

# Emotion in Schizophrenia: Where Feeling Meets Thinking

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## Abstract

Our understanding of the nature of emotional difficulties in schizophrenia has been greatly enhanced by translational research over the past two decades. By incorporating methods and theories from affective science, researchers have been able to discover that people with schizophrenia exhibit very few outward displays of emotion but report experiencing strong feelings in the presence of emotionally evocative stimuli or events. Recent behavioral, psychophysiological, and brain imaging research has pointed to the importance of considering the time course of emotion in schizophrenia. This work has shown that people with schizophrenia have the ability to experience emotion in the moment; however, they appear to have difficulties when anticipating future pleasurable experiences, and this perhaps affects their motivation to have such experiences. While advancements in our understanding of emotional experience and expression in individuals with schizophrenia have been made, these developments have led to a new collection of research questions directed at understanding the time course of emotion in schizophrenia, including the role of memory and anticipation in motivated behavior, translating laboratory findings to the development of new assessment tools and new treatments targeting emotional impairments in people with this disorder.

## Keywords

schizophrenia, emotion, anticipation, memory

Schizophrenia is a disorder that impacts many domains. Some of its more recognizable symptoms involve difficulties in thinking (e.g., disorganized thinking, delusions) and perception (e.g., hallucinations). While these symptoms may come and go with episodes, some of the more long-lasting symptoms involve difficulties in emotion. In particular, the so-called negative symptoms of flat affect (lack of outward expression of emotion), anhedonia (diminished experience of pleasure), and avolition (diminished motivation) all involve emotion. These symptoms are often resistant to medication and are associated with poor overall functioning, pointing to the importance of understanding emotion in schizophrenia.

What do we mean by emotion? Most psychological researchers and theorists agree that emotions are responses to events, whether internal or external, that consist of multiple components including outward expression (e.g., a smile), reported experience (e.g., reporting feelings of happiness), physiology (e.g., increased heart rate), appraisal (e.g., labeling one's experience and its probable cause), and brain activation (e.g., activation in certain areas of the prefrontal cortex).

Kring (1999) summarized the state of the field with respect to understanding emotional difficulties in schizophrenia and pointed toward promising future directions. Ten years later, much of this promise has been realized, and exciting

new avenues for the assessment and treatment of emotional difficulties in schizophrenia are now under way. In this paper, we review our current understanding of how emotion does (or does not) go awry among people with schizophrenia and then highlight the ways in which these research findings have been translated into current assessment and treatment strategies.

Our understanding of the nature of emotional difficulties in schizophrenia has become much clearer in the last two decades because of translational research. Specifically, researchers have adopted the methods and theories developed in affective science and neuroscience to study emotion in schizophrenia. These methods include laboratory studies in which emotionally evocative stimuli are presented to people with and without schizophrenia and measures of facial expression, reported experience, physiology, and brain activation are obtained. A remarkably consistent pattern of findings has emerged from these studies (see Kring & Moran, 2008, for review): In the presence of emotionally evocative stimuli—whether they be

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films, pictures, foods, odors, or sounds—people with schizophrenia are less outwardly expressive of positive and negative emotion than are people without schizophrenia. However, people with schizophrenia report feeling emotions as strongly as, if not stronger than, people without schizophrenia. Additionally, studies of emotion in the context of daily life find the same pattern of results: People with schizophrenia experience strong feelings in their day-to-day lives even though the contexts in which they experience these feelings are different from those without the disorder.

## A Closer Look at Emotional Experience

Over the past 10 years, researchers have taken a closer look at emotional experience in schizophrenia. Many question whether people with schizophrenia can complete a self-report rating scale about their feelings given concurrent problems with disorganized thinking that may accompany the disorder. However, people with schizophrenia draw upon the same knowledge structures of emotion when reporting on their experiences as do people without schizophrenia (Kring, Barrett, & Gard, 2003), bolstering our confidence in these reports of emotion experience. Further, reports of emotional experience are stable across time and medication status (Kring & Earnst, 1999). This is not to say that symptoms may not impact reports of emotional experience, in the same way that any type of context may influence people's reports of emotional experience, regardless of whether an illness like schizophrenia is involved. Yet, the emotion reports of people with schizophrenia are just as reliable and valid as those of people without the disorder.

