people with schizophrenia would experience current and predicted pleasure comparable with controls if their prospectings were more detailed (e.g., through training to prospect in greater detail), even without recalling and describing positive memories first.

Studies examining reward processing and motivated behavior in schizophrenia provide evidence for impairments in the neural correlates of anticipatory pleasure (e.g., ventral striatum; see Kring & Barch, 2014; Strauss, Waltz, & Gold, 2014, for reviews), even in people who are not taking antidopaminergic medications. To the extent that current and predicted emotion experience reflects reward value, our findings suggest that when prompted with specific and salient cues to recall personal memories, people with schizophrenia are able to generate value representations that are comparable with controls. Future studies will need to assess the neural correlates of anticipatory pleasure as well as the linkage between current and predicted pleasure and effort to engage in future pleasurable events. Of note, Gard, Kring, Gard, Horan, and Green (2007) found that the anticipatory pleasure deficit in daily life (i.e., predicted pleasure for future events) was greater for goal-directed activities. These findings along with our current results suggest, albeit speculatively, that aspects of the neural circuitry that support anticipatory pleasure are intact.

As with any study, there are important limitations to acknowledge. First, our sample sizes were relatively small. Second, we investigated only a subset of potential processes comprising anticipatory pleasure (i.e., memory, prospection, emotion experience). Other processes, such as defeatist beliefs (Grant & Beck, 2009) and difficulties with reward processing (Strauss et al., 2014), may well be related to anticipatory pleasure deficits (Kring & Barch, 2014). Third, several people with schizophrenia were receiving more than one medication, and overall, there was considerable variability in the combination of medications prescribed. Regardless of medication types, the possibility of medication effects cannot be ruled out. Finally, although we coded for several domains, we did not include others (e.g., personal importance, feelings of [p]reexperiencing, time since/until event).

To conclude, we investigated three processes that comprise anticipatory pleasure: memory, prospection, and emotion experience. Although the ability to recall and describe memories in response to specific and salient cues was largely intact, our findings suggest two areas of difficulty in schizophrenia. First, people

with schizophrenia were less likely to draw from the past when prospecting. Second, the prospecting of people with schizophrenia were, in some ways, less detailed and richly experienced than people without schizophrenia. Nonetheless, when people with schizophrenia recalled and described positive memories prior to prospecting, they experienced and predicted comparable positive emotion.

