THE RELATIONSHIP OF SOCIAL ANXIETY AND SOCIAL ANHEDONIA TO PSYCHOMETRICALLY IDENTIFIED SCHIZOTYPY

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Abstract:

Schizotypy and schizophrenia involve social disinterest (anhedonia) and social anxiety. To clarify the role of social dysfunction in schizotypy, this study examined the relationship of social anxiety and social anhedonia in 364 young adults. As hypothesized, there was a moderate association between these constructs, which diminished after partialing out positive schizotypy. A series of CFAs found that a three-factor solution with positive schizotypy, negative schizotypy, and social anxiety factors provided the best fit for the data. Social anxiety is more strongly associated with positive schizotypy than negative schizotypy. A model in which social anxiety and anhedonia formed a general social dysfunction factor did not provide adequate fit, suggesting that social anhedonia and social anxiety are separate constructs with different relationships to schizotypy.

Article:

One of the central themes identified in the study of the schizophrenia-spectrum disorders is the presence of social deficits in those diagnosed with these disorders. Despite the general acceptance that social deficits are important factors in the diagnosis and conceptualization of spectrum disorders, the exact nature of the deficits remains poorly understood. Studies describe different types of social deficits in at-risk and clinical populations, including social withdrawal, poor social skills, social anxiety, social disinterest or anhedonia, and a lack of perspective-taking ability. The present research explores the relationship between two commonly identified categories of social dysfunction-social anxiety and social anhedonia-with the goal of better understanding how these symptoms overlap and differ, and for whom these symptoms are relevant.

SCHIZOPHRENIA AND THE SCHIZOTYPY SPECTRUM

Current models of the etiology of schizophrenia (e.g., Andreasen, 1999; Gottesman, 1991; Meehl, 1990) assume that there are schizophrenia-prone, or "schizotypic," people who are vulnerable to developing schizophrenia and related disorders. While the exact mechanisms are not fully understood, this vulnerability is presumed to result from an interaction of multiple genetic, neurodevelopmental, and psychosocial factors. These risk factors produce a continuum of schizophrenic-like adjustment referred to as schizotypy. It is hypothesized that the majority of schizotypic people will not decompensate into psychosis, although they may experience mild or temporary symptoms. These symptoms fall on a continuum from relatively healthy to subclinical deviance to full-blown clinical psychosis. Thus, schizotypy is expressed across a dynamic continuum of adjustment with severity contingent on the interaction of biopsychosocial factors (Gooding & Iacono, 1995).

Schizotypy-and, by extension, schizophrenia-has been described as a multidimensional construct consisting of two or more factors. Positive and negative schizotypy are the most consistently replicated factors, although other possible factors include cognitive disorganization, paranoia, and nonconformity (e.g., Mason, Claridge & Williams, 1997; Raine et al, 1994; Stefanis et al., 2002; Vollema & van den Bosch, 1995). Positive and negative schizotypy represent symptom dimensions that frequently co-occur, not discrete subcategories. These factors are consistent with the hypothesized dimensional structure of schizophrenia (e.g., Arndt, Alliger, & Andreasen, 1991; Bilder, Mukherjee, Rieder, & Pandurangi, 1985; Liddle, 1987; Peralta, Cuesta, & de Leon, 1992). This

parallel structure adds empirical support to the hypothesis that the vulnerability to schizophrenia is expressed across the continuum of schizotypy.

SOCIAL DYSFUNCTION, SCHIZOTYPY, AND SCHIZOPHRENIA

Social impairment is widely described as a feature of the prodromal, active, and residual phases of schizophrenia, and it is a central feature of schizophrenia-spectrum conditions such as schizoid and schizotypal personality disorders (American Psychiatric Association, 2000). This social dysfunction includes isolation and disinterest in social contact (referred to as social anhedonia) and social anxiety. In their classic texts, Kraepelin (1913/1919) and Bleuler (1911/1950) described asociality as characteristic of the preschizophrenic condition as well as of nonpsychotic relatives of patients. Social anhedonia played a central role in Rado's (1956) model of the development of schizophrenia, which greatly influenced Meehl's theory of schizotypy. Similarly, social anhedonia is a component of schizotaxia, a condition recently proposed by Tsuang, Stone, and Faraone (2000) to convey the liability for schizophrenia. Thus, social anhedonia is a prominent aspect of the negative symptom dimension of schizotypy and schizophrenia, and it provides a promising point-of-entry for identifying schizotypic people.