Results of studies using physiological measures of emotion (e.g., skin conductance, facial muscle activity, startle modulation) support the findings of comparable reports of emotional experience between people with and without schizophrenia, thus rendering less likely the possibility that people with schizophrenia are reporting feelings according to the demands of the experimental situation. For example, an indirect physiological measure of emotional response is the magnitude of an eyeblink in response to a startling noise. If a person is in a negative emotional state when hearing the startling noise, the blink response will be larger than it will be if the person is in a neutral state or a positive emotional state. Four studies have now shown that people with schizophrenia show the same pattern of blink response (or emotion-modulated startle) as do people without schizophrenia (Kring & Moran, 2008).

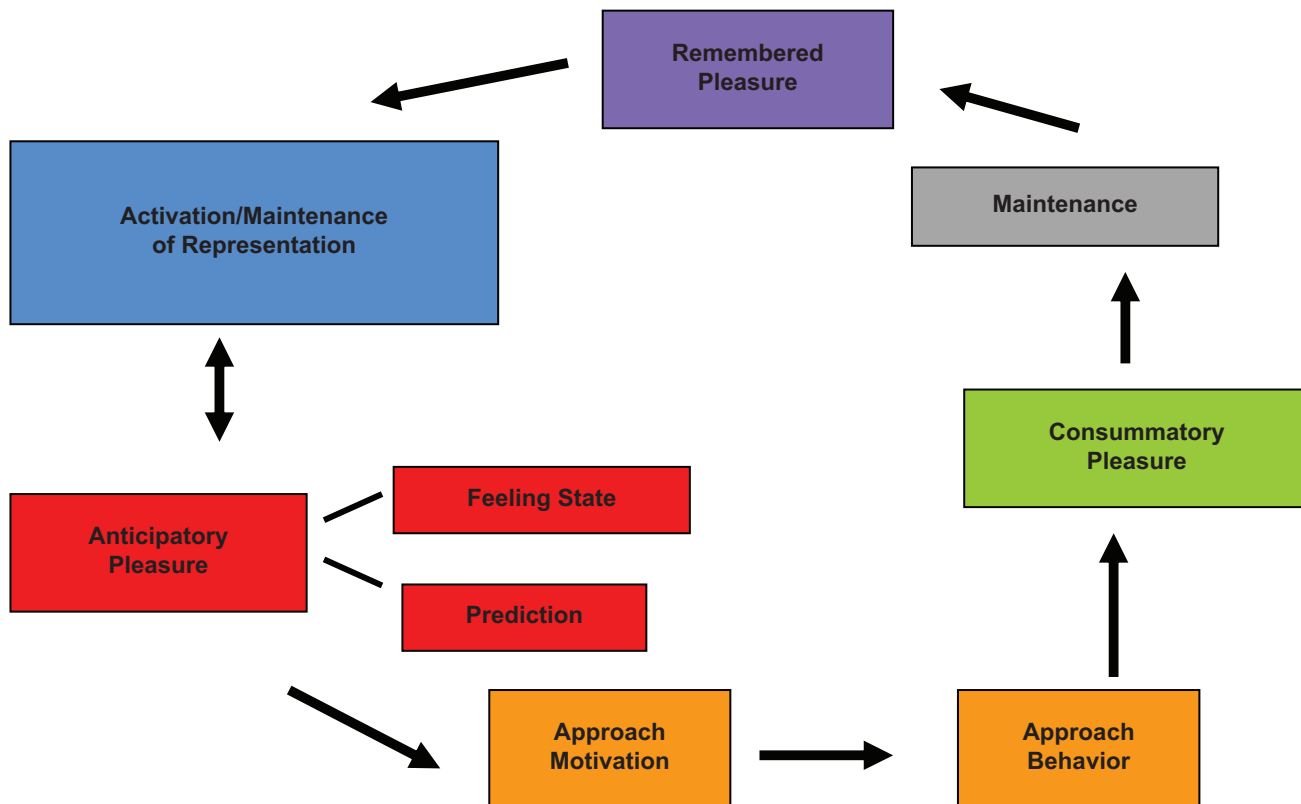
Findings from brain activation studies using functional magnetic resonance imaging (fMRI) or positron emission tomography (PET) during the presentation of emotionally evocative stimuli are more mixed. Several studies have found that, compared to people without schizophrenia, those with the disorder show less activation of the amygdala (an area of the brain linked to the salience of stimuli, including emotional intensity) in response to positive and negative stimuli (see Aleman & Kahn, 2005, for review), but other studies find comparable or even greater amygdala activation among people with schizophrenia; some studies have found decreased activation

