

# Anhedonia, Positive and Negative Affect, and Social Functioning in Schizophrenia

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## Abstract

This study examines the relationship between anhedonia and the trait dimensions of positive affect (PA) and negative affect (NA) in schizophrenia. The relationship between poor social functioning in schizophrenia and these individual differences in affectivity is also examined. Schizophrenia outpatients ( $n = 37$ ) and normal controls ( $n = 15$ ) were assessed at a baseline evaluation and again approximately 90 days later. Consistent with the hypothesized decrease in hedonic capacity in schizophrenia, patients reported significantly greater physical and social anhedonia and less PA than controls. However, the schizophrenia group also reported significantly greater NA and social anxiety than did controls. In support of the dispositional view of these individual differences in affectivity, trait measures demonstrated test-retest reliability, and group differences between the schizophrenia group and controls were stable over the 90-day followup period. Within the schizophrenia group, physical and social anhedonia were comparably negatively correlated with trait PA; however, social but not physical anhedonia was significantly positively correlated with NA and social anxiety. Poor social functioning in the schizophrenia group was associated with greater physical and social anhedonia and greater NA and social anxiety. Alternatively, greater trait PA was related to better social functioning. These findings indicate that schizophrenia is characterized by both low PA and elevated NA and that these affective characteristics are a stable feature of the illness. The results also suggest important links between affect and social functioning in schizophrenia.

**Key words:** Anhedonia, affect, emotion.

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Anhedonia, the decreased capacity to experience pleasure, has been hypothesized to be a core feature of schizophre-

nia that may contribute to the liability of developing this disorder (Meehl 1962; Rado 1962). Additionally, both Meehl and Rado proposed that anhedonia is related to other aspects of emotional functioning in schizophrenia and underlies the social isolation and impairment seen in this disorder. Although Meehl has since diminished the centrality of anhedonia in his theory (1990), his original conjectures inspired a number of studies to examine whether anhedonia is related to vulnerability to schizophrenia (Berenbaum et al. 1990; Katsanis et al. 1990; Clementz et al. 1991; Grove et al. 1991; Chapman et al. 1994). In a 10-year followup study of college students, Chapman et al. (1994) found that in association with magical ideation, social (but not physical) anhedonia was related to increased risk for psychosis as well as dimensional scores of schizotypal personality at followup. They hypothesized that social withdrawal secondary to social anhedonia may deprive individuals of the benefits of social contact (e.g., emotional support, social validation of cognitions and perceptions), leading to increased risk of psychosis.

Unlike the study of anhedonia as an indicator of psychosis proneness, little research has examined how anhedonia is related to various features of schizophrenia in individuals with the illness (Chapman et al. 1976; Schuck et al. 1984; Berenbaum and Oltmanns 1992; Katsanis et al. 1992; Blanchard et al. 1994). In fact, little is known about anhedonia in schizophrenia, including how it is related to other domains of affect and social impairment. Furthermore, the temporal stability (i.e., trait status) of anhedonia has not been directly tested in schizophrenia, only inferred from its relationship with premorbid adjustment (e.g., Katsanis et al. 1992).

Despite its definition as a deficit in emotional experience, the aspects of emotion that are affected in anhedonia

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are not well understood. To date, research has focused on the *state* correlates of anhedonia, and the findings have been inconsistent. Berenbaum and Oltmanns (1992) failed to find physical or social anhedonia in schizophrenia patients to be related to self-reported emotional responses to films and flavored drinks. On the other hand, Blanchard et al. (1994) found that physical, but not social anhedonia is moderately related to decreased self-reported positive mood in response to affect-eliciting films. A similar lack of replication has been found in nonclinical samples: In college students, physical anhedonia was unrelated to self-reported mood or facial displays of affect (Berenbaum et al. 1987). However, Fitzgibbons and Simons (1992) found that physically anhedonic college students rated positive and neutral slides as less positive than normally hedonic subjects. Additionally, Fiorito and Simons (1994) found that college students high in physical anhedonia rated positive images as less positive and both positive and negative images as less arousing than did normal controls.

Blanchard (Blanchard et al. 1994; Blanchard 1998) has suggested several possible factors to account for the variability in findings, including the method of mood measurement, in particular the affects assessed and the use of state measures of affect. Another concern with laboratory mood induction studies is the nature of the evocative stimuli employed. As observed by Berenbaum et al. (1987), the available data suggest that anhedonia is not related to affective responsivity to all forms of stimuli. Actually, Meehl never intended the concept of anhedonia in schizophrenia to be construed as a pan-deficit in the capacity to experience pleasure. For example, Meehl (1962) originally observed that "schizoid anhedonia is mainly interpersonal, i.e., schizotypes seem to derive adequate pleasure from esthetic and cognitive rewards" (p. 833). Similarly, Meehl (1990), in explaining his preference for the term *hypohedonia*, indicated that even the most deteriorated schizophrenia patients can achieve pleasure from a few sources, such as smoking or watching television. The inconsistent findings of laboratory mood induction studies may be a consequence of the failure to examine social-interpersonal factors, which are presumed to be central to the construct of anhedonia. The neglect of social stimuli in mood manipulation procedures is also problematic because social-interpersonal activity has repeatedly been found to be a robust predictor of positive affect (Clark and Watson 1988; Watson 1988a; Watson et al. 1992; Watson and Clark 1993).

