

A New Perspective on Anhedonia in Schizophrenia

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Objective: Previous research provides evidence for discrepancies in various types of emotional self-report in individuals with schizophrenia; patients and healthy subjects report similar levels of positive emotion when reporting current feelings, yet patients report lower levels of positive emotion when reporting on non-current feelings. Such apparent discrepancies, which have come to be termed the “emotion paradox” in schizophrenia, have complicated our understanding of what anhedonia actually reflects in this patient population. The authors sought to resolve this paradox.

Method: The authors reviewed the empirical literature on anhedonia and emotional experience in schizophrenia through the lens of the accessibility model of emotional self-report, a well-validated model of emotional self-report developed in the affective science literature that clarifies the sources of emotion knowledge that individuals access when

providing different types of self-report. The authors used this model to propose a resolution to the “emotion paradox” and to provide a new psychological conceptualization of anhedonia.

Results: Data are presented in support of this new perspective on anhedonia and to demonstrate how cognitive impairments may influence reports of noncurrent feelings in schizophrenia.

Conclusions: The authors conclude that anhedonia should no longer be considered an experiential deficit or a diminished “capacity” for pleasure in patients with schizophrenia. Rather, anhedonia reflects a set of beliefs related to low pleasure that surface when patients are asked to report their noncurrent feelings. Encoding and retrieval processes may serve to maintain these beliefs despite contrary real-world pleasurable experiences. Implications for assessment and treatment are discussed in relation to this new conceptualization of anhedonia.

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Anhedonia has long been considered a core clinical feature of schizophrenia (1–3). The most common understanding of anhedonia is that it reflects a diminished experience of pleasure. Although this definition clearly applies to individuals with major depression who report experiencing less pleasure when exposed to activities or stimuli that were previously enjoyable and who rate positive stimuli as being less pleasant than do healthy comparison subjects (4–7), it is uncertain whether these notions accurately reflect anhedonia as it occurs in schizophrenia.

Confusion regarding the nature of anhedonia in schizophrenia comes from a consistent set of contradictory findings in the empirical literature, which have come to be termed the “emotion paradox.” Patients report levels of positive emotion similar to those of healthy comparison subjects when providing reports of current feelings, but they report less pleasure relative to comparison subjects when reporting their noncurrent feelings (see references 8, 9 for a meta-analysis and review). When results from these diverse methods are viewed together, it is unclear

what anhedonia actually reflects in schizophrenia. In this article, we review the empirical literature on anhedonia and emotional experience in schizophrenia through the lens of a well-validated model of emotional self-report developed in the affective science literature (10) and use this model to resolve the “emotion paradox” and provide a new conceptualization of anhedonia.

Self-Reports of Feelings in Schizophrenia

Self-reports of emotional experience can be divided into two broad categories: reports of current feelings and reports of noncurrent feelings (10). The key difference between the two lies in the time frame and response format of the query that is used.

Current Feelings

Questions about current feelings ask participants to report how they feel in the moment. They can be made in re-

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sponse to stimuli, during daily events, or in an interview; the determining factor is whether the question asks how the person feels “right now” or “at this moment.”

In the schizophrenia literature, studies in which subjects are asked to report current feelings of positive emotion consistently indicate that patients’ in-the-moment reports are similar to those of healthy comparison subjects. For example, findings from laboratory-based experiments indicate that schizophrenia patients report experiencing levels of positive emotion similar to those reported by comparison subjects when exposed to a variety of evocative stimuli, including complex pictures, faces, sounds, words, and food (8, 9, 11–16). Results of naturalistic experience-sampling studies provide a similar picture, indicating that although patients have a lower frequency of positive events in their daily lives (17, 18), they report experiencing increases in positive emotion that are comparable to those of comparison subjects when engaged in pleasurable activities (19, 20).

However, there is consistent evidence indicating that schizophrenia patients have a heightened experience of negative emotions when reporting current feelings. This was highlighted by a recent meta-analysis of laboratory-based emotional experience studies (8), which found that patients report experiencing greater negative emotion than do comparison subjects when exposed to unpleasant, neutral, and pleasant stimuli and asked to rate how negative those stimuli made them feel. Naturalistic studies obtaining reports of current feelings also indicate that patients report higher levels of negative emotion during their daily lives (17, 18). Because of the uniformity of these findings, some researchers have suggested that anhedonia may in part reflect elevations in negative emotion (13, 21, 22). Consistent with this notion is a recent study (22) that employed a data-driven approach to determining whether subgroups of patients could be identified based on their self-reported current feelings when exposed to pleasant and unpleasant stimuli. Cluster and discriminant function analyses revealed that the majority of schizophrenia patients reported experiencing positive and negative emotional stimuli similarly to comparison subjects. However, a subgroup of patients reported experiencing unpleasant stimuli as being highly negative and arousing; these patients also had elevated anhedonia ratings on the Chapman Physical and Social Anhedonia Scales (23). Thus, it is possible that anhedonia reflects, at least in part, abnormalities in the momentary experience of negative but not positive emotions in schizophrenia.