References

- Addis, D. R., Pan, L., Vu, M. A., Laiser, N., & Schacter, D. L. (2009). Constructive episodic simulation of the future and the past: Distinct subsystems of a core brain network mediate imagining and remembering. *Neuropsychologia*, *47*, 2222–2238. <http://dx.doi.org/10.1016/j.neuropsychologia.2008.10.026>
- Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: Common and distinct neural substrates during event construction and elaboration. *Neuropsychologia*, *45*, 1363–1377. <http://dx.doi.org/10.1016/j.neuropsychologia.2006.10.016>
- Botzung, A., Denkova, E., & Manning, L. (2008). Experiencing past and future personal events: Functional neuroimaging evidence on the neural bases of mental time travel. *Brain and Cognition*, *66*, 202–212. <http://dx.doi.org/10.1016/j.bandc.2007.07.011>
- Buckner, R. L., & Carroll, D. C. (2007). Self-projection and the brain. *Trends in Cognitive Sciences*, *11*, 49–57. <http://dx.doi.org/10.1016/j.tics.2006.11.004>
- Cohen, A. S., & Minor, K. S. (2010). Emotional experience in patients with schizophrenia revisited: Meta-analysis of laboratory studies. *Schizophrenia Bulletin*, *36*, 143–150. <http://dx.doi.org/10.1093/schbul/sbn061>
- 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: An International Journal*, *14*, 535–547. <http://dx.doi.org/10.1016/j.concog.2005.01.005>
- D'Argembeau, A., Raffard, S., & Van der Linden, M. (2008). Remembering the past and imagining the future in schizophrenia. *Journal of Abnormal Psychology*, *117*, 247–251. <http://dx.doi.org/10.1037/0021-843X.117.1.247>
- D'Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and Cognition: An International Journal*, *13*, 844–858. <http://dx.doi.org/10.1016/j.concog.2004.07.007>
- D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation strategies. *Consciousness and Cognition: An International Journal*, *15*, 342–350. <http://dx.doi.org/10.1016/j.concog.2005.09.001>
- Docherty, N. M., Hall, M. J., & Gordinier, S. W. (1998). Affective reactivity of speech in schizophrenia patients and their nonschizophrenic relatives. *Journal of Abnormal Psychology*, *107*, 461–467. <http://dx.doi.org/10.1037/0021-843X.107.3.461>
- Docherty, N. M., & Hebert, A. S. (1997). Comparative affective reactivity of different types of communication disturbances in schizophrenia. *Journal of Abnormal Psychology*, *106*, 325–330. <http://dx.doi.org/10.1037/0021-843X.106.2.325>
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2002a). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research version, patient edition. (SCID-I/P)*. New York, NY: Biometrics Research, New York State Psychiatric Institute.
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2002b). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research version, non-patient edition. (SCID-I/NP)*. New York, NY: Biometrics Research, New York State Psychiatric Institute.
- Fleiss, J. L., & Shrout, P. E. (1978). Approximate interval estimation for a certain intraclass correlation coefficient. *Psychometrika*, *43*, 259–262. <http://dx.doi.org/10.1007/BF02293867>
- Gard, D. E., Kring, A. M., Gard, M. G., Horan, W. P., & Green, M. F. (2007). Anhedonia in schizophrenia: Distinctions between anticipatory and consummatory pleasure. *Schizophrenia Research*, *93*(1–3), 253–260. <http://dx.doi.org/10.1016/j.schres.2007.03.008>
- Gilbert, D. T., & Wilson, T. D. (2007). Propection: Experiencing the future. *Science*, *317*, 1351–1354. <http://dx.doi.org/10.1126/science.1144161>
- Girden, E. R. (1992). *ANOVA: Repeated measures* (Vol. 84). Thousand Oaks, CA: Sage.
- Grant, P. M., & Beck, A. T. (2009). Defeatist beliefs as a mediator of cognitive impairment, negative symptoms, and functioning in schizophrenia. *Schizophrenia Bulletin*, *35*, 798–806. <http://dx.doi.org/10.1093/schbul/sbn008>
- Gruber, J., & Kring, A. M. (2008). Narrating emotional events in schizophrenia. *Journal of Abnormal Psychology*, *117*, 520–533. <http://dx.doi.org/10.1037/0021-843X.117.3.520>
- Hassabis, D., Kumaran, D., Vann, S. D., & Maguire, E. A. (2007). Patients with hippocampal amnesia cannot imagine new experiences. *Proceedings of the National Academy of Sciences of the United States of America*, *104*, 1726–1731. <http://dx.doi.org/10.1073/pnas.0610561104>
- Hooley, J. M. (2010). Social factors in schizophrenia. *Current Directions in Psychological Science*, *19*, 238–242. <http://dx.doi.org/10.1177/0963721410377597>
- Kirkpatrick, B., Fenton, W. S., Carpenter, W. T., Jr., & Marder, S. R. (2006). The NIMH-MATRICES consensus statement on negative symptoms. *Schizophrenia Bulletin*, *32*, 214–219. <http://dx.doi.org/10.1093/schbul/sbj053>
- Klein, S. B., Loftus, J., & Kihlstrom, J. F. (2002). Memory and temporal experience: The effects of episodic memory loss on an amnesic patient's ability to remember the past and imagine the future. *Social Cognition*, *20*, 353–379. <http://dx.doi.org/10.1521/soco.20.5.353.21125>
- Kring, A. M., & Barch, D. M. (2014). The motivation and pleasure dimension of negative symptoms: Neural substrates and behavioral outputs. *European Neuropsychopharmacology*, *24*, 725–736. <http://dx.doi.org/10.1016/j.euroneuro.2013.06.007>
- Kring, A. M., & Caponigro, J. M. (2010). Emotion in schizophrenia: Where feeling meets thinking. *Current Directions in Psychological Science*, *19*, 255–259. <http://dx.doi.org/10.1177/0963721410377599>
- Kring, A. M., & Elis, O. (2013). Emotion deficits in people with schizophrenia. *Annual Review of Clinical Psychology*, *9*, 409–433. <http://dx.doi.org/10.1146/annurev-clinpsy-050212-185538>
- Kring, A. M., Gur, R. E., Blanchard, J. J., Horan, W. P., & Reise, S. P. (2013). The Clinical Assessment Interview for Negative Symptoms (CAINS): Final development and validation. *The American Journal of Psychiatry*, *170*, 165–172. <http://dx.doi.org/10.1176/appi.ajp.2012.12010109>
- Kring, A. M., & Moran, E. K. (2008). Emotional response deficits in schizophrenia: Insights from affective science. *Schizophrenia Bulletin*, *34*, 819–834. <http://dx.doi.org/10.1093/schbul/sbn071>
- Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for the Expanded Brief Psychiatric Rating Scale (BPRS). *Schizophrenia Bulletin*, *12*, 594–602.
- McLeod, H. J., Wood, N., & Brewin, C. R. (2006). Autobiographical memory deficits in schizophrenia. *Cognition and Emotion*, *20*, 536–547. <http://dx.doi.org/10.1080/02699930500342472>
- Okuda, J., Fujii, T., Ohtake, H., Tsukiura, T., Tanji, K., Suzuki, K., . . . Yamadori, A. (2003). Thinking of the future and past: The roles of the frontal pole and the medial temporal lobes. *NeuroImage*, *19*, 1369–1380. <http://dx.doi.org/10.1016/s1053>