in areas of the prefrontal cortex as well, whereas others have not. The reasons for the mixed findings likely have to do with the fact that, to date, there are relatively few brain activation studies in which emotionally evocative stimuli have been presented to people with schizophrenia. Furthermore, differences in scanning methods, in emotional stimuli used and task instructions, and in participant characteristics (e.g., differences in medication, years of illness, severity of symptoms) contribute to the differences across studies. For example, studies often examine the difference between brain activation in response to an emotional stimulus (e.g., picture of puppies) compared to brain activation in response to a neutral stimulus (e.g., picture of a chair) by subtracting brain activation to the neutral stimulus from brain activation to the emotional stimulus. However, some studies find that people with schizophrenia show greater activation to neutral stimuli compared to people without schizophrenia; thus the results of such subtractions might suggest under-recruitment of a particular brain region (e.g., the amygdala) when in fact activity in response to emotional stimuli is comparable or even greater among people with schizophrenia.

Studies with healthy participants may be particularly relevant when interpreting these mixed findings. For example, studies of the perception of facial expressions find relatively more robust brain activation in areas such as the amygdala, parahippocampal cortex, pregenual cingulate, and dorsal portions of the inferior frontal gyrus. By contrast, studies that present evocative stimuli and ask participants to report on their feelings find relatively greater activation in other areas such as the prefrontal cortex (ventromedial, orbitofrontal, dorsolateral), anterior insula, medial temporal lobe, ventral inferior frontal gyrus, and temporal pole (Wager et al., 2008). Making the picture even more complicated, studies suggest that reporting on feelings is associated with activation in more dorsal/rostral areas of the medial prefrontal cortex, whereas reporting on the affective properties of a stimulus (e.g., identifying something as positive or an expression as angry) is associated with activation in more ventral portions of the medial prefrontal cortex (e.g., Ochsner, 2008). Thus, when interpreting brain activation findings in schizophrenia, it is important to consider the type of stimuli presented (e.g., faces, other evocative stimuli) and the type of task instruction (e.g., rating feelings vs. rating stimuli).

Despite these complexities and differences between studies, the findings of comparable physiology and reported experience among people with and without schizophrenia despite possible differences in brain activation raises the intriguing possibility that people with schizophrenia are recruiting the brain differently to end up with the same behavioral result (i.e., comparable reports of emotional experience). The upsurge of interest in linkages among emotion, motivation, and cognition in schizophrenia alongside technological advances in imaging will promote further collaborations between affective and cognitive neuroscientists. Thus we will know a great deal more about how the brain supports emotional experience among people with schizophrenia in the very near future.

## Temporal Experience of Pleasure



**Fig. 1.** A model of the temporal experience of pleasure. A pleasurable experience may involve activating a cognitive representation of a past, related experience that will then trigger a process of predicting or anticipating what the new experience will feel like as well as a feeling of pleasure knowing that the experience is going to be happening in the future. These anticipatory processes will activate the motivation and behavior to go after or approach the experience. In the moment of “consuming” the experience, pleasure is experienced and savored or maintained so that it will be remembered at a later time.