Noncurrent Feelings

It is also very common to ask patients to provide reports of noncurrent feelings. Questions about noncurrent feelings use several different response formats, including retrospective, hypothetical, trait, and prospective self-reports. In contrast to reports of current feelings, there is substantial evidence that in self-reports of noncurrent

feelings, patients report experiencing less pleasure than do comparison subjects (24). Below we review the literature on reports of noncurrent feelings in schizophrenia in relation to the various self-report formats.

Retrospective self-reports. Retrospective emotional self-reports are those that require subjects to report on feelings from the past, as in the following examples: “Over the past 2 weeks, how good did you feel?” “What did you do for fun in the past few weeks? How good did you feel when you did that?” It is generally accepted that a large proportion of individuals with schizophrenia report diminished pleasure when queried during clinical interviews that elicit retrospective reports (9, 25). For example, in our outpatient clinic at the Maryland Psychiatric Research Center, approximately 82% of 385 schizophrenia patients met criteria for at least mild anhedonia and 58% for anhedonia of moderate or higher severity on the Scale for the Assessment of Negative Symptoms (26).

Hypothetical self-reports. Individuals with schizophrenia also report less pleasure than do healthy subjects on a number of self-report questionnaires that fall into the category of hypothetical emotional self-reports (24). In hypothetical emotional self-report questionnaires, such as the Chapman Physical and Social Anhedonia Scales (23), subjects are asked to indicate how they think they would feel in a certain hypothetical scenario (e.g., “True or False: Although there are things that I enjoy doing by myself, I usually seem to have more fun when I do things with other people”). Patients consistently endorse experiencing less pleasure than do comparison subjects when completing hypothetical emotional self-reports (24).

Trait self-reports. In trait emotional self-report queries, participants are asked to indicate how much they *generally* feel a specific emotion (e.g., “In general, how happy do you feel?”; responses range from 1 [not at all] to 5 [extremely]). When completing trait measures, patients typically report less positive emotion and more negative emotion than do comparison subjects (24).

Prospective self-reports. Prospective emotion reports require participants to predict their emotions in the future. Several studies indicate that individuals with schizophrenia predict less pleasure than do comparison subjects when providing prospective self-reports of pleasure, which has led some researchers to suggest that anhedonia primarily reflects an “anticipatory” pleasure deficit. Gard et al. (19) conducted a naturalistic study in which participants were asked to indicate what they were doing and how much pleasure they felt at that moment, as well as which activities they were looking forward to doing and how much pleasure they expected to experience while doing them. They found that patients differed from comparison subjects in the amount of enjoyment they anticipated they would get out of future goal-directed activities but that the levels of in-the-moment pleasure they reported were similar to those reported by comparison subjects. Several stud-

ies that used the Temporal Experience of Pleasure Scale (27), a self-report questionnaire, to assess “consummatory” (i.e., momentary) and “anticipatory” (i.e., future) pleasure found that schizophrenia patients report intact consummatory but diminished anticipatory pleasure (19, 28); however, contrasting findings have also been reported (29).

Summary. When results obtained using retrospective, hypothetical, trait, and prospective self-report formats are viewed together, it is clear that individuals with schizophrenia report less pleasure than comparison subjects when reporting their noncurrent feelings. The fact that diminished reports of pleasure encompass all self-reports that entail reporting on noncurrent feelings, and not just prospective reports, indicates that anhedonia does not solely reflect an anticipatory pleasure deficit. The apparent discrepancies between reports of current pleasure, which indicate that patients are similar to comparison subjects, and reports of noncurrent pleasure, in which patients report less pleasure than comparison subjects, have been the focus of much discussion in recent years. As noted, some researchers have termed the lack of correspondence between these two types of reports the “emotion paradox” in schizophrenia. But is this really a paradox? Should we expect reports made using these different response formats to converge? If not, what do self-reports obtained using these different measures tell us about what self-reported anhedonia actually reflects in schizophrenia?

Is There an “Emotion Paradox” in Schizophrenia?

In clinical practice, it is often assumed that the same processes are involved in all types of emotional self-report; however, this assumption is mistaken. There is consistent empirical evidence for discrepancies among different types of emotional self-report indicating that healthy individuals frequently report differences in what they are currently experiencing compared with what they have experienced in the past or expect to experience in the future (10, 30, 31). These discrepancies result from accessing different types of knowledge when providing the various types of emotional self-report. Each source of information can result in a different pattern of self-reported emotional experience, depending on what is required by the method of measurement, and inconsistencies among the different methods of assessment would thus be expected.