In the present study, we address these concerns by focusing on the trait affect correlates of anhedonia. We chose to focus on measuring affect using trait ratings for several reasons. First, trait indices of affect should provide more reliable and generalizable markers of affect

than do single-point assessments of mood. Second, in assessing trait affectivity, we are not constrained by issues arising from the nature of the evocative stimuli that might be used in a mood induction paradigm. A related point is that trait markers of positive affect have been shown to be significantly associated with social-interpersonal activity (e.g., Watson 1988a; Watson et al. 1992). Third, the use of trait indices should allow a better understanding of anhedonia in the context of prevailing models of personality and affect. In particular, how is anhedonia related to the personality dimensions of positive affect (PA) and negative affect (NA) (e.g., Zevon and Tellegen 1982; Tellegen 1985; Watson and Tellegen 1985; Watson 1988b; Watson and Clark 1992a, 1992b; Tellegen and Waller, in press)? It is important to note that PA and NA are viewed as largely independent dimensions that may have differential (not just opposite) correlations with other variables (e.g., Costa and McCrae 1980; Tellegen 1985; Clark and Watson 1988; Watson 1988a; Watson et al. 1992; Tellegen and Waller, in press).

The first objective of this study was to test the hypothesis that anhedonia, as well as positive and negative affectivity, reflect enduring individual differences in persons with schizophrenia. Although data from nonpsychiatric samples have demonstrated the test-retest reliability of indices of both anhedonia (Chapman et al. 1982) and trait PA and trait NA (e.g., Tellegen and Waller, in press), there are no published data supporting similar reliability in schizophrenia. Thus, the current study examines the test-retest reliability of putative trait indicators of anhedonia and affect in schizophrenia outpatients over approximately 90 days. Following an approach employed in personality research involving twins (Lykken et al. 1992), this study design also affords the opportunity to use a strategy of averaging trait measures from the two assessments to obtain more reliable estimates of self-rated traits. This averaging of trait indices across assessments decreases error variance attributable to both measurement error and unsystematic variation in self-descriptions of personality (Lykken et al. 1992).

The second aim of this study was to evaluate the relationship between anhedonia and trait dimensions of PA and NA. We hypothesized that anhedonia, as a construct reflecting the decreased capacity to experience pleasure, should be associated with decreased trait PA. The hypothesized relationship between anhedonia and trait NA was less clear. On one hand, the Chapman scales of anhedonia were developed to be independent of negative affective states such as social anxiety (Mishlove and Chapman 1985). Personality models that posit independent dimensions of PA and NA would also lead to a prediction of the independence of anhedonia and trait NA. In support of this view, Berenbaum and Connelly (1993) found the

effect of stress on positive mood and current hedonic capacity to be independent of its influence on negative mood in college students. Alternatively, Meehl, in both his original (1962) and revised (1990) theories, proposed that anhedonia is an important contributor to or in some cases a consequence of what he describes as "aversive drift" in schizophrenia—the tendency for activities, people, and places "to take on a burdensome, threatening, gloomy, negative emotional charge" (Meehl 1990, p. 21). This aversive drift is proposed to be intense and pervasive in the interpersonal domain, manifesting as ambivalence and interpersonal fear (Meehl 1962). Such a proposal would indicate that anhedonia is characterized by decreased PA and increased NA. Therefore, we sought to test the hypothesis that anhedonia is related to low trait PA as well as elevated trait NA.

The third aim of this study was to assess the relationship between anhedonia and social functioning in schizophrenia. Social dysfunction is a central feature of schizophrenia, as reflected by the inclusion of social dysfunction in the diagnostic criteria for the active phase of schizophrenia and as a symptom of the prodromal and residual phases of the illness (American Psychiatric Association 1987, 1994), as well as repeated demonstration of social impairment in this disorder (e.g., Bellack et al. 1990; Mueser et al. 1990). Anhedonia has been hypothesized to underlie the social withdrawal and impairment seen in schizophrenia (Meehl 1962). In support of Meehl's conjectures, anhedonia in schizophrenia subjects has been found to be related to poor premorbid adjustment (Chapman et al. 1976; Schuck et al. 1984; Katsanis et al. 1992). Similarly, in studies of college students, high anhedonia is related to various indices of decreased social competence (Haberman et al. 1979; Chapman et al. 1980; Numbers and Chapman 1982; Beckfield 1985; Mishlove and Chapman 1985). However, in a recent study of inpatients with schizophrenia, Blanchard et al. (1994) reported that anhedonia is not related to behavioral ratings of social skill, at least in conflictual negative encounters. Blanchard (1998) suggested the need to explore how anhedonia is related to other dimensions of social functioning, including social skill in affiliative social-interpersonal encounters and *current* social functioning in the community.

To determine how anhedonia relates to the social activities of patients in the community, we examined the relationship between anhedonia and current social functioning in a sample of stabilized schizophrenia outpatients. We hypothesized that anhedonia would be related to poorer social functioning (e.g., fewer friends, less romantic involvement, fewer social-interpersonal activities). Related to this, we sought to replicate in schizophrenia subjects the findings from nonpsychiatric populations

that trait markers of PA, but not NA, are positively related to social-interpersonal activity (e.g., Watson 1988a; Hotard et al. 1989; Watson et al. 1992; Watson and Clark 1993). Therefore, we predicted that trait PA, but not trait NA, would be associated with social adjustment in schizophrenia subjects and that greater trait PA would be related to better social adjustment.