Furthermore, social anhedonia appears to be a useful predictor of risk for developing schizophrenia and related conditions. Kwapil (1998) reported that 24% of nonpsychotic young adults identified by elevated scores on the Revised Social Anhedonia Scale (Eckblad, Chapman, Chapman, & Mishlove, 1982) developed schizophrenia-spectrum disorders at a ten-year follow-up assessment compared to only 1% of control participants.

Although social anhedonia is a hallmark of negative symptom schizotypy, the relationship between social anxiety and schizotypy is less clear. Social anxiety is commonly reported among patients with schizophrenia and spectrum disorders. Pallanti, Quercioli, and Hollander (2004) reported a 36% comorbidity rate of social anxiety in a sample of outpatients with schizophrenia. Furthermore, social anxiety often occurs among nondisordered schizotypes, including nonpsychotic relatives of patients with schizophrenia and people with schizotypal personality disorder. Torgerson, Skre, Onstad, Edvardsen, and Kringlen (1993) reported that excessive social anxiety was more common in nonpsychotic dizygotic and monozygotic cotwins of patients with schizophrenia than among control participants. Social anxiety is also one of the diagnostic criteria of schizotypal personality disorder, although the nature of social anxiety in the disorder has narrowed in the current edition and is limited to social anxiety fueled by paranoid expectations of mistreatment (DSM-IV-TR; American Psychiatric Association, 2000). Although Raine et al. (1994) initially categorized social anxiety as part of negative schizotypy, inconsistent results led to the suggestion that social anxiety may constitute a third factor separate from positive and negative schizotypy known as "disorganization/social impairment" (Bentall, Claridge, & Slade, 1989; Raine, Lencz, & Mednick, 1995; Venables & Bailes, 1994).

DIFFERENTIATING SOCIAL ANHEDONIA AND SOCIAL ANXIETY

Social anxiety and social anhedonia appear to be differentiated by their expressions of positive and negative affect in social situations. Human development and functioning occur within a social context and, in general, social interactions increase the experience of positive affect (e.g., Fleeson, Malanos, & Achille, 2002; Watson, 2000). However, Kwapil et al. (2006) found that high levels of self-reported social anhedonia were associated with lower levels of positive affect but not increased negative affect when compared to control participants. People high in social anxiety, on the other hand, experience increases in negative affect in social situations due to fears of embarrassment and humiliation (Kashdan, 2004). Consistent with this finding, Vittengl and Holt (1998) found that undergraduates high in social anxiety reported higher levels of negative affect than control participants in diary records obtained after social encounters. These findings suggest that people who experience high levels of social anxiety may withdraw from social encounters and experience social impairment for different reasons than those high in social anhedonia. Socially anhedonic people may withdraw because social encounters are less rewarding, whereas socially anxious people may withdraw to avoid the negative emotions associated with fear of evaluation.

Differences in affective response to social experiences may provide a theoretical framework for understanding the relationship of social anxiety and social anhedonia to the dimensions of schizotypy. Social anhedonia is generally considered to be a component of negative symptom schizotypy-consistent with the flattened or blunted affect that characterizes this dimension. Social anxiety, on the other hand, is reported to involve intense emotional reactivity (especially negative affect in social situations), consistent with the affective instability observed in positive symptom schizotypy. Lewandowski et al. (2006) examined the relationship of psychometrically defined schizotypy with symptoms of depression and anxiety in a college student sample (n=1258). A series of confirmatory factor analyses indicated that a three factor solution of positive schizotypy, negative schizotypy, and negative affect provided the best solution for self-report measures of schizotypy, anxiety, and depression. As hypothesized, the model indicated that symptoms of depression and anxiety were more strongly associated with the positive-symptom dimension of schizotypy than with the negative-symptom dimension. However, that study examined general anxiety and depression, and it did not consider the relationship of social anxiety to the schizotypy dimensions. Given that social anxiety appears to be characterized by affective dysregulation and elevated levels of negative affect, whereas social anhedonia is characterized by a diminution of affect, one might expect an investigation of social anxiety to follow the pattern observed by Lewandowski et al.