### Linking Emotion and Cognition

One of the paradoxes that emerged from the findings on emotional experience in schizophrenia is a discrepancy between laboratory studies and clinical ratings. Specifically, many people with schizophrenia receive a clinical rating of anhedonia, indicating that they have diminished experience of positive emotion. Yet in the presence of emotionally pleasant things, such as films, pictures, tastes, or just day-to-day life, people with schizophrenia report experiencing as much pleasure as do people without schizophrenia. Drawing upon research on the reward system in humans and animals, Kring (1999) argued for the importance of considering the temporal course of pleasure to distinguish anticipatory from in-the-moment pleasure. When people with schizophrenia are presented with pleasurable stimuli either in a lab or in daily life, they can and do derive pleasure from these experiences. However, evidence now supports the contention that people with schizophrenia appear less likely to anticipate that future events will be pleasurable, are less likely to experience pleasure in anticipation

of things to come, and thus may be less likely to seek out pleasurable experiences (Gard, Kring, Germans Gard, Horan, & Green, 2007). Other behavioral and fMRI studies also find that people with schizophrenia have difficulties in what we call *anticipatory pleasure*. This term encompasses both the anticipation of future pleasurable experiences as well as the experience of pleasure in anticipation of future events.

The ability to anticipate whether something in the future will be pleasurable requires complex cognitive skills, such as imagination, reflection, drawing upon past experiences, and maintaining an image or emotional state. Thus, the latest wave of research on emotion in schizophrenia explicitly integrates emotion and cognition, or feeling and thinking. What do we mean by cognition? Broadly, cognition refers to a set of mental or thought processes, such as attending, thinking, remembering, perceiving, and deciding. In Figure 1, we point to several emotion–cognition interactions that come into play in the temporal experience of pleasure. For example, consider the problem of what to have for dinner. You consider pizza, which

may then lead you to summon a past experience of eating pizza from the neighborhood pizzeria (activating a representation and holding this in working memory), which prompts you to predict that the pizza will be very enjoyable; indeed you experience pleasure now, knowing you will soon be eating tasty pizza (i.e., anticipatory pleasure). These processes will support your motivational system such that you will order and pick up the pizza (approach motivation and behavior), and once you eat it, you will experience in-the-moment or consummatory pleasure. You will savor (maintain) the pleasure from the pizza, and this experience will be encoded into memory. Thus, the next time you contemplate dinner, this memory may be called upon to kick-start the process all over again.

Cognitive and affective neuroscience research with healthy people has clearly demonstrated that the brain is not simply divided into regions specific to our psychological concepts, such as cognition and emotion. Instead, overlapping brain regions support thinking and feeling in interesting and complex ways (e.g., Barrett, 2009). Understanding cognition–emotion interactions is also at the forefront of research on mental illness (Taylor & Liberzon, 2007).

Cognitive neuroscience findings in healthy people suggest that our ability to forecast relies on our ability to remember the past (e.g., Schacter, Addis, & Buckner, 2007), with a core network of brain regions, including areas of the medial prefrontal and medial temporal cortex, supporting both abilities. Thus, when we imagine what it will be like to have a tasty dinner with friends, we likely draw on our past experiences with dinners and friends to help imagine this future experience. Maintaining and processing emotional experiences as they occur no doubt facilitates the development of memories for these experiences, and evidence from psychophysiological and fMRI studies finds that people with schizophrenia appear to have difficulty holding on to these experiences (Horan, Wynn, Kring, Simons, & Green, 2010; Kring, Germans Gard, & Gard, 2009; Ursu et al., 2010).

Only a few studies to date have examined whether people with schizophrenia can retrieve memories of their emotional experiences, and even fewer have examined the relationship between memory and anticipation. One study found that people with schizophrenia were able to recall their feelings about positive films and foods 4 hours later (Horan, Green, Kring, & Nuechterlein, 2006). However, the majority of the work in this area focuses on recalling emotional stimuli (which is distinguishable from remembering feelings). For example, one study found that people with schizophrenia had difficulty recalling positive emotional stimuli 24 hours later (Herberner, Rosen, Khine, & Sweeney, 2007). Research with healthy people has found that emotionally arousing events and stimuli are remembered better than neutral ones. However, individuals with schizophrenia may not exhibit this enhancement for remembering emotional stimuli (Hall, Harris, McKirdy, Johnstone, & Lawrie, 2007).