In summary, schizophrenia outpatients and normal controls were assessed twice in approximately 90 days to test the following hypotheses: (1) trait indices of anhedonia and affectivity are temporally stable in both schizophrenia subjects and controls; (2) schizophrenia subjects report greater anhedonia than controls, and anhedonia is associated with less trait PA and greater trait NA; and (3) schizophrenia subjects demonstrate poorer social functioning than controls, and this poor social functioning would be correlated with greater anhedonia and less trait PA; however, it was predicted that social functioning is not associated with trait NA.

## Methods

**Overview.** The study involved a baseline evaluation and a followup assessment. Although efforts were made to conduct followup assessments at 90 days, time between assessments varied as a function of subject schedules and availability. The schizophrenia and control groups did not differ in their average time between assessments ( $t = -1.59$ ,  $df = 50$ , NS; schizophrenia group, mean days between assessments = 96.54, standard deviation [SD] = 14.10, minimum = 77, maximum = 147; control group, mean days between assessments = 90.13, SD = 10.24, minimum = 72, maximum = 112). At baseline, diagnostic evaluations were conducted with the Structured Clinical Interview for *DSM-III-R* patient and nonpatient editions (SCID; Spitzer et al. 1990) to determine study inclusion criteria. Videotaped clinical interviews were conducted at both assessments to evaluate social functioning in schizophrenia subjects and controls and to record symptomatology in the schizophrenia subjects during the month preceding the interview. Data regarding symptomatology rated on the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962) are presented in a separate report (Blanchard and Bellack, submitted for publication). Following the clinical interview, subjects were accompanied by a research assistant to a separate room and were instructed in completing self-report scales. Self-report measures included indices of physical and social anhedonia, trait PA and trait NA, and social anxiety. Measures of anxiety were included in the present study because of Meehl's (1962) proposal that aversive drift is characterized in part by exaggerated interpersonal fear. Items from

the true-false anhedonia and trait affectivity scales were intermixed and combined to form one self-report inventory. The social anxiety scales were administered separately because of their different response format. Clinical interviewers were blind to all self-report scores at both assessments.

**Subjects.** Participants included 43 schizophrenia outpatients and 15 control subjects. Participants were paid for their involvement in the study. Schizophrenia subjects, who consented to participate and met the diagnostic criteria of *DSM-III-R* (American Psychiatric Association 1987), were drawn from the outpatient Schizophrenia Clinic at the Medical College of Pennsylvania/Eastern Pennsylvania Psychiatric Institute. Controls were recruited from the Medical College of Pennsylvania's clerical and support staff and screened for psychiatric disorders. Diagnostic information on all participants (schizophrenia and control) was obtained using the mood syndromes and psychotic and associated symptoms sections of the SCID (Spitzer et al. 1990). Diagnostic interviews were conducted by a Master's- or Ph.D.-level diagnostic interviewer with extensive training and experience in diagnostic and symptom assessment from involvement in earlier studies, including the Treatment Strategies in Schizophrenia study of the National Institute of Mental Health (Keith et al. 1989, Schooler et al. 1989), and formal training in the use of the SCID. Prior training from the Spitzer group in the SCID established high diagnostic agreement between the raters for the diagnoses studied ( $\kappa$ s  $> 0.90$ ). Six schizophrenia subjects were dropped from the study because they refused to participate in followup assessments (2) or because project staff were unable to locate them at followup (4). Patients who were not available for the followup did not differ from those assessed at both followups in any demographic or treatment-history variables, nor did they differ on any of the self-report scales or in ratings of social functioning obtained at the initial evaluation. The final schizophrenia sample had 37 patients who were available for assessment at both baseline and followup.

This stabilized schizophrenia outpatient sample had a mean of 4.33 prior hospitalizations ( $SD = 3.00$ ), and the average number of months since the last hospitalization was 21.73 ( $SD = 33.21$ ). All schizophrenia subjects were medicated and their average dose of neuroleptics, in chlorpromazine unit equivalents (American Medical Association 1994, p. 263), was 770 mg ( $SD = 406$ ). Four patients were receiving neuroleptics for which chlorpromazine equivalence is not available: remoxipride (3 patients; mean dose = 150 mg,  $SD = 75$ ) and risperidone (1 patient; 16 mg). Nineteen patients were on anti-Parkinsonian medication (benztropine equivalents: mean = 2.13

mg,  $SD = 1.33$ ); four patients were also taking a benzodiazepine (lorazepam: mean = 2.50 mg,  $SD = 1.73$ ); and one patient was receiving lithium (1,200 mg) in addition to a neuroleptic.

Schizophrenia subjects did not differ from controls in age ( $t = -0.11$ ,  $df = 50$ , NS; schizophrenia patient mean age = 36.14,  $SD = 7.46$ ; control 36.40,  $SD = 9.69$ ), education ( $t = -0.57$ ,  $df = 50$ , NS; schizophrenia patient mean years of education = 12.27,  $SD = 2.05$ ; control 12.60,  $SD = 1.45$ ), or race ( $\chi^2[1, n = 52] = 0.02$ , NS). Most of the sample was African-American (24 schizophrenia patients, 10 controls; the remaining participants were Caucasian (13 schizophrenia patients, 5 controls). There were no group differences in gender ( $\chi^2[1, n = 52] = 1.87$ , NS), although a somewhat larger percentage of schizophrenia subjects were male (73%,  $n = 27$ ) compared with controls (53%,  $n = 8$ ).