Few studies have considered social anhedonia and social anxiety separately, and the nature of their relationship remains unclear. One potential reason why researchers have considered these constructs under a general umbrella of social distress is that it is methodologically challenging to separate these two constructs because they share similar overt behaviors. In other words, both social anxiety and social anhedonia might lead to social withdrawal, but the underlying motivation for this behavior might be different. Brown, Silvia, Myin-Germeys, and Kwapil (2007) examined the relationship of social anxiety and social anhedonia in the daily lives of young adults using the experience sampling methodology (ESM). They found that people high in social anxiety experienced different patterns of social dysfunction in their daily lives than those high in social anhedonia. Socially anxious people were more likely to be high in positive schizotypy, high in negative affect, and impaired when with unfamiliar people; socially anhedonic people were more likely to be high in negative schizotypy, low in positive affect but not high in negative affect, and to demonstrate a general pattern of social disinterest and withdrawal.

GOALS AND HYPOTHESES OF THE PROPOSED STUDY
The goals of the present research are to examine the relationship of social anxiety and social anhedonia, and to examine the relationship of social anhedonia and anxiety with the positive and negative symptom dimensions of schizotypy in an unselected sample of college students. College students provide an appropriate sample for examining the relationship between schizotypy and social functioning. Although college graduates have a slightly lower lifetime prevalence of schizophrenia than the general population (Robins et al., 1984), longitudinal studies have reported that psychometrically identified schizotypic college students are at heightened risk for developing psychotic disorders and schizophrenia-spectrum illnesses (e.g., Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Kwapil, 1998).

We offer four main hypotheses regarding social anhedonia and social anxiety. First, we hypothesize that there is a modest relationship between social anxiety and social anhedonia, especially across lower and middle ranges of the constructs. Given shared method variance and the proneness people may have to report problems in social encounters, reports of social anxiety and anhedonia should co-occur to a modest degree. However, high levels of social anhedonia are presumed to be characterized by negative symptoms of schizotypy, including diminution of affect. In contrast, high levels of social anxiety are likely to be characterized by high affective reactivity (especially in regards to negative affect). Therefore, a person reporting socially anhedonic symptoms at the higher end of the range will likely not demonstrate the distress that is an essential part of the expression of social anxiety symptoms. Thus, our second hypothesis is that there should be a decoupling of this relationship at high levels of social anhedonia (resulting in an overall curvilinear relationship). We do not have specific predictions about any particular score cut-off that will reliably determine when the relationship between social anxiety and anhedonia will diminish. Given that social anhedonia is conceptualized as a dimension with

meaningful variance across the range of scores, it would be conceptually inconsistent to apply cut-off scores (especially given that there are not established cut-off scores for these measures).

Third, we predict that the relationship between social anxiety and social anhedonia will diminish when variance associated with positive symptoms of schizotypy is partialed from the relationship. In other words, we expect that the relationship between social anhedonia and social anxiety will be at least partially mediated by positive schizotypy, given the findings of Lewandowski et al. (2006) that social anhedonia is modestly associated with positive schizotypy and anxiety. Thus, removing positive schizotypy from the mix should lessen the relationship of anxiety and anhedonia, consistent with our initial hypothesis. Fourth, we examined the relationship of positive and negative schizotypy with social anhedonia and social anxiety. Consistent with these predictions and the findings of Lewandowski et al., it is expected that social anxiety will be more strongly associated with positive schizotypy (given their shared affective reactivity) than with negative schizotypy.

METHOD
PARTICIPANTS
Usable data were collected for 272 female and 92 male college students enrolled in General Psychology courses at the University of North Carolina at Greensboro (UNCG). The sample was limited to Caucasian and African-American participants because reliable norms for the schizotypy scales have not been established for other ethnic groups. The sample was 75% Caucasian and 25% African American, consistent with the student demographics at UNCG. The mean age of the sample was 19.7 years (SD = 2.9). Males and females did not differ in age or ethnicity.

College students provide an appropriate sample for examining the relationship between schizotypy and social functioning. Although college graduates have a slightly lower lifetime prevalence of schizophrenia than the general population (Robins et al., 1984), longitudinal studies have reported that psychometrically identified schizotypic college students are at heightened risk for developing psychotic disorders and schizophrenia-spectrum illnesses (e.g., Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Kwapil, 1998).