The accessibility model of emotional self-report, a model of emotional self-report developed in the affective science literature by Robinson and Clore (10), clarifies why such discrepancies are likely to occur and delineates the sources of knowledge that people access when providing reports of current and noncurrent feelings. The model proposes that people may access four sources of information when reporting their feelings: 1) experiential knowledge, 2) episodic memory, 3) situation-specific beliefs, and 4) identity-related beliefs. Individuals are thought to

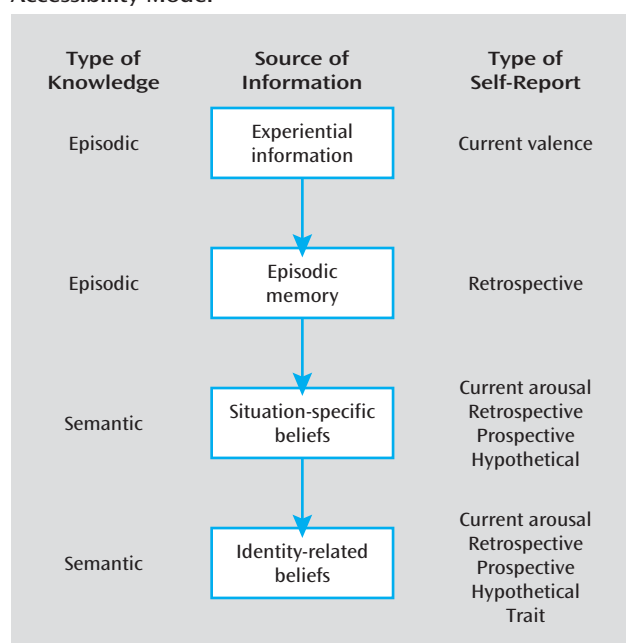
prioritize these sources of information, relying first on the most specific and accessible source of information that is relevant to the query presented. In this sense, when a given query renders one type of knowledge inaccessible, people respond by accessing the next most specific source of information that is available (Figure 1).

In brief, Robinson and Clore (10) propose that when reporting on current feelings, individuals access experiential knowledge and report directly on their emotions in a way that is uninfluenced by episodic memory abilities or overarching attitudes and beliefs. However, when required to provide self-report of noncurrent feelings, individuals attempt to utilize episodic memory to retrieve relevant contextual details that can enable them to re-create their previous emotional experiences (Figure 2). To the extent to which enough contextual details can be retrieved to generate an emotional experience similar to the one at the time of the initial episode, individuals are able to use episodic memory to report their recent emotions, and these reports are consistent with their previous experiences. However, when episodic memories are inaccessible or are irrelevant to the response format at hand, people will rely on broader sources of information that are available to them, namely, situation-specific or identity-related beliefs. These most general sources of knowledge include beliefs about which types of emotions are likely to be elicited by specific situations (e.g., “Social interactions are enjoyable”), as well as general attitudes and beliefs that the person holds about him- or herself (“I am generally a happy person”), respectively.

Consistent with this model, there is evidence indicating that reports of current and noncurrent feelings of positive emotion made by healthy individuals diverge in meaningful and expected ways. For example, when healthy individuals are asked to rate their prospective pleasure before a vacation, their in-the-moment pleasure during a vacation, and their retrospective pleasure after a vacation, they typically overestimate their level of pleasure prospectively and retrospectively relative to what they experienced in the moment (32). Robinson and Clore (10) propose that this bias toward overestimating positive emotions during reports of noncurrent feelings occurs because healthy individuals draw on semantic knowledge stores and rely on situation-specific or identity-related beliefs when making these reports. Elevated reports of noncurrent relative to current feelings therefore reflect that most healthy individuals believe that they are generally in a moderately positive mood and that specific types of situations (e.g., vacations) are pleasurable.

Much like healthy individuals, individuals with schizophrenia also show discrepancies among reports of current and noncurrent feelings (as previously reviewed). Below we report a secondary analysis of data from Heerey and Gold (33) and Strauss et al. (29) to examine whether schizophrenia patients and healthy comparison subjects display the same patterns of relationships between reports of current and noncurrent feelings.

FIGURE 1. Four Sources of Information Accessed When Individuals Provide Emotional Self-Report, According to the Accessibility Model^a



^a Experiential and episodic information rely on episodic emotion knowledge, whereas situation-specific and identity-related beliefs rely on semantic emotion knowledge. Individuals prioritize the most specific source of knowledge that is available to them and relevant to the response format being used. The middle column illustrates the hierarchy of information prioritization. The right column depicts the most common types of emotional self-report that are likely to be based on the different sources of information.

To test the hypothesis that patients and comparison subjects display similar patterns of emotional self-report, we first examined whether various reports of noncurrent feelings were more highly correlated with each other than with reports of current feelings. Measures of current feelings (see reference 33) consisted of self-reported feelings of positive and negative emotion in response to pleasant, unpleasant, and neutral stimuli from the International Affective Picture System (34). Reports of noncurrent feelings were examined from all of the major emotional self-report response formats, including retrospective (the Scale for the Assessment of Negative Symptoms), hypothetical (the Chapman Physical and Social Anhedonia Scales and the Temporal Experience of Pleasure Scale), trait (the Positive and Negative Affect Scale) (35), and prospective (the anticipatory pleasure subscale of the Temporal Experience of Pleasure Scale) measures. As can be seen in Table 1, for both comparison subjects and patients, in-the-moment valence reports (i.e., reports of current feelings) were not significantly correlated with trait positive and negative affect on the Positive and Negative Affect Scale or the Chapman Physical or Social Anhedonia Scales (i.e., reports of noncurrent feelings). Additionally, there was no significant association in patients between valence reports and anhedonia on the Scale for the Assessment of Negative