### Instruments.

**Anhedonia.** Anhedonia was assessed with the revised versions of the Physical Anhedonia Scale (Chapman and Chapman 1978) and the Social Anhedonia Scale (Eckblad et al. 1982). These true-false self-report measures provide indices of the pleasure derived from physical and social-interpersonal sources, respectively. They have been shown to be reliable, with internal consistency reliabilities (coefficient  $\alpha$ ) of 0.79 to 0.82 for the Physical Anhedonia Scale (Chapman et al. 1982) and 0.79 for the Social Anhedonia Scale (reported in Mishlove and Chapman 1985). Six-week test-retest reliability for the Physical Anhedonia Scale in normal college students has been found to be adequate ( $r > 0.77$ ). Test-retest reliability for the Social Anhedonia Scale has not been reported.

**Trait measures of affect.** Trait indices of affectivity were derived from the Multidimensional Personality Questionnaire (MPQ; Tellegen 1978/1982, 1985; Tellegen and Waller, in press), a true-false self-report questionnaire to measure normal personality characteristics, which has been used in several studies of psychopathology (e.g., DiLalla et al. 1993; Berenbaum et al. 1994; DiLalla and Gottesman 1995). Trait PA was assessed with the Well-Being scale and trait NA with the Stress Reaction scale of the MPQ. As in other studies employing these scales (e.g., Watson et al. 1988; Church and Burke 1994), our reported results are based on the abbreviated versions (11 items for Well-Being and 14 items for Stress Reaction) because they are less correlated with each other than the full scales. The Well-Being scale measures the tendency to experience positive emotions: High scorers describe themselves as happy, enthusiastic, optimistic, and experiencing enjoyment from activities; low scorers experience little joy and are seldom happy. This PA trait marker is positively correlated with state indices of PA (Tellegen

1985; Watson 1988a), social activity (Watson 1988a), and the quantity and quality of social relationships (Hotard et al. 1989). The Well-Being scale has been found internally consistent (coefficient  $\alpha > 0.85$ ) and temporally stable (30-day test-retest  $r = 0.90$ ) (Tellegen 1978/1982, 1985; Tellegen and Waller, in press).

The Stress Reaction scale of the MPQ was used for trait NA because it reflects the tendency to experience negative affect. High scorers on the Stress Reaction scale describe themselves as anxious, worrying, and irritable; low scorers convey a higher threshold for experiencing NA and greater coping with stress. The Stress Reaction scale is positively correlated with state indices of NA (Tellegen 1985; Watson 1988a; Tellegen and Waller, in press) and health complaints (Watson 1988a) and has been found to be internally consistent ( $\alpha > 0.88$ ) and temporally stable (30-day test-retest  $r = 0.89$ ) (Tellegen 1978/1982; Tellegen and Waller, in press).

**Social anxiety.** Social anxiety was measured with the Interaction Anxiousness Scale (Leary 1983b) and the brief Fear of Negative Evaluation Scale (Watson and Friend 1969; Leary 1983a).<sup>1</sup> The Interaction Anxiousness Scale is a 15-item scale that measures the subjective experience of anxiety associated with social interactions. Each item is scored on a scale of 1 (not at all characteristic of me) to 5 (very characteristic of me). The Interaction Anxiousness Scale has good internal consistency (Leary 1983b), is significantly correlated with other self-report measures of social anxiety (Leary 1983b; Herbert et al. 1991; Leary and Kowalski 1993), and discriminates individuals with interpersonal difficulties involving anxiety from nonclinical controls (Leary 1983b). The brief version of the Fear of Negative Evaluation Scale (Leary 1983a) measures anxious apprehension related to the prospect of being evaluated negatively by others. The brief Fear of Negative Evaluation Scale is a 12-item questionnaire that uses a 5-point scale with anchors similar to those used for the Interaction Anxiousness Scale. It has good internal consistency (Leary 1983a) and is significantly associated with other self-report measures of social anxiety and avoidance (Leary 1983a; Herbert et al. 1991), including the Interaction Anxiousness Scale (Leary 1983a, 1983b).

**Social functioning.** Subjects' ability to function in the community during the month before each assessment was evaluated with an abbreviated Social Adjustment Scale-II (SAS-II; Schooler et al. 1979). The Social Adjustment Scale is a widely used interview measure of community functioning developed specifically for use

with schizophrenia patients. The SAS-II has established reliability, and protocols based on patient interviews have shown a high correspondence to data provided by community informants (Glazer et al. 1980); patient interviews have been shown to be related to behavioral indices of social competence (Mueser et al. 1990). Nine items from Social Leisure, Interpersonal Contacts, and Romantic Involvement sections of the Social Adjustment Scale were used. Each item is scored on a 5-point scale with higher scores reflecting poorer functioning. The nine items were summed and used to form an index of current social functioning. In the present sample, the Social Adjustment Scale index of social functioning had high internal consistency at both baseline ( $\alpha = 0.88$ ) and followup ( $\alpha = 0.85$ ). Interrater agreement for this rating of social functioning, calculated on 20 percent of the interviews, was high, with an Intraclass Correlation Coefficient (ICC) of 0.99 (ICC form 2, 1; Shrout and Fleiss 1979).

Items in the SAS reflect both frequency of social activities (i.e., type and frequency of social-leisure activities engaged in, frequency of social contacts, degree of participation in these social contacts, frequency of seeing or being in contact with friends by phone or letter, and frequency of romantic contacts) and satisfaction or comfort with these activities (i.e., comfort while being with other people, ease of communication with friends, degree of friction with friends, and sensitivity to any difficulties with friends). Given the intent of the present study to examine group differences and correlates of social behavior rather than satisfaction or comfort with such behavior, substantive analyses in this report will focus on an index of social frequency based on the five items of the SAS tapping this domain. These items were summed and used to form an index of social adjustment defined by frequency of social contacts. Internal consistency remained adequate with this abbreviated scale (baseline  $\alpha = 0.84$ ; followup  $\alpha = 0.77$ ).