MATERIALS AND PROCEDURES
Participants completed a brief demographic questionnaire, the Social Interaction Anxiety Scale and the Social Phobia Scale (SIAS and SPS; Mattick & Clark, 1998), and four schizotypy questionnaires: the Revised Social Anhedonia, Physical Anhedonia (Chapman, Chapman, & Raulin, 1976), Perceptual Aberration (Chapman, Chapman, & Raulin, 1978), and Magical Ideation (Eckblad & Chapman, 1983) Scales. The items on the schizotypy scales were intermixed with a 13-item measure of infrequent responding (Chapman & Chapman, 1983). The infrequency scale was included to screen out participants who responded in a random or "fake-bad" manner. Consistent with the recommendations of Chapman and Chapman, participants who endorsed more than two infrequency items were dropped from further study.

The SIAS contains 20 items that assesses discomfort during social situations, and the 20-item SPS assesses socially phobic concerns of being scrutinized or judged during routine activities. Coefficent alpha is reported to be .90 for the SIAS and .94 for the SPS (Mattick & Clarke, 1998). The Revised Social Anhedonia Scale consists of 40 items that tap asociality and indifference to others, while the Physical Anhedonia Scale includes 61 items that measure deficits in sensory and aesthetic pleasure. The anhedonia scales generally tap aspects of negative symptom schizotypy. However, Lewandowski et al. (2006) reported that the Revised Social Anhedonia Scale also is modestly associated with measures of positive schizotypy, consistent with findings from Diaz, Dickerson, and Kwapil (2003) that high scorers experience both positive and negative symptoms of schizophrenia. The Perceptual Aberration Scale consists of 35 items that tap schizotypal perceptual experiences and bodily distortions, while the Magical Ideation Scale is made up of 30 items that measure belief in implausible or invalid causality. The Perceptual Aberration and Magical Ideation Scales assess positive symptom schizotypy.

Participants completed the above measures, as well as other measures not included in the present study, as part of the Department of Psychology mass screening. The assessment lasted between 1.5 and 2 hours. Students received course credit for their participation.

RESULTS

DESCRIPTIVE STATISTICS

Table 1 presents the descriptive statistics for the schizotypy and social anxiety scales. The coefficient alpha was good to excellent for all of the scales. The mean, standard deviation, distribution, and reliability for each of the schizotypy scales were consistent with data from our larger normative sample (n = 6,137). The alpha level was set at .001 for all of the analyses due to the large sample size. Analyses are presented for the male and female participants combined, because the results were substantively unchanged when computed separately by sex. Table 2 displays the bivariate correlations of scores on the schizotypy and social anxiety scales. Consistent with earlier findings (Chapman, Chapman, & Miller, 1982), the Revised Social Anhedonia and Physical Anhedonia Scales were significantly positively correlated, as were the Perceptual Aberration and Magical Ideation Scales. The Physical Anhedonia Scale was uncorrelated with either the Magical Ideation or Perceptual Aberration Scales. The Social Anhedonia Scale was significantly, though modestly, correlated with the Perceptual Aberration and Magical Ideation Scales-consistent with the finding that Social Anhedonia taps aspects of both positive and negative schizotypy. Scores on the SIAS and SPS correlated significantly with each other and all the other scales, except the Physical Anhedonia Scale.

RELATIONSHIP BETWEEN SOCIAL ANXIETY AND SOCIAL ANHEDONIA

Both a linear and curvilinear model were fit to describe the relationship between the social anxiety scales and social anhedonia. A significant positive linear relationship between the SPS and social anhedonia was observed, $F(1, 362) = 27.97$, $p < .001$, as well as between the SIAS and social anhedonia, $F(1,362) = 51.74$, $p < .001$. The curvilinear model was also significant for both the SPS, $F(2,361) = 14.09$, $p < .001$, and the SIAS, $F(2,361) = 26.12$, $p < .001$, suggesting that there is both a linear and curvilinear component to the relationship. As hypothesized, the analyses support a decoupling of the linear relationship between social anxiety and social anhedonia at high levels of social anhedonia. Further evidence of this decoupling is seen by the fact that as scores on the Revised Social Anhedonia Scale increase, there is a decreasing percentage of participants with elevated scores on the social anxiety scales. For example, 60% of the participants who scored above the mean on the Revised Social Anhedonia Scale scored above the mean on the SPS. However, only 33% of the participants who received a score of at least 1 SD above the mean on the anhedonia scale scored as highly on the SPS. Likewise, only 10% of the participants with anhedonia scores at least 2 SD above the mean received SPS scores of 2 or more SD above the mean. Thus, extremely high scorers on the Revised Social Anhedonia Scale included a minimal number of those also scoring high on measures of social anxiety.