FIGURE 2. Definitions of Episodic and Semantic Memory

Episodic Memory	Memory for a specific event or experience in the past that is highly susceptible to forgetting after sufficient passage of time.
Semantic Memory	General knowledge (e.g., meanings of words, overlearned facts) that is independent of any specific learning episode or experience and is typically resistant to forgetting over time. Such general knowledge forms the basis for new generalizations and beliefs that are seldom updated and do not fade easily over time.

Symptoms. Table 2 presents correlations among various self-reports of noncurrent feelings in comparison subjects and patients; both groups generally show moderate relationships among the trait, hypothetical, and prospective reports. Importantly, in both groups, the magnitude of correlations among the various reports on noncurrent feelings is higher than the magnitude of correlation between reports on current and noncurrent feelings.

A number of studies of healthy individuals indicate that reports of current and noncurrent feelings are often moderately correlated with each other (e.g., references 36, 37; see reference 10 for a review) but that various measures of noncurrent feelings tend to correlate with each other more highly than they do with measures of current feelings. This pattern of correlations is consistent with Robinson and Clore's (10) notion that current and noncurrent emotion reports are completed by accessing different sources of emotion knowledge. Relatively few studies have reported correlations among a wide number of emotional self-reports in schizophrenia; however, there is consistent evidence that patients display a pattern of correlations among reports of current and noncurrent feelings that is similar to that displayed in healthy comparison subjects (13, 15, 38, 39).

Although additional studies are needed to make a definitive determination, these findings suggest that there is in fact no "emotion paradox" in schizophrenia—at least not in the sense that different types of emotional self-report lead to inconsistent results in patients but not healthy subjects. However, this should not be surprising and should even be expected, because it is known that individuals complete reports of current and noncurrent feelings by accessing different sources of emotion knowledge (10). What is surprising, however, is that patients and healthy comparison subjects show different patterns of self-report across measures of current and noncurrent feelings. Whereas healthy subjects report higher levels of noncurrent than current positive emotions, individuals with schizophrenia do not. This pattern of self-report may be a reflection of patients *underestimating* their positive emotions prospectively and retrospectively or of patients having a reduced or absent *overestimation bias*. We are un-

TABLE 1. Correlations Between Self-Reports of Current Valence and Cognition, Retrospective Self-Reports, Hypothetical Self-Reports, and Trait Self-Reports in Schizophrenia Patients and Healthy Comparison Subjects^a

Group and Measure	Type of Measure	Reports of Current Emotion to Stimuli		
		Positive	Neutral	Negative
Schizophrenia patients				
Hopkins Verbal Learning Test, trials 1–3, total score	Memory	0.03	−0.08	0.07
Letter-number sequencing test, T-score	Working memory	−0.14	−0.31	−0.24
Positive and Negative Affect Scale, positive items, total score	Trait	0.04	0.07	−0.17
Positive and Negative Affect Scale, negative items, total score	Trait	0.11	−0.08	0.02
Chapman Physical Anhedonia Scale, total score	Hypothetical	−0.16	−0.03	0.10
Chapman Social Anhedonia Scale, total score	Hypothetical	−0.13	0.08	−0.01
Scale for the Assessment of Negative Symptoms, average of all anhedonia items	Retrospective	0.03	0.03	−0.02
Comparison subjects				
Hopkins Verbal Learning Test, trials 1–3, total score	Memory	−0.15	0.27	0.20
Letter-number sequencing test, T-score	Working memory	−0.21	−0.10	−0.06
Positive and Negative Affect Scale, positive items, total score	Trait	0.14	0.12	0.04
Positive and Negative Affect Scale, negative items, total score	Trait	0.18	−0.09	0.21
Chapman Physical Anhedonia Scale, total score	Hypothetical	−0.03	−0.19	−0.13
Chapman Social Anhedonia Scale, total score	Hypothetical	−0.06	−0.14	−0.04
Scale for the Assessment of Negative Symptoms, average of all anhedonia items	Retrospective	—	—	—

^a Data are from Heerey and Gold (33). Participants included 41 outpatients with DSM-IV diagnoses of schizophrenia or schizoaffective disorder and 31 healthy comparison subjects recruited from the community. The groups did not differ significantly in age, parental education, gender, or race. Participants rated how positive or negative they felt while viewing positive, negative, and neutral stimuli from the International Affective Picture System stimulus set on the standard 9-point Likert scale. Behavioral analyses indicated that the groups did not differ significantly in self-reported valence ratings for positive, negative, or neutral images.

aware of any sampling studies asking patients and comparison subjects to provide prospective, current, and retrospective self-reports using the same reporting format; such a study would clarify which interpretation is correct.