## Results

First, analyses were conducted to examine the internal consistency and test-retest reliability of the self-report measures in both subject groups. Second, differences between schizophrenia and control groups in anhedonia, affectivity, social anxiety, and social functioning at both assessments were evaluated. Finally, correlational analyses were conducted to assess the relationships between anhedonia, affectivity, anxiety, and social functioning within the schizophrenia group.

**Reliability.** Internal consistency reliability (coefficient  $\alpha$ ) was examined for each of the self-report scales. For the Physical and Social Anhedonia scales, median  $\alpha = 0.86$

<sup>1</sup>One control subject did not complete the Fear of Negative Evaluation Scale at the baseline assessment and another control subject did not complete the Interaction Anxiousness Scale at the followup evaluation. Both were dropped from analyses involving these measures.

and 0.84, respectively across assessments and groups. Adequate reliability was also obtained for the Well-Being and Stress Reaction scales, with median  $\alpha = 0.76$  and 0.85, respectively. Similarly, internal consistency was good for the Interaction Anxiousness Scale, 0.89, and the Fear of Negative Evaluations Scale, 0.82.

Test-retest reliability of the self-report scales of affect and interview-rated social adjustment in schizophrenia and control groups was examined with Pearson product-moment correlations. As can be seen in table 1, self-descriptions of affect in both schizophrenia subjects and controls were reliable across the 90-day followup with stability coefficients of 0.74 or greater. One exception was

**Table 1. Test-retest reliabilities of anhedonia, affect, anxiety, and social adjustment scales in schizophrenia and control groups**

Instrument	Group	
	Schizophrenia	Control
Physical Anhedonia Scale	0.74	0.86
Social Anhedonia Scale	0.79	0.82
Well-Being	0.75	0.79
Stress Reaction	0.77	0.79
Interaction Anxiousness Scale	0.77	0.90
Fear of Negative Evaluation Scale	0.60	0.91
Social Adjustment Scale II, abbreviated	0.66	0.50 <sup>1</sup>

*Note.*—Because of missing data for the Interaction Anxiousness (Leary 1983b) and Fear of Negative Evaluation (Leary 1983a) scales, control group  $n = 14$ .  $p < 0.001$  (one-tailed) except as indicated. Physical Anhedonia Scale (Chapman and Chapman 1978); Social Anhedonia Scale (Eckblad et al. 1982); Well-Being and Stress Reaction of the Multidimensional Personality Questionnaire (Tellegen 1978/1982); Social Adjustment Scale II, abbreviated (Schooler et al. 1979).

<sup>1</sup> $p < 0.05$ .

the Fear of Negative Evaluation Scale, which was somewhat less reliable for schizophrenia subjects than the other measures ( $r = 0.60$ ). The abbreviated SAS demonstrated significant test-retest correlations in both schizophrenia ( $r = 0.66$ ) and control groups ( $r = 0.50$ ).

**Group Comparisons.** Descriptive data for the self-report scales and ratings of social adjustment are presented in table 2. Group differences in anhedonia, trait affectivity, and anxiety were evaluated with separate repeated measures analyses of variance (ANOVAs). For the ANOVA conducted on the Physical Anhedonia Scale, the main effect of Group was significant ( $F = 8.22$ ;  $df = 1,50$ ;  $p < 0.01$ ), but not the main effect of Time or the Group  $\times$  Time interaction ( $F = 2.08$  and  $0.06$ , respectively;  $df = 1,50$ ; NS). Similarly, for the Social Anhedonia Scale the main effect of group was significant ( $F = 12.09$ ;  $df = 1,50$ ;  $p < 0.005$ ); however, the main effects of Time and the Group  $\times$  Time interaction were not significant ( $F = 0.92$  and  $0.01$ , respectively;  $df = 1,50$ ; NS). These results indicate that the schizophrenia subjects reported greater physical and social anhedonia than did controls across the two assessments.

The ANOVAs conducted on the Well-Being and Stress Reaction scales yielded significant main effects for both Well-Being ( $F = 8.49$ ;  $df = 1,50$ ;  $p < 0.01$ ) and Stress Reaction ( $F = 19.58$ ;  $df = 1,50$ ;  $p < 0.001$ ). The main effects of Time were not significant for either Well-Being or Stress Reaction ( $F = 2.10$  and  $0.01$ , respectively;  $df = 1,50$ ; NS). Nor were the Group  $\times$  Time interactions significant for Well-Being or Stress Reaction ( $F = 1.00$  and  $0.07$ , respectively;  $df = 1,50$ ; NS). Thus, schizophrenia subjects reported significantly less Well-Being and greater Stress Reaction than controls. These findings were stable across assessments.