A study that investigated the link between memory and anticipation in schizophrenia found that people with schizophrenia recalled fewer specific memories and generated fewer specific anticipated future events than did people without

the disorder (D'Argembeau, Raffard, & van der Linden, 2008). It will be particularly important to explicitly examine the linkage between envisioning the future and remembering the past, particularly for emotional events among people with schizophrenia, at both the behavioral and neural levels.

Other investigators have begun to examine how cognitive control, which refers to a broad array of processes including direction of attention to relevant information, maintenance of contextual information to guide behavior, and monitoring of novel information for its relevance to current goals, can influence emotional experience. For example, Dichter, Bellion, Casp, and Belger (2009) examined how, among people with and without schizophrenia, attention and emotion interact. The daily-life analog to this type of experiment might be paying attention to road signs on your way to a destination despite a screaming toddler in the backseat of your car. Findings indicated that healthy individuals activated different brain regions to facilitate attention to the demands of a task (e.g., more dorsal regions of the prefrontal cortex) while at the same time inhibiting attention to emotionally distracting information (e.g., more ventral areas of the prefrontal cortex), whereas people with schizophrenia did not. Ursu et al. (2010) found that people with and without schizophrenia exhibited comparable activations in the ventromedial prefrontal cortex while viewing emotionally evocative pictures. However, healthy controls continued to show activation in the dorsolateral and ventromedial prefrontal cortex during a 12-second delay between picture viewing and reporting emotional experience, presumably reflecting the active maintenance and control of their feelings, whereas people with schizophrenia did not show this persistent activation.

### **Toward the Next Step of Translation: Assessment and Treatment**

The next step of translational research on emotion and schizophrenia—that is, research translating laboratory findings to the development of new assessment and treatments—is well under way. For example, the Collaboration to Advance Negative Symptom Assessment (CANSAS) is a currently ongoing multisite study developing and validating a new clinical measure of negative symptoms (CAINS). The CAINS includes items to assess the five consensus negative symptoms: flat affect, alogia, anhedonia, asociality, and avolition. Importantly, the measure includes questions to distinguish anticipatory and in-the-moment pleasure to better assess the nature of anhedonia in schizophrenia. Once the 3-year CANSAS study is completed, the new measure will be ready for dissemination for use in treatment trials and other research pertinent to elucidating negative symptoms.

Translational research over the past decade has also informed the development of psychosocial treatments that target not just symptoms but also specific emotional and cognitive difficulties. For example, cognitive behavior therapy has been successfully used as an adjunctive treatment to medications for symptoms such as disorganized thinking, delusions, and

hallucinations (Wykes, Steel, Everitt, & Tarrier, 2008). More recently, it has been modified to more explicitly target the negative symptoms in schizophrenia. Preliminary data on an emotion-focused meditation treatment targeting anticipatory pleasure and motivation difficulties in schizophrenia are also promising (e.g., Johnson et al., 2009). In the next 10 years, additional efforts to develop treatments that selectively target the specific emotional difficulties in schizophrenia will likely yield much promise, thus fully realizing the potential of translational research. That is, efforts to better uncover specific deficits in schizophrenia (e.g., links between anticipation and remembering salient emotional experiences) along with the causes of these deficits (e.g., disrupted connections between brain areas supporting emotion and anticipation/memory) will allow us to develop more targeted interventions, whether pharmacological or psychosocial, for these mechanisms rather than for broad categories like negative symptoms.

## Recommended Reading

- Gard, D.E., Kring, A.M., Germans Gard, M., Horan, W.P., & Green, M.F. (2007). (See References). A recent paper illustrating the deficits in anticipatory pleasure among people with schizophrenia.
- Kring, A.M., & Moran, E.K. (2008). (See References). A recent and more comprehensive narrative review of the literature on emotional responding in schizophrenia.

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## Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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