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Self-Reported Affective Traits and Current Affective Experiences of Biological Relatives of People with Schizophrenia

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Abstract

Schizophrenia is characterized by self-reported trait anhedonia but intact hedonic responses during laboratory experiments. Affective traits of first-degree biological relatives may be similar to those of people with schizophrenia, and measures of hedonic response in relatives may be free of antipsychotic medication or cognitive confounds. Relatives also self-report increased anhedonia, yet it is unclear whether, like in patients, this anhedonia is paired with largely intact hedonic self-report. In this study, first-degree relatives of people with schizophrenia ($n=33$) and nonpsychiatric controls ($n=25$) completed a wide range of questionnaires and tasks assessing social and physical anhedonia, positive and negative affective experience, and anticipatory and consummatory pleasure. Valence, intensity, frequency, and the arousal of current emotion were assessed. Extraversion and current positive and negative affective state were also examined in relation to self-reported social anhedonia. Relatives evidenced the same disjunction of increased self-reported anhedonia and intact affective response observed in people with schizophrenia. Group differences in anhedonia were not better accounted for by decreased current positive affect, increased current negative affect, or decreased extraversion in relatives. Results suggest that, like people with schizophrenia, first-degree relatives report intact hedonic response on both questionnaire and laboratory measures despite significant elevations in self-reported social anhedonia.

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Contributors

ARD designed the study, wrote the protocol, and managed the literature searches. ARD undertook the statistical analysis and wrote the first draft of the manuscript. SRS provided resources and staff for assistance with data collection. JGK and SRS assisted with proofreading and refining the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

The authors have no conflicts of interest to declare.

Keywords

schizotypal; relatives; affect; emotion; anhedonia; genetic

1. Introduction

Questionnaire trait anhedonia is elevated in biological relatives of people with schizophrenia (e.g., Kendler et al., 1996; Clementz et al., 1991; Docherty & Sponheim, 2008; for a review, see Docherty & Sponheim, 2014), and a significant proportion of variance in questionnaire anhedonia in twins is due to genetic factors (MacDonald et al., 2001; Macare et al., 2012). The symptom of anhedonia is thought to reflect a lack of interest or pleasure. Social anhedonia reflects a lack of interest or pleasure in social stimuli, and asociality reflects a lack of motivated social behavior. In people with schizophrenia, social anhedonia/asociality is associated with both poor prognosis (Meuser et al., 1991; Fenton & McGlashan, 1991; Sayers et al., 2006) and functional deficits (e.g., Green et al., 2012). More severely anhedonic schizophrenia probands tend to have family members with increased anhedonia (e.g., Berenbaum & McGrew, 1993; Fanous et al., 2001). These findings suggest that refining this phenotype is important to the etiology and treatment of schizophrenia.

Despite reporting increased anhedonia, people with schizophrenia tend to evidence intact hedonic experience in the lab, suggesting a disjunction between characteristic self-report and experiential self-report (for a review, see Strauss, 2014). The current study examined whether biological first-degree relatives exhibit a similar pattern of increased self-reported trait anhedonia and intact momentary hedonic response to positive stimuli. To better understand self-reported anhedonia in relatives, this study also examined the association of anhedonia with other social and affective constructs.

Studying affect in relatives presents certain advantages. There are disorder-specific factors that can interfere with affective self-report in schizophrenia, and relatives may present with fewer of these factors. For example, antipsychotic use in people with schizophrenia is associated with significantly increased self-reported subjective emotional numbing (Moritz et al., 2013). This could impact the extent to which individuals are emotionally detached and less engaged in a task, and/or inclined to respond the way they think they “should” respond. This could paradoxically lead to (seemingly) intact affective response. Visual processing and attentional factors related to the cognitive symptoms of schizophrenia also have the potential to distort hedonic reports (e.g., Strauss, Llerena, & Gold, 2011). These factors could lead to less engagement with a task and more superficial responses to task stimuli. For example, distracted or inattentive individuals seeing a picture of a baby may find it simpler to assign a positive or negative “value” to the stimulus rather than to report on an emotional response to the picture.

Another possible confound includes influences of stigma or negative self-beliefs on anhedonia self-report. If one negatively characterizes one’s self or quality of life, then one may report experiencing less pleasure generally, yet evidence intact momentary pleasure. This is not inconsistent with associations between reported perceived stigma/low self-esteem and negative symptoms in patients (Perivoliotis et al., 2008; Grant & Beck, 2009).