**Table 2. Descriptive statistics for anhedonia, affectivity, anxiety, and social adjustment scales in schizophrenia and control groups at baseline and 90-day followup**

Scale	Baseline		Followup		Group effect, $F$	$p$
	Schizophrenia Mean (SD)	Control Mean (SD)	Schizophrenia Mean (SD)	Control Mean (SD)		
Physical Anhedonia Scale	20.03 (7.96)	13.13 (8.40)	18.62 (8.08)	12.13 (8.18)	8.22	< 0.01
Social Anhedonia Scale	15.11 (5.75)	8.80 (6.71)	14.54 (6.07)	8.20 (7.47)	12.09	< 0.005
Well-Being	6.32 (2.74)	8.33 (2.13)	6.46 (3.01)	9.07 (2.74)	8.49	< 0.01
Stress Reaction	7.81 (3.76)	3.00 (3.21)	7.68 (3.98)	3.07 (3.20)	19.58	< 0.005
Interaction Anxiousness Scale	41.24 (10.34)	30.36 (10.99)	42.65 (10.93)	31.21 (11.09)	12.14	< 0.005
Fear of Negative Evaluation Scale	35.19 (8.49)	28.64 (9.40)	34.27 (9.04)	29.07 (8.92)	5.28	< 0.05
Social Adjustment Scale	14.49 (5.81)	12.07 (4.01)	15.59 (4.76)	13.53 (7.54)	28.88	< 0.005

*Note.*—Physical Anhedonia Scale (Chapman and Chapman 1978); Social Anhedonia Scale (Eckblad et al. 1982); Social Adjustment Scale = Social Adjustment Scale II (Schooler et al. 1979), abbreviated (higher scores reflect poorer social functioning). Because of missing data for the Interaction Anxiousness (Leary 1983b) and Fear of Negative Evaluation (Leary 1983a) scales, control  $n = 14$  at each assessment. Significance levels for group effect based on repeated-measures ANOVAs. Effects for Time and Group  $\times$  Time interaction were not significant. SD = standard deviation. See text under "Results" for statistics.

For the anxiety measures, the ANOVAs resulted in a significant main effect of Group for the Interaction Anxiety Scale ( $F = 12.14$ ;  $df = 1,49$ ;  $p < 0.005$ ) and the Fear of Negative Evaluation Scale ( $F = 5.28$ ;  $df = 1,49$ ;  $p < 0.05$ ). However, as with analyses for the other self-report scales, the main effects of Time and the Group  $\times$  Time interaction were not significant, for either the Interaction Anxiousness Scale ( $F = 1.16$  and  $0.07$ , respectively;  $df = 1,49$ ; NS) or the Fear of Negative Evaluation Scale ( $F = 0.37$  and  $0.05$ , respectively;  $df = 1,49$ ; NS). Therefore, schizophrenia subjects reported greater social anxiety than did controls across assessments.

To examine group differences in social functioning, a repeated-measures ANOVA was conducted on ratings from the abbreviated SAS. The main effect of Group was significant ( $F = 28.88$ ;  $df = 1,50$ ;  $p < 0.001$ ), but not the main effects of Time or the Group  $\times$  Time interaction ( $F = 1.72$  and  $0.15$ , respectively;  $df = 1,50$ ; NS). These results indicate that schizophrenia subjects were rated as having poorer social functioning than controls and that these group differences were stable over time.

**Correlates Within the Schizophrenia Group.** Given the temporal stability of both the self-report and the interview measures, trait indices and social functioning ratings were averaged across the two assessments for subsequent correlational analyses within the schizophrenia group. The Pearson correlations between the averaged trait scales are presented in table 3. Similar to other studies of the Chapman scales (e.g., Katsanis et al. 1992; Blanchard et al. 1994), the Physical and the Social Anhedonia scales share a moderate amount of variance (25% in the present sample). The Well-Being and Stress Reaction scales were

**Table 3. Correlations between averaged ratings of anhedonia, trait affect, and anxiety in schizophrenia subjects**

	1	2	3	4	5	6
1. PAS	—					
2. SAS	0.51 <sup>1</sup>	—				
3. WB	-0.23	-0.36 <sup>2</sup>	—			
4. SR	0.20	0.50 <sup>1</sup>	-0.35 <sup>2</sup>	—		
5. IAS	0.23	0.64 <sup>1</sup>	-0.52 <sup>1</sup>	0.74 <sup>1</sup>	—	
6. FNE	0.13	0.48 <sup>1</sup>	-0.48 <sup>1</sup>	0.70 <sup>1</sup>	0.75 <sup>1</sup>	—

*Note.*—All ratings averaged across baseline and followup assessments. PAS = Physical Anhedonia Scale (Chapman and Chapman 1978); SAS = Social Anhedonia Scale (Eckblad et al. 1982); WB = Well-Being; and SR = Stress Reaction of the Multidimensional Personality Questionnaire (Tellegen 1978/1982); IAS = Interaction Anxiousness Scale (Leary 1983b); FNE = Fear of Negative Evaluation Scale (Leary 1983a).

<sup>1</sup> $p < 0.005$  (two-tailed).

<sup>2</sup> $p < 0.05$ .

significantly negatively correlated ( $r = -0.35$ ), indicating approximately 12 percent common variance. This correlation in the schizophrenia group is similar to correlations of approximately  $-0.30$  to  $-0.40$  for these measures, based on single assessments, in normal subjects (e.g., Watson 1988a; Church and Burke 1994) and in anxiety and depressive disorders (Watson et al. 1988).