THE RELATIONSHIP OF SOCIAL ANXIETY AND SOCIAL ANHEDONIA TO THE SCHIZOTYPY DIMENSIONS

To examine the relationship of social anhedonia and social anxiety independent of the effects of positive schizotypy, scores from the Perceptual Aberration and Magical Ideation Scales were partialed from the correlations between scores on the Revised Social Anhedonia Scale and the social anxiety measures. These partial correlations were significant for the SPS, $r^{sub}p^ = .19$, $p < .001$, and the SIAS, $r^{sub}p^ = .30$, $p < .001$. To evaluate whether these partial correlations were significantly less than the bivariate correlations, mediational analyses were conducted using the Aroian second-order exact solution formula (1944) as recommended by MacKinnon, Lock wood, Hoffman, West, and Sheets (2002). The partial correlations were significantly lower than the bivariate correlations between scores on the Revised Social Anhedonia Scale and the SPS, $z = 3.8$, $p < .001$, but not the SIAS, $z = 2.4$, $p < .05$. This suggests that the relationship between measures of social anhedonia and socially phobic experiences, but not social discomfort, is mediated in part by positive symptom schizotypy.

To examine the relationship of social anxiety with schizotypy, four confirmatory factor analyses based upon a priori hypotheses were conducted. These analyses compared the fit of several competing models of schizotypy

and social anxiety. Both the sample size and number of participants per variable were adequate for conducting confirmatory factor analyses (Anderson & Gerbing, 1985; Bentler & Chou, 1987). Following the recommendations of Little, Cunningham, Shahar, and Widaman (2002), the items for each of the schizotypy scales were divided into three parcels to produce more robust estimates. The residuals from each parcel within a schizotypy scale were allowed to correlate, given that they shared a common source. Goodness of fit was assessed using the Goodness of Fit Index (GFI), Adjusted GFI, Normed Fit Index (NFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and the chi-square statistic. Table 3 reports these fit statistics. Model fit adequacy is typically indicated by fit indices greater than .95, RMSEA less than .05, and a nonsignificant chi-square statistic (Bentler & Bonnett, 1980; Browne & Cudeck, 1993); however, with a sample size this large, a nonsignificant chi-square value is unlikely. The models were nested, so the change in chi-square was compared across successive models to assess improvement in fit.

The first model tested whether all the scales load primarily on a single factor, representing general psychopathology. As indicated in Table 3, this model provided a poor fit. The second model evaluated the fit of a two-factor model: one factor represented general schizotypy, and another factor represented social anxiety. This model also provided poor fit. A third model evaluated a three-factor model containing positive schizotypy, negative schizotypy, and social anxiety factors. This model provided a marked improvement, but still failed to provide adequate fit. Lewandowski et al. (2006) found that an alternative three-factor model in which the Revised Social Anhedonia Scale cross-loaded on positive and negative schizotypy factors provided the best fit for the data. A similar three-factor model, when applied to this data, provided excellent fit. Given that the models were nested, the change in chi-square and degrees of freedom were evaluated with each successive model. In every case the subsequent model provided significantly improved fit over the preceding model. As hypothesized, the final model indicated that the social anxiety factor was more strongly associated with positive, than negative, schizotypy. Figure 1 contains the standardized coefficients for the final three-factor model.

Two additional models were tested to clarify the relationship of social anxiety and social anhedonia with schizotypy. The first model tested whether social anhedonia and social anxiety might be better understood as tapping a general social dysfunction factor. In this model, the Perceptual Aberration and Magical Ideation Scales loaded on a positive schizotypy factor, the Physical Anhedonia Scale loaded on a negative symptom/anhedonia factor, and the social anhedonia and anxiety scales loaded on a social dysfunction factor. The fit for this model was poor (all fit indices < .90 and RMSEA > .10).

The second model examined whether the social anxiety measures were part of positive schizotypy, rather than constituting a separate factor. In this model, the Perceptual Aberration, Magical Ideation, and social anxiety Scales loaded on a positive schizotypy factor, while the Revised Social and Physical Anhedonia Scales loaded on a negative symptom/anhedonia factor. The model was also recomputed with social anhedonia cross-loading on positive schizotypy. Neither model produced adequate fit (all fit indices < .90 and RMSEA > .10). The distributions of scores for the schizotypy scales depart from normality (Chapman, Chapman, & Kwapil, 1995). Following the recommendation of Wilcox and Muska (2001), the confirmatory factor analyses were computed using bootstrap procedures. The analyses were computed using 1000 bootstrap samples, and the difference (bias) between the original coefficients and the bootstrapped coefficients was determined. All of the bootstrap samples were usable and the bias was minimal for the standardized regression weights (bias range: -0.005 to 0.005) and the correlation coefficients (-0.013 to -0.008). The results of the bootstrap analyses support the findings of the original analyses.