First-degree biological relatives, genetically similar to probands, are largely free of antipsychotic medication confounds and appear to have milder attentional deficits (Snitz et al., 2006). Unaffected relatives also may experience less stigma relating to mental illness and may have fewer negative self-beliefs. In this study, first-degree relatives of people with schizophrenia and nonpsychiatric controls completed a wide range of measures assessing social and physical anhedonia, positive and negative hedonic and affective responses to visual stimuli, as well as self-reported anticipatory and consummatory pleasure as measured by the Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006). Diminished affective response could involve a disruption in one or more of multiple emotion facets, such as valence (positive vs. negative), intensity, frequency, and arousal (Feldman-Barrett et al., 1999; Ortony et al., 1988; Bless et al., 2001). Thus, this study included laboratory tasks assessing all of these facets. Finally, self-reported social anhedonia could be a by-product of decreased extraversion or current negative affective state. This study examined anhedonia in relation to both of these constructs to better understand self-report in biological relatives.

2. Materials and Methods

2.1 Participants

Participants included 33 first-degree relatives of patients with schizophrenia or schizoaffective disorder (12 males, 21 females) and 25 healthy controls (10 males and 15 females). Table 1 presents data on the demographic characteristics of participants. Family probands were 18–65 year old males and females with schizophrenia or schizoaffective disorder without current drug abuse or dependence, or alcohol abuse or dependence within the last month, as assessed by the *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I*; First et al., 1996). Diagnostic information collected from patients was gathered within the context of a larger family study in which outpatients were recruited from the VA Health Care System and community mental health outpatient programs (detailed methods can be found in Docherty et al., 2014). Relatives and controls had been recruited for a 15-hour protocol over 2–3 visits that entailed a clinical session (4–5 hours), and cognitive/affective task session (3–4 hours) and an EEG session (5–6 hours). Participants were excluded for a history of diagnosed head injury, learning disability, and current substance abuse or dependence. None of the participants had an estimated IQ of less than 70 as measured by the *Wechsler Adult Intelligence Scale, Third Edition (WAIS-III*; Wechsler, 1997). Measures reported here were included in the protocol. Due to time constraints, some relatives and controls could not provide complete task and questionnaire data; however, a majority (27 relative and 22 control participants) completed the entire protocol. All participants completed an informed consent process, and the Minneapolis VA Health Care System and University of Minnesota Institutional Review Boards approved the study protocol.

2.2 Measures

2.2.1 Diagnostic Interviews—After completing the informed consent process, proband participants in the larger family study first completed the *SCID-I* along with supplemental Medical History and Psychosis modules of the *Diagnostic Interview for Genetics Studies (DIGS*; Nurnberger et al., 1994). A consensus process based on published guidelines

(Leckman et al., 1982) was used to determine lifetime Axis I diagnoses for subjects. This involved a second doctoral-level clinician reviewing the *SCID-I*, symptom ratings, and patient medical history. Medical records were reviewed when possible with signed consent from the proband.

Relative and control participants completed the *SCID-I* and the *Structured Interview for Schizotypy (SIS)* (Kendler et al., 1989), in order to more fully characterize Cluster A personality traits. Supplemental Medical History and Psychosis Modules of the *DIGS* were administered. During the consensus process one relative was removed from the final data analysis due to a diagnosis of bipolar disorder in the proband (rather than schizophrenia or schizoaffective disorder). One control participant was diagnosed with schizoid personality disorder as assessed by the *SIS* and was also excluded from the final data analysis. None of the remaining relatives or controls met full criteria for any Cluster A personality disorder as assessed by the *SIS*.

2.2.2 Affective and Symptom Measures

Chapman Scales: Participants completed a “Survey of Attitudes and Experiences” (SAE) that included a pseudo-random mixture of true-false questions from the *Revised Social Anhedonia Scale (RSAS)*, the *Physical Anhedonia Scale (PAS)*, the *Magical Ideation Scale (MIS)*, the *Perceptual Aberration Scale (PerAb)*, and the *Infrequency Scale*. The *RSAS* is a 40-item true-false questionnaire designed to measure lack of interest or pleasure in social interaction. The *PAS* is a 61-item true-false questionnaire designed to measure the amount of pleasure or interest in physical hedonic experiences. Cronbach's α for the *RSAS* in this study was .74, and for the *PAS*, .80.

Other *SAE* scales, the *Magical Ideation Scale* and the *Perceptual Aberration Scale*, measure aspects of positive schizotypal traits (i.e., unusual and psychotic-like beliefs and experiences) that are distinct from anhedonia. The *Infrequency Scale* was added to detect careless responding. The entire survey took approximately 40 minutes for relatives and controls to complete. Due to the time constraints of the protocol, one relative and four controls could not complete the entirety of the *SAE*.