Correlational analyses of the relationship between anhedonia and affect in the schizophrenia group indicated that the Social Anhedonia Scale was negatively correlated with Well-Being ( $r = -0.36$ ,  $p < 0.05$ ) and positively correlated with Stress Reaction ( $r = 0.50$ ,  $p < 0.005$ ). The Physical Anhedonia Scale was moderately, but not significantly correlated with Well-Being ( $r = -0.23$ , NS) and Stress Reaction ( $r = 0.20$ , NS). Social, but not physical anhedonia was also significantly positively correlated with measures of social anxiety (i.e., the Interaction Anxiousness Scale and the Fear of Negative Evaluation Scale). To determine whether social anhedonia correlated with the measures of PA and NA to a significantly different degree than did physical anhedonia, the significance of the difference between these dependent correlations was tested (equation 1 in Meng et al. 1992). Social and physical anhedonia's correlations with Well-Being were not significantly different ( $Z = 0.81$ , NS). However, social anhedonia had significantly larger correlations than physical anhedonia with Stress Reaction ( $Z = 1.92$ ,  $p < 0.05$ ), Interaction Anxiousness ( $Z = 2.81$ ,  $p < 0.005$ ), and Fear of Negative Evaluation ( $Z = 2.20$ ,  $p < 0.05$ ). Thus, anhedonia in schizophrenia is associated with low PA. Furthermore, anhedonia is associated with high NA, and this association appears to be particularly strong for social anhedonia.

Affective correlates of social functioning in the schizophrenia group were examined with Pearson product-moment correlations. Because we hypothesized that anhedonia and trait PA, but not trait NA, would be associated with social functioning, the reported significance levels are based on one-tailed tests for the Anhedonia and Well-Being scales and two-tailed tests for the Stress Reaction and the anxiety scales. Both the Physical Anhedonia Scale and the Social Anhedonia Scale were positively correlated with poorer social functioning ( $r = 0.29$  and  $0.39$ , respectively,  $p < 0.05$ , one-tailed). On the other hand, Well-Being was negatively correlated with poorer social functioning ( $r = -0.53$ ,  $p < 0.005$ , one-tailed), with greater Well-Being related to less social impairment. Poor social functioning was also positively correlated with Stress Reaction ( $r = 0.33$ ,  $p < 0.05$ , two-tailed) and scores on the Fear of Negative Evaluation Scale ( $r = 0.42$ ,  $p < 0.01$ , two-tailed) and the Interaction Anxiousness Scale ( $r = 0.36$ ,  $p < 0.05$ , two-tailed).

To determine the independent contributions of PA and NA to social functioning, partial correlations were com-

puted using the Well-Being and Stress Reaction scales.<sup>2</sup> After controlling for Well-Being, the correlation between Social Adjustment and Stress Reaction was not significant ( $p = 0.17$ , NS). However, after controlling for Stress Reaction, the partial correlation between Well-Being and Social Adjustment remained significant ( $p = -0.46$ ,  $p < 0.005$ ). These findings suggest that the relationship between NA and poor social functioning is mediated by low PA. Thus, poor social functioning in schizophrenia appears to be uniquely associated with low trait PA.

## Discussion

Several hypotheses related to anhedonia, affect, and social functioning in schizophrenia were examined. Consistent with the hypothesized decrease in hedonic capacity in schizophrenia, schizophrenia outpatients reported significantly greater physical and social anhedonia and less trait PA than control subjects. However, this group also reported significantly greater trait NA and social anxiety than the controls. In support of the dispositional view of these individual differences in affectivity, trait measures demonstrated test-retest reliability, and group differences between schizophrenia and control groups were stable over the 90-day followup period.

The findings that schizophrenia subjects differed from controls on both Well-Being and Stress Reaction scales converge with other reports of decreased PA and increased NA in schizophrenia. DiLalla and Gottesman (1995) found that in within-pair comparisons of twins discordant for schizophrenia, affected twins had significantly lower Well-Being scores and significantly greater Stress Reaction scores than their mentally healthy twin, in addition to other scale differences. To the extent that Extroversion and Neuroticism reflect trait dimensions of PA and NA, respectively (Tellegen 1985; Watson and Clark 1992b; Tellegen and Waller, in press), the present results are also in accord with Berenbaum and Fujita's (1994) meta-analyses of studies finding decreased Extroversion and elevated Neuroticism in schizophrenia subjects compared with controls. Thus, the pattern of decreased PA and increased NA appears to be a replicable feature of schizophrenia.

In examining the affective correlates of anhedonia in schizophrenia, physical and social anhedonia were found to be negatively correlated with a marker of trait PA. Social anhedonia was also positively correlated with a

marker of trait NA. Thus, anhedonia, particularly as measured by the Social Anhedonia Scale, appears to be a marker of both low PA and high NA. Measures of social anxiety were also related to low PA and high NA. These results converge with the findings of Watson et al. (1988) that symptoms and diagnoses associated with social avoidance and discomfort are related to both low PA and high NA.

Although the content of the Social Anhedonia Scale was carefully selected to reflect schizoid rather than anxious withdrawal (Mishlove and Chapman 1985), this scale was correlated with measures of social anxiety. This result does not appear to be unique to schizophrenia. The Social Anhedonia Scale has been found to be moderately correlated ( $r = 0.25$ ,  $p < 0.01$ ) with the Interaction Anxiousness Scale in college students (Laurenceau et al. 1994). The Social Anhedonia Scale has also been found to correlate with other measures of anxiety in college students (Peterson and Knudson 1983; Leak 1991) and patients with personality disorders (Bailey et al. 1993). Furthermore, Bailey et al. (1993) reported that the Social Anhedonia Scale is correlated with the *DSM-III-R* criteria for avoidant personality disorder ( $r = 0.40$ ,  $p < 0.01$ ) and the schizotypal criterion item of social anxiety ( $r = 0.55$ ,  $p < 0.001$ ).