What Do Diminished Reports of Noncurrent Positive Emotion Reflect in Schizophrenia?

When viewed in relation to the Robinson and Clore model (10), the apparent discrepancies among different types of self-report are clearly interpretable. When asked to make reports of current positive emotion, patients, like comparison subjects, will access experiential knowledge and report directly on their feelings. In this sense, reports of current feelings are the only true indication of a person's "capacity" for pleasure when exposed to a pleasurable event or stimulus because he or she relies only on experiential emotion knowledge. The fact that patients and comparison subjects report experiencing similar levels of pleasure when providing reports of current feelings suggests that the long-held notion that people with schizophrenia have a reduced "capacity" for pleasure (3) should no longer be viewed as an accurate conceptualization of anhedonia as it occurs in this patient population (see also references 8, 9, 13, 15, 33).

The reports of low levels of positive emotion that have been taken as an indication of anhedonia occur when patients are asked to report their noncurrent feelings using retrospective, hypothetical, trait, and prospective formats.

What these self-reports have in common is that they require access to semantic rather than experiential emotion knowledge and thus require that subjects access beliefs about pleasure. For example, measures with hypothetical reports like the Chapman scales are by their nature completed by accessing semantic memory, and people respond to individual items by drawing on situation-specific or identity-related beliefs. Similarly, the "in general" time frame in trait reports makes it difficult to average across life events, and trait measures are completed by accessing beliefs about pleasure. The reports of lower levels of positive emotion observed using the various reports of noncurrent feelings can thus be interpreted as reflecting that patients do not display the same retrospective/prospective overestimation bias as comparison subjects and that they either do not possess normative beliefs regarding whether specific situations result in pleasure or do not hold the same broad identity-related beliefs as comparison subjects. Future studies should investigate whether the self-reports of low levels of noncurrent positive emotion seen in schizophrenia reflect situation-specific, identity-related, or both types of beliefs.

It is of considerable clinical importance to understand the meaning of retrospective reports of pleasure that are obtained during a symptom interview. When providing retrospective reports, individuals attempt to retrieve contextual details of episodes that occurred in the time period that is queried (e.g., the past 2 weeks, the past month) and reconstruct their past feelings by recalling relevant event-related details and past thoughts (10, 30, 31). The ability to recall

TABLE 2. Correlations Among Retrospective, Hypothetical, Trait, and Prospective Emotional Self-Reports and Cognition in Schizophrenia Patients and Healthy Comparison Subjects^a

Group and Measure	Type of Measure	Measure ^b								
		1	2	3	4	5	6	7	8	9
Schizophrenia patients										
1. Chapman Physical Anhedonia Scale	Hypothetical	1.00								
2. Chapman Social Anhedonia Scale	Hypothetical	0.66***	1.00							
3. Temporal Experience of Pleasure Scale, anticipatory subscale, mean score	Hypothetical, prospective	−0.23*	−0.25*	1.00						
4. Temporal Experience of Pleasure Scale, consummatory subscale, mean score	Hypothetical	−0.40**	−0.13	0.54***	1.00					
5. Scale for the Assessment of Negative Symptoms, average of anhedonia items	Retrospective	0.33**	0.51***	0.04	−0.07	1.00				
6. Positive and Negative Affect Scale, positive items, total score	Trait	−0.36**	−0.36**	0.32*	0.27*	−0.29*	1.00			
7. Positive and Negative Affect Scale, negative items, total score	Trait	0.19*	0.34**	−0.32*	−0.12	0.30*	0.03	1.00		
8. Letter-number sequencing test, T-score	Cognition	−0.43***	−0.32**	0.16	0.27*	−0.24*	0.08	−0.07	1.00	
9. Hopkins Verbal Learning Test and Brief Visual Memory Test, mean T-score ^c	Cognition	−0.28**	−0.23*	−0.02	0.03	−0.22*	0.07	−0.24*	0.54***	1.00
Comparison subjects										
1. Chapman Physical Anhedonia Scale	Hypothetical	1.00								
2. Chapman Social Anhedonia Scale	Hypothetical	0.54***	1.00							
3. Temporal Experience of Pleasure Scale, anticipatory subscale, mean score	Hypothetical, prospective	−0.30*	−0.07	1.00						
4. Temporal Experience of Pleasure Scale, consummatory subscale, mean score	Hypothetical	−0.65***	−0.28*	0.41***	1.00					
5. Scale for the Assessment of Negative Symptoms, average of anhedonia items	Retrospective	—	—	—	—	1.00				
6. Positive and Negative Affect Scale, positive items, total score	Trait	−0.19	−0.22	0.06	0.28	—	1.00			
7. Positive and Negative Affect Scale, negative items, total score	Trait	0.16	0.28	−0.27	−0.32*	—		1.00		
8. Letter-number sequencing test, T-score	Working memory	0.04	−0.01	0.04	0.14	—	−0.13	0.12	1.00	
9. Hopkins Verbal Learning Test and Brief Visual Memory Test, mean T-score ^c	Memory	−0.02	0.04	−0.06	0.21	—	−0.14	0.11	0.47**	1.00