Positive and Negative Affect Schedule-Extended Form: Twenty items from the *Positive and Negative Affect Schedule-Extended Form (PANAS-X)* (Watson & Clark, 1994), reflecting different negative and positive emotions, were administered. Participants made ratings on a 1 (*very slightly/not at all*) to 5 (*extremely*) Likert scale. Cronbach's α in this study was .87.

Extraversion: The extraversion subscale of the *International Personality Item Pool (IPIP)* (Goldberg, 1999) was included to examine possible associations of extraversion with social anhedonia. These 10 items require responses to statements such as “I feel comfortable around people” and “I don't talk a lot” (reverse scored). Participants made ratings on a 1 (*very inaccurate*) to 5 (*very accurate*) Likert scale. Cronbach's α for this study was .80.

Temporal Experience of Pleasure Scale: The *TEPS* (Gard et al., 2006) is a self-report questionnaire designed to measure consummatory and anticipatory pleasure. The *TEPS* consummatory pleasure subscale (8 items) purportedly measures everyday liking. The

subscale contains items such as "I enjoy taking a deep breath of fresh air when I walk outside" and "I appreciate the beauty of a fresh snowfall". The other subscale was designed to measure trait anticipatory pleasure with 10 items, such as "I don't look forward to things like eating out in restaurants" and "I look forward to a lot of things in my life". The range of the scale goes from 1 to 6, and higher scores indicate more pleasure. Cronbach's α for consummatory and anticipatory pleasure subscales were .72 and .61 in this sample, respectively. Because a Cronbach's α of .70 or higher is generally considered acceptable, results from analyses using the TEPS anticipatory subscale in this sample should be interpreted with caution.

Picture Rating Task: The *PRT* by Kerns et al. (2008) is a computer task designed to assess affect intensity, using the same positive and negative picture stimuli reported in Barrett et al. (2004). The task contained 16 positive, neutral, and negative pictures, and took approximately 8 minutes to complete. Following Barrett and Russell (1999), 16 different emotions were rated after each stimulus was presented. These included positive high arousal emotions (alert, elated, excited, and happy), positive low arousal emotions (calm, contented, relaxed, and serene), negative high arousal emotions (nervous, stressed, tense, and upset), and negative low arousal emotions (depressed, fatigued, lethargic, and sad). This allowed for the assessment of both emotional valence (positive vs. negative) and emotional arousal (high vs. low). Details of this task are published in (Kerns et al., 2008). Following previous research (Kerns et al., 2008; Schimmack & Diener, 1997), the dependent variable for PA intensity is the average intensity of all positive emotions that all participants indicated that they experienced while viewing positive pictures.

Self-Reported Liking Task: Participants completed a *Self-Reported Liking Task (SRLT)* to rate the pleasantness of visual affective stimuli. This procedure was adapted by the authors from the *Liking Task* by Heerey & Gold (2007) and was modified for this study. In the original task, three pictures were presented on the same screen simultaneously, while in the current version, one picture at a time was presented. This was to make the task ratings more directly comparable to PRT ratings. Participants viewed and rated 40 slides, each containing an image from the International Affective Picture System (*IAPS*; Lang, Bradley, & Cuthbert, 2005). Sixteen positive, sixteen negative, and eight neutral slides were randomized for each participant.

The photos on each slide were items of varying content, valence, and arousal. Participants first rated the degree to which each slide was experienced as "pleasurable", and then rated the degree to which the slide was experienced as "exciting", using 9-point Likert scales beginning with 1, *extremely [unpleasant/calm]* and moving to 9, *extremely [pleasant/exciting]*. Pleasantness ratings provided the measure of liking while excitement ratings measured the level of arousal. Each rating scale was presented beneath each stimulus immediately upon picture presentation and participants had unlimited time to make their ratings. Slides were removed from the screen after ratings were made, followed by an interstimulus interval of 10s. Both the PRT and SRLT tasks were administered separately and time was allotted between tasks for other protocol measures.

2.3 Statistical Analyses

To characterize affective traits in first-degree relatives, the distributions of the affective measures were examined and compared across relative and control samples. Age and sex were also examined in relation to affective measures. Because males and females differed on two of the affective measures, group comparisons were run with and without sex as a covariate. Spearman *rho* correlations examined associations of anhedonia with affective variables.