- Painter, J. M., & Kring, A. M. (2015). Back to the future: Similarities and differences in emotional memories and prospectives. *Applied Cognitive Psychology, 29*, 271–279. <http://dx.doi.org/10.1002/acp.3105>
- Pennebaker, J. W. (2001). *Linguistic inquiry and word count*. Mahwah, NJ: Erlbaum Publishers.
- Potheegadoo, J., Cordier, A., Berna, F., & Danion, J. M. (2014). Effectiveness of a specific cueing method for improving autobiographical memory recall in patients with schizophrenia. *Schizophrenia Research, 152*, 229–234.
- Raffard, S., D'Argembeau, A., Lardi, C., Bayard, S., Boulenger, J. P., & Van der Linden, M. (2010). Narrative identity in schizophrenia. *Consciousness and Cognition: An International Journal, 19*, 328–340. <http://dx.doi.org/10.1016/j.concog.2009.10.005>
- Raffard, S., Esposito, F., Boulenger, J. P., & Van der Linden, M. (2013). Impaired ability to imagine future pleasant events is associated with apathy in schizophrenia. *Psychiatry Research, 209*, 393–400. <http://dx.doi.org/10.1016/j.psychres.2013.04.016>
- Ranganath, C., Minzenberg, M. J., & Ragland, J. D. (2008). The cognitive neuroscience of memory function and dysfunction in schizophrenia. *Biological Psychiatry, 64*, 18–25. <http://dx.doi.org/10.1016/j.biopsych.2008.04.011>
- Rasmussen, A. S., & Berntsen, D. (2013). The reality of the past versus the ideality of the future: Emotional valence and functional differences between past and future mental time travel. *Memory & Cognition, 41*, 187–200. <http://dx.doi.org/10.3758/s13421-012-0260-y>
- 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. [http://dx.doi.org/10.1016/S0165-1781\(02\)00317-7](http://dx.doi.org/10.1016/S0165-1781(02)00317-7)
- Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society of London, 362*, 773–786. <http://dx.doi.org/10.1098/rstb.2007.2087>
- Schacter, D. L., Addis, D. R., & Buckner, R. L. (2007). Remembering the past to imagine the future: The prospective brain. *Nature Reviews Neuroscience, 8*, 657–661. <http://dx.doi.org/10.1038/nrn2213>
- Strauss, G. P., Waltz, J. A., & Gold, J. M. (2014). A review of reward processing and motivational impairment in schizophrenia. *Schizophrenia Bulletin, 40*(Suppl. 2), S107–S116. <http://dx.doi.org/10.1093/schbul/sbt197>
- Szpunar, K. K. (2010). Evidence for an implicit influence of memory on future thinking. *Memory & Cognition, 38*, 531–540. <http://dx.doi.org/10.3758/MC.38.5.531>
- Szpunar, K. K., Watson, J. M., & McDermott, K. B. (2007). Neural substrates of envisioning the future. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 104*, 642–647. <http://dx.doi.org/10.1073/pnas.0610082104>
- Wechsler, D. (2001). *Wechsler Test of Adult Reading*. San Antonio, TX: Psychological Corporation.
- Wechsler, D. (2009). *Wechsler Individual Achievement Test* (3rd ed.). San Antonio, TX: Psychological Corporation.
- Williams, J. M., Ellis, N. C., Tyers, C., Healy, H., Rose, G., & MacLeod, A. K. (1996). The specificity of autobiographical memory and imageability of the future. *Memory & Cognition, 24*, 116–125. <http://dx.doi.org/10.3758/BF03197278>

Received September 3, 2015

Revision received January 28, 2016

Accepted January 28, 2016 ■