^a Data are from Strauss et al. (29). Participants included 86 individuals with DSM-IV diagnoses of schizophrenia or schizoaffective disorder and 59 healthy comparison subjects recruited from the community. The groups did not differ significantly in age, parental education, gender, or race. Participants completed self-report emotion questionnaires. Schizophrenia patients had significantly lower scores on the Hopkins Verbal Learning Test and Brief Visual Memory Test, the letter-number sequencing test, the Temporal Experience of Pleasure Scale, consummatory subscale (less pleasure), and the Positive and Negative Affect Scale, positive items (less positive emotion) than comparison subjects and significantly higher scores on the Chapman Physical and Social Anhedonia Scales (more anhedonia) and the Positive and Negative Affect Scale, negative items (more negative emotion). The groups did not differ significantly on the Temporal Experience of Pleasure Scale anticipatory subscale.

^b Numerals refer to numbered items in column 1.

^c Mean MATRICS Battery T-score on the Hopkins Verbal Learning Test (trials 1–3 total) and the Brief Visual Memory Test (trials 1–3 subscales).

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

these contextual details fades quickly over time (40), and when there are too few episodic details to facilitate reports about past emotions, individuals access semantic memory and rely on more general beliefs about their emotions to fill in the details of what they cannot remember (31). In such cases, retrospective reports may be inconsistent with the actual emotions experienced during the period in question. The wider the time frame used in the query, the more likely a subject will be to rely on semantic rather than episodic memory to complete the emotion report. In healthy individuals, there is evidence that episodic memory can typically be accessed to complete emotion reports for time frames narrower than “the last few weeks” and that semantic memory is accessed for time frames broader than this (31).

These findings are important for understanding the meaning of retrospective emotion reports in schizophrenia and what appear to be contradictory findings in the empirical literature. On the one hand, we have experimental data from studies showing that patients do not differ from comparison subjects in retrospective pleasure reports when relatively short time frames (e.g., 4 hours) are used (13, 38), and on the other hand, we have clinical interview data collected using wider time frames (e.g., past 2 weeks) in which patients retrospectively report diminished pleasure (25). A likely explanation for these discrepancies is that when patients are asked to provide retrospective reports over shorter time frames, they can rely on episodic memory and accurately recall their initial experience of positive emotion.

However, when providing retrospective reports over longer time frames, patients (much like comparison subjects) are likely to rely on semantic memory because they cannot recall enough contextual details of episodes that occurred during these wider time frames. Retrospective reports of low levels of positive emotion in the context of longer time frames therefore likely reflect that patients base their report on their general sense of well-being, rather than the actual emotions they experienced during the time frame in question. The severity of patients' episodic memory impairments should dictate the point at which they no longer base their report on episodic memory and shift to relying on semantic memory. This should be taken into account when conducting symptom interviews; the time frame selected for the retrospective report is of critical importance because it dictates whether the self-report reflects memory for recent feelings, as intended, or beliefs about how the patient thinks he or she generally feels, which may be inaccurate.

Newer, "next-generation" negative symptom scales include prospective emotion reports for assessing anhedonia (41, 42). Prospective reports are less influenced by episodic memory than other types of emotion report and more influenced by beliefs about emotion (10). Studies utilizing prospective self-reports that have found patients to report less predicted future pleasure than comparison subjects (19) provide converging evidence with studies utilizing retrospective, hypothetical, and trait self-report formats and indicate that patients have abnormal beliefs related to pleasure and lack the overestimation bias seen in comparison subjects. Overestimating future pleasure occurs for a number of reasons, including accessing unrepresentative memories to gauge how good one will feel in the future; focusing on essential features of future events, particularly far-off events, and ignoring inessential features that may be less pleasant and lower the overall net value of the event; focusing on early moments of a future event and ignoring that later feelings are likely to be less intense; and ignoring the fact that contextual factors that are present or not present at the moment may be more or less important in the future (43). Any number of these factors may function differently in schizophrenia and make prospective overestimation less likely.

It will be important to determine how patients develop these beliefs of low pleasure. We speculate that such beliefs may stem from not having an adequate number and diversity of pleasurable experiences to develop normative beliefs of pleasure, as well as early negative life events (e.g., social rejection) that shaped their identity-related and situation-specific beliefs about pleasure.

Role of Cognitive Impairments in Emotional Self-Report in Schizophrenia

It is clear that there are different cognitive demands associated with various emotional self-reports, and these demands may affect patients and healthy subjects differ-

entially, depending on the nature and severity of patients' cognitive impairments. In addition to the influence of episodic memory deficits on retrospective reports previously discussed, hypothetical reports are also likely to be influenced by cognitive impairments. Hypothetical reports like the Chapman scales require that individuals form a mental representation of the situation being probed (44)—a process that requires working memory. It is likely that the severity of patients' working memory impairment would interact with their ability to complete hypothetical reports, potentially causing them to rely on broad identity-related beliefs when they have difficulty forming a mental representation of the hypothetical scenario. Thus, the presence of cognitive impairments may influence patients' reports of noncurrent feelings in a predictable way, causing them to access semantic memory and base their self-report on broad identity-related beliefs instead of the intended sources of emotion knowledge (i.e., episodic memory for retrospective reports and situation-specific beliefs for hypothetical reports).