3. Results

3.1 Participant Age and Sex

While group differences in age and sex were not statistically significant, first-degree relatives tended to be older and there was a statistical trend ($p < .10$) toward a higher proportion of females to males in the relative group. Across all participants and within each group separately (relative and control) age was not significantly associated with any of the phenotypes. Analyses of variance included sex as a covariate, but no notable differences in results were evident when the covariate was removed.

3.2 Self-Reported Personality Traits and Current Affective state

Relatives reported significantly more social anhedonia than controls ($F_{2, 54} = 9.0, p = .004$). Relatives also reported more perceptual aberration ($F_{2, 54} = 4.3, p = .04$). Group comparisons are presented in Table 2. Groups did not differ in physical anhedonia, magical ideation, current PA (Table 2) or extraversion (relatives $M(SD) = 9.0 (4.0)$, controls = 10.5 (3.9); $F_{2, 54} = 0.9, ns$) but relatives reported significantly greater current NA than controls on the PANAS ($F_{2, 54} = 6.8, p = .01$; group differences for the PANAS previously reported in Docherty et al., 2014).

3.3 Task Assessment of Positive Affect

After establishing that relatives reported increased anhedonia, we next examined whether relatives would also exhibit differences in reports of current affect in laboratory tasks. Group comparisons of scores on the task variables are also presented in Table 2. On the Picture Rating Task, relatives and controls did not differ significantly on any affective facet measured, including intensity of PA ($F_{2, 58} = 0.2, ns$) and frequency of PA ($F_{2, 58} = 0.1, ns$). For the Self-Reported Liking Task, relatives also did not differ from controls in their liking of positive pictures ($F_{2, 50} = 1.7, ns$) and, instead, relatives actually reported increased arousal on ratings for positive pictures. This increase fell to a trend when sex was entered as a covariate in the model ($F_{2, 50} = 2.8, p = .10$). Hence, although relatives reported increased trait anhedonia, there was no evidence of decreased momentary hedonic response in relatives.

3.4 Consummatory Versus Anticipatory Pleasure

Self-reported pleasure on the TEPS was also similar between relatives and controls. Relatives did not report less consummatory pleasure; in fact, they reported more consummatory pleasure than controls on the TEPS ($F_{2, 54} = 4.5, p = .04$).

3.5 Association of Social Anhedonia with Affect and Extraversion

Because relatives reported increased social anhedonia, we wanted to better understand the nature of this trait by examining anhedonia in relation to affect and extraversion. Table 3 presents associations of social anhedonia with the range of affective measures. Of note, social anhedonia self-report was significantly positively associated with current negative affective state in the relative group, but it was not significantly associated with current PA or with extraversion in either group.

Because relatives reported both increased NA and social anhedonia, and because these were significantly positively correlated, we examined whether current negative emotional state might account for the differences in self-reported social anhedonia across groups. Group differences in social anhedonia remained significant when accounting for current NA ($F_{2,45} = 5.3, p = .03, \eta^2 = .11$).

4. Discussion

Results suggest that first-degree relatives, like people with schizophrenia-spectrum disorders, report intact liking of pleasurable stimuli despite significant elevations in social anhedonia. Increased current negative affect, decreased current positive affect, and decreased extraversion do not appear to account for differences in self-reported trait anhedonia between groups.

In assessments of momentary hedonic responses to pleasant stimuli, relatives reported as much positive affect as control participants. So despite a significant elevation in both social anhedonia and NA in relatives, there was no decrease on task or questionnaire measures of positive affective experience compared with controls.

The intact hedonic rating of relatives across two task measures is consistent with previous research using pleasantness ratings in people with schizophrenia and controls (Heerey & Gold, 2007). In addition, the current results suggest that self-reported anhedonia, but intact momentary hedonic experiences in people with schizophrenia may not result from effects of medication or marked cognitive deficits. This pattern of increased anhedonia but intact momentary hedonic responses to stimuli might be related to the expression of genetic liability in the experience and recollection of affective experiences.

Explanations for the disjunction of reported anhedonia with momentary hedonic experiences in relatives could include 1) differences in affective working or episodic memory, or 2) a decrease in attention to day-to-day affective experiences. Previous research has implicated differences in affective working memory underlying paradoxical affective reports in patients, including semantic and episodic memory (Strauss & Gold, 2013). Other research has found evidence for decreased attention to emotions in anhedonia in schizophrenia (e.g., Martin et al., 2013). It is possible that cognitive difficulties limiting attention to affect in the moment could compromise memory for affective experience. These possible interpretations are not mutually exclusive. Future research could benefit from an examination of affective working memory and attention to emotion in relation to anhedonia in relatives.