It is interesting that the Physical Anhedonia Scale, although sharing approximately 25 percent of its variance with the Social Anhedonia Scale, was not significantly correlated with measures of NA and anxiety in the schizophrenia group. These results may relate to the recent 10-year followup of measures of proneness to psychosis by Chapman et al. (1994), indicating that social, but not physical anhedonia is related to risk for psychosis. Evidence from the current study suggests that social anhedonia is more strongly associated with NA than is physical anhedonia. It is interesting to speculate that the Social Anhedonia Scale's link with both low PA and high NA is what underlies this measure's prognostic significance (Chapman et al. 1994). The importance of NA in schizophrenia is suggested by evidence that the risk of relapse is increased by stressors such as life events (Ventura et al. 1989) or the expressed emotion (EE) of family members (Parker and Hadzi-Pavlovic 1990). Watson and Clark's (1984) study of individual differences in the predisposition to experience NA could be informative in understanding individual variability in responding to stress and the vulnerability to relapse in schizophrenia (Fowles 1992). NA has been shown to predict poor prognosis in other disorders, such as anxiety and depression (Clark et al. 1994).

As predicted, in the present study the schizophrenia subjects demonstrated poorer social functioning than controls. This characteristic poor social functioning was significantly correlated with greater levels of both physical

<sup>2</sup>Because of the high intercorrelations between Stress Reaction and the measures of social anxiety, partial correlations are not presented for these measures; however, identical results are obtained when each anxiety measure is examined in partial correlations with Well-Being and social functioning.



and social anhedonia. This finding converges with other studies reporting that anhedonia is related to poor premorbid functioning in schizophrenia (Chapman et al. 1976; Schuck et al. 1984; Katsanis et al. 1992) and extends these findings to indicate that anhedonia is related to current social functioning in the community in stabilized outpatients. The present results also indicate that although anhedonia may not be related to social skill in dealing with conflictual social encounters (Blanchard et al. 1994), it is associated with other dimensions of current social-interpersonal functioning. Consistent with the correlation between the scales of social anhedonia and anxiety, social functioning was also negatively correlated with social anxiety. The correlation between social functioning and indices of NA appeared to be mediated by the latter measures' assessment of low PA. The results of partial correlations involving PA and NA indicated that PA was a unique predictor of social functioning in schizophrenia in that higher PA was associated with better functioning. It is noteworthy that the scale used to measure PA in this study (the Well-Being scale of the MPQ) contains no social-interpersonal items. Thus, the association between trait PA and social functioning cannot be attributed to content overlap in the scales measuring these constructs. The relationship between PA and social adjustment in the schizophrenia group replicates a number of studies with normal subjects showing a positive correlation between PA and social activities (e.g., Watson 1988a; Hotard et al. 1989; Watson et al. 1992; Watson and Clark 1993). The relationship between PA and social activity is not well understood: Increased dispositional PA may increase affiliative tendencies and lead to increased social activity; alternatively, participation in social activities may result in increased PA.

Several limitations of the current study should be noted. Although the longitudinal design of this investigation allowed us to address the temporal stability of trait markers, a study of medicated schizophrenia subjects with multiple prior episodes makes it impossible to determine the effects of medication, if any, on the variables under study (Blanchard and Neale 1992). Nor was it possible to determine whether the measured traits reflect premorbid personality. For example, some studies have found trait markers to be affected by prior episodes of psychopathology—the “scar” effect (e.g., Kendler et al. 1993). Another concern is that the findings regarding the temporal stability of traits obtained from these clinically stabilized outpatients may not generalize to more symptomatic patients or to patients with greater variability in symptomatology. A more definitive test of the stability of trait indices might involve a longitudinal assessment of schizophrenia subjects as inpatients following an exacerbation and again as outpatients during a period of stabilization. It would also be informative to examine first-episode schizophrenia

subjects. The longitudinal study of first-episode patients could address questions regarding the developmental trajectory of affectivity in schizophrenia. For example, is high NA coincidental with low PA in the early stages of schizophrenia, or does NA increase over the course of the illness as suggested by Meehl's (1962, 1990) proposal of aversive drift?

Another potential limitation of the current study is that ratings of social functioning were based on patient self-reports, which may introduce error through inaccurate recall or reporting biases. However, the social functioning interview used in this study has been shown to have high convergent validity with reports from significant others (Glazer et al. 1980). Moreover, patient reports with this interview have been shown to relate to independent behavioral indices of social competence (Mueser et al. 1990). The present findings of high internal consistency, good interrater agreement, and high test-retest reliability suggest a lack of substantial unsystematic error in ratings. The validity of patient reports of functioning is further supported by the finding that a trait marker of PA was related to social functioning in schizophrenia subjects: these results converge with data obtained from normal subjects using daily reports of social activities (e.g., Watson 1988a; Watson et al. 1992). It would be informative to simultaneously examine premorbid adjustment, current social functioning, and behavioral ratings of social competence in various forms of social encounters (e.g., affiliative vs. conflictual), so that potential differential links between affectivity and these various areas of social-interpersonal functioning might be identified.

In summary, the present findings indicate that trait indices of anhedonia and affect are temporally stable in schizophrenia and control subjects, supporting the dispositional view of these affective dimensions. Patients with schizophrenia were characterized by high anhedonia, low PA, and high NA. These patients also demonstrated poorer social functioning compared with controls. Robust links between social functioning and affectivity were demonstrated, specifically, the poorer the social functioning found in schizophrenia subjects, the lower their PA.

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