To test the possibility that cognitive processes are related to reports of noncurrent but not current emotion in schizophrenia, we conducted a secondary analysis of data from Heerey and Gold (33) and Strauss et al. (29). We hypothesized that 1) retrospective reports of pleasure on the anhedonia item of the Scale for the Assessment of Negative Symptoms would be related to poorer episodic memory on a standard neuropsychological memory measure, and 2) reports of pleasure on hypothetical scales like the Chapman scales and the Temporal Experience of Pleasure Scale would be related to working memory impairments. As can be seen in Table 1, reports of current feelings in response to positive stimuli were not significantly correlated with either working memory or episodic memory. This nonsignificant correlation is consistent with Robinson and Clore's (10) notion that cognitive processes do not affect reports of current feelings. As hypothesized, retrospective reports of pleasure on the Scale for the Assessment of Negative Symptoms were associated with poorer episodic memory (Table 2), and patients with mild to severe clinically rated anhedonia had poorer memory than patients with questionable or no anhedonia (Figure 3). Also as predicted, poorer working memory was significantly correlated with reports of lower levels of pleasure on hypothetical reports, as indicated by significant associations between working memory performance and anhedonia on the Chapman scales and lower levels of pleasure on the consummatory subscale of the Temporal Experience of Pleasure Scale (Table 2). Notably, the correlation between working memory and the anticipatory subscale of the Temporal Experience of Pleasure Scale was nonsignificant; however, this may reflect the lack of an anticipatory pleasure deficit in our patient sample (29).

Overall, these findings provide some preliminary support for the notion that cognitive impairment is related to reports of noncurrent feelings in schizophrenia. Other

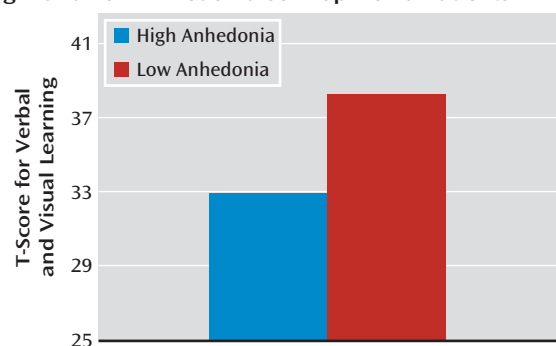
studies have also demonstrated the role of cognitive and neurophysiological impairments in emotional self-report. For example, Ursu and colleagues (45) found that patients displayed neural activation similar to that of healthy subjects in the presence of emotional stimuli at prefrontal, limbic, and paralimbic structures but reduced activation in the dorsolateral prefrontal cortex during a 12.5-second delay period that occurred before subjects made a retrospective emotion report, when cognitive control processes were actively engaged in maintaining emotional experience. Burbridge and Barch (46) found that working memory moderates the relationship between hypothetical reports and in-the-moment pleasure reports, which is consistent with the notion that working memory deficits may predict the extent to which patients complete non-current feeling reports by relying on semantic rather than episodic emotion knowledge.

An important question also remains as to how patients maintain beliefs of low pleasure despite having some life experiences in which they do engage in pleasure-seeking behavior and experience high levels of positive emotion while doing so. Why do these experiences not serve as counterevidence to alter these beliefs? One possibility is that cognitive processes facilitate the maintenance of such beliefs. In the literature on personality and autobiographical memory in healthy individuals, there is evidence that broad identity-related beliefs are sometimes dissociated from daily life events (47). This research demonstrates that individuals form emotional schemas (e.g., “How I generally feel during family interactions”) and that these schemas are used to organize and reconstruct details from life events, especially those occurring further in the past. When a life event does not match the schema that an individual holds, it is often forgotten or not retrieved (47, 48). These schemas thus play a major role in forming and maintaining identity-related beliefs, even in the face of contradictory evidence. Once such beliefs are formed, they are often slow to change in response to actual experiences because individuals encode and retrieve information consistent with their beliefs, instead of information that contradicts them, to maintain a consistent self-representation (48). It is possible that schizophrenia patients maintain the belief that they do not experience pleasure despite counterevidence from real-world experiences because everyday experiences of pleasure are inconsistent with their long-held beliefs and thus are not encoded or retrieved. Studies of emotional memory in schizophrenia are consistent with this notion, providing evidence for aberrant encoding and retrieval of positive stimuli (49).