It is important to note that physical anhedonia was not elevated in the relatives. This is inconsistent with previous research (Clementz et al., 1991; Docherty & Sponheim, 2008) and could point to unique social difficulties underlying anhedonia reported by relatives. However in this sample, physical anhedonia scores in relatives did fall within the bounds of sampling error. Controls in this sample endorsed more physical anhedonia than has been reported in other studies. It is also important to note that social anhedonia in relatives was not significantly negatively associated with TEPS anticipatory pleasure, as has been found previously in patients. However, given the correlation of $-.26$, it is very possible that a larger sample would improve power to detect an association.

In summary, our sample of first-degree relatives reported intact liking of pleasurable stimuli despite significant elevations in social anhedonia relative to controls. Current negative affect and positive affect did not appear to account for differences in social anhedonia between groups. Decreased trait extraversion was not associated with social anhedonia in this sample, but this does not rule out the possibility that differences in real and/or perceived social functioning underlie social anhedonia self-report. Future research would benefit from examination of schizotypy in relation to measures of both emotional control and social functioning in biological relatives. Finally, future research should expand on this study by directly comparing patients and relatives on measures examining the disjunction between momentary and trait anhedonia.

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Table 1

Sample Characteristics

	Relatives	Controls
N	33	25
Age Mean (SD)	50.4 (16.8) ^Y	43.1 (13.1)
Sex (% Female)	64	35
GAF Score	76.5 (9.5)	86.2 (4.5)
DIGS Parental Education Score	4.4 (1.2)	4.8 (1.1)

Note. Relatives = first-degree relative sample, GAF = Global Assessment of Functioning, DIGS = Diagnostic Interview for Genetics Studies.

^Y
 $p < .10$ (trend) compared with controls

Table 2

Comparison of Self-Reported Traits and Momentary Affective Assessments in First-Degree Relatives and Nonpsychiatric Controls

	REL	NC	<i>d</i>
<i>Schizotypal Traits</i>			
Social Anhedonia Scale ^a	13.3 (5.0)	9.8 (3.3)	.83**
Physical Anhedonia Scale ^a	13.5 (6.3)	13.1 (6.3)	.06
Perceptual Aberration Scale ^a	4.3 (3.9)	2.6 (0.8)	.60*
Magical Ideation Scale ^a	5.5 (5.0)	3.3 (3.2)	.52
<i>Pleasure Questionnaire</i>			
TEPS Liking	35.8 (8.7)	31.4 (5.4)	.61*
TEPS Wanting	42.9 (6.7)	44.3 (6.3)	-.22
<i>Current Affective State^b</i>			
PANAS Current Negative Affect	12.6 (4.1)	10.8 (1.2)	.60*
PANAS Current Positive Affect	32.93 (8.1)	33.0 (6.7)	-.01
<i>Momentary Affective Assessments</i>			
PRT PA Intensity for Positive Pictures	8.88 (2.8)	9.54 (3.2)	-.22
PRT PA Frequency for Positive Pictures	72.72 (20.5)	75.92 (24.5)	-.14
SRLT Liking of Positive Pictures	6.61 (1.0)	6.73 (0.7)	-.14
SRLT Arousal for Positive Pictures	5.53 (0.8)	4.99 (0.8)	.68*

Note. REL = first-degree relative sample, NC = non-psychiatric control sample, *d* = Cohen's *d* effect size, TEPS = *Temporal Experience of Pleasure Scale*, PANAS = *Positive and Negative Affect Scale*, PRT = *Picture Rating Task*, PA = positive affect, SRLT = *Self-Reported Liking Task*.

^a relatives *n* = 33, controls *n* = 21.

* *p* < .05.

** *p* < .01.

^b As noted in text, PANAS current affect group differences are also reported in Docherty et al., 2014, *Schizophrenia Research*. These do not constitute analyses from a separate sample.

Table 3

Associations of Social Anhedonia Scores with Affect and Extraversion in Relatives and Controls

	First-Degree Relatives	Controls
<i>Affective Task (Positive Pictures)</i>		
PRT PA	.13	.11
SRLT Liking	-.46*	-.05
SRLT Arousal	-.22	.15
<i>Affective Questionnaire</i>		
PANAS NA	.47*	-.01
PANAS PA	.23	.10
TEPS Liking	-.19	.14
TEPS Wanting	-.26	-.01
Extraversion	-.06	-.04

PRT = *Picture Rating Task*, PA = positive affect, SRLT = *Self-Reported Liking Task*, PANAS = *Positive and Negative Affect Scale*, NA = negative affect, TEPS = *Temporal Experience of Pleasure Scale*.

*
 $p < .05$.