Behavioral Component of Anhedonia

In addition to the psychological component that is evident when patients report on noncurrent feelings, it is also clear that there is a behavioral aspect of anhedonia. Several studies indicate that schizophrenia patients engage in

FIGURE 3. Verbal and Visual Learning Performance Among High- and Low-Anhedonia Schizophrenia Patients^a

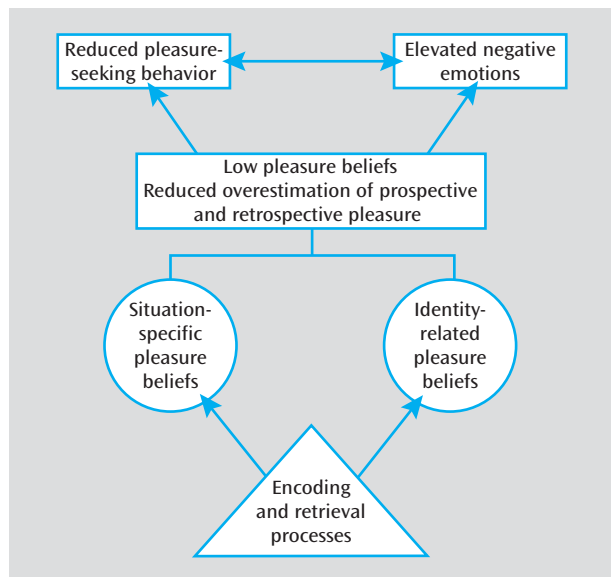


^a Data are from Strauss et al. (29). Participants were 86 individuals with DSM-IV diagnoses of schizophrenia or schizoaffective disorder and 59 healthy comparison subjects recruited from the community. The groups did not differ significantly in age, parental education, gender, or race. Schizophrenia patients were divided into high- and low-anhedonia groups according to average scores across all anhedonia items on the Scale for the Assessment of Negative Symptoms; high-anhedonia patients had mean ratings of ≥ 2 or greater (mild severity or higher), and low-anhedonia patients had mean ratings < 2 (questionable or absent anhedonia). Groups were compared on the mean MATRICS Battery T-score for the total score for trials 1–3 on the Hopkins Verbal Learning Test and the score for trials 1–3 on the Brief Visuospatial Memory Test (mean=50, SD=10). The high- and low-anhedonia groups differed significantly in mean memory performance ($F=6.02$, $df=1, 85$, $p=0.01$), such that high-anhedonia patients had poorer memory performance than low-anhedonia patients.

fewer pleasurable activities than do healthy comparison subjects (17–20), which may be so because they are less motivated to initiate goal-directed activities that could yield pleasurable opportunities. Psychological processes likely contribute to this behavioral component of anhedonia. Simply put, if patients believe that they generally do not experience pleasure or that specific activities (e.g., social interactions) do not bring pleasure, then why engage in them? From a clinical standpoint, it is therefore likely that the presence of such beliefs would be useful in predicting which patients would or would not evidence low levels of pleasure-seeking behavior.

Treatment Implications

These beliefs could feasibly be changed by targeting cognitive distortions that people with schizophrenia hold about their emotions. Grant et al. (50) recently developed such a treatment approach in which schizophrenia patients are asked to monitor their activities and emotional experiences regularly to collect “data” that can then be reviewed in treatment sessions to disconfirm the belief that nothing is enjoyable. When these cognitive therapy techniques are coupled with behavioral ones that actively schedule pleasurable events in patients’ lives, these methods may be a valuable means of providing the type of feedback that can shift patients’ beliefs of low pleasure. The behavioral treatment component seems particularly im-

FIGURE 4. Proposed Components of Anhedonia^a

^a We propose that anhedonia has three components: 1) low pleasure beliefs and a lack of prospective or retrospective overestimation of positive emotion, 2) reduced pleasure-seeking behavior, and 3) elevated negative emotions. These three components may interact with one another. Low pleasure beliefs consist of situation-specific and/or identity-related beliefs. Encoding and retrieval processes maintain low pleasure beliefs.

portant given that many patients have limited resources and fewer opportunities for pleasure than healthy individuals and thus may not have enough pleasurable activities to counter the belief that they do not experience pleasure; actively scheduling pleasurable events into their lives could help a great deal in shifting their perspective. Given that anhedonia reflects psychological and behavioral processes rather than experiential ones, it may be that treatment strategies would be more effective if focused on changing low pleasure beliefs and increasing pleasure-seeking behavior rather than on increasing capacity for positive emotional experience.

Conclusions

Based on our review and our application of the accessibility model of emotional self-report to reconsider the nature of anhedonia in schizophrenia, we propose that anhedonia should no longer be viewed as a diminished *capacity* to experience pleasure in people with schizophrenia. Rather, anhedonia appears to have three components: 1) a psychological component consisting of a set of beliefs related to low pleasure that surfaces when a patient is asked to report on noncurrent positive emotions, 2) a behavioral component reflected by reductions in pleasure-seeking behavior, and 3) elevations of negative emotions (Figure 4). Given that schizophrenia is not characterized by an experiential hedonic deficit, it may be that the term “anhedonia” is no longer appropriate. More descriptive terms like “reduced pleasure-seeking behavior” and “beliefs of

low pleasure” may be more accurate and perhaps more likely to promote advances in assessment and treatment.

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