DISCUSSION
DIMENSIONS OF SOCIAL DYSFUNCTION IN SCHIZOTYPY
The present study examined the relationship between self-reported social anxiety and social anhedonia and their associations with positive and negative schizotypy. Researchers examining social dysfunction in schizotypy and schizophrenia have often failed to distinguish between social anhedonia and social anxiety. However, social anxiety and anhedonia appear to represent different patterns of dysfunction that have different implications

regarding the etiology, course, nature, and treatment of impairment across the continuum of schizotypy and schizophrenia-spectrum disorders (e.g., Kashdan, 2004; Kwapil et al., 2008; Vittengl & Holt, 1998).

The present findings indicate that social anhedonia and social anxiety are separate constructs and that these aspects of social impairment are differentially associated with underlying dimensions of schizotypy. Social anhedonia is associated with emotional deficits (especially in positive affect), whereas social anxiety is associated with an excess of negative affect in social contexts. These findings are consistent with reports that positive affect and negative affect are independent factors with specific characteristics and patterns in daily life (e.g., Goldstein & Strube, 1994; Watson, 2000). The modest relationship between social anxiety and social anhedonia was not surprising given that low scores on both scales represent relatively healthy social functioning. Furthermore, participants' willingness to acknowledge social problems likely contributed in part to this association. The findings also suggest that the relationship between social anxiety and anhedonia is mediated in part by self-reported symptoms of positive schizotypy, given that social anhedonia is modestly associated with positive, as well as negative schizotypy. Removal of variance associated with positive schizotypy significantly diminished, but did not eliminate, the relationship between social anxiety and anhedonia. It was also predicted that socially anhedonic people would be less likely to experience marked social anxiety, resulting in a curvilinear relationship between the constructs. Consistent with this hypothesis, this relationship was characterized by both curvilinear and linear components.

The confirmatory factor analyses supported a two-factor solution for schizotypy, with social anxiety represented as a separate dimension. Furthermore, the confirmatory factor analyses did not support the idea that social anxiety and anhedonia form a general social impairment factor. These findings are consistent with the fact that social anxiety is central to or comorbid with a number of disorders, and is not a unique feature of schizotypy. In contrast, trait-like social anhedonia appears to be more central to schizotypy, as evidenced by the confirmatory factor analyses. Social anhedonia as measured by the Revised Social Anhedonia Scale appears to represent dysfunction distinct from that seen in mood disorders. Clearly, depression can involve disinterest in social contact and withdrawal. However, anhedonic symptoms in depression tend to be limited to the depressive episodes. Furthermore, participants identified by high scores on the Revised Social Anhedonia Scale do not report elevated rates of depressive disorders in either cross-sectional or longitudinal assessments (e.g., Kwapil, 1998).

Although the present study suggests that both types of social dysfunction share some variance with positive schizotypy, results from the confirmatory factor analyses indicate that social anxiety is more strongly associated with positive symptom schizotypy, consistent with findings by Lewandowski et al. (2006) that self-reported symptoms of anxiety and depression are more strongly associated with positive schizotypy than with negative schizotypy. This supports the notion that positive schizotypy and social anxiety are characterized by affective dysregulation and elevated levels of negative affect, while social anhedonia is characterized by a diminution of affect.

The three-factor model in which the Revised Social Anhedonia Scale loaded exclusively on the negative schizotypy factor along with the Physical Anhedonia Scale provided poorer fit than the final model in which the Revised Social Anhedonia Scale loaded on both the positive and negative schizotypy factors. These findings are consistent with the modest positive correlation of the Revised Social Anhedonia Scale with measures of positive schizotypy reported in the literature (e.g., Lewandowski et al., 2006), and with interview assessments of participants identified by deviantly high scores on the scale. Kwapil (1998) reported that socially anhedonic college students exhibited elevated rates of psychotic symptoms and schizophrenia-spectrum disorders at a ten-year follow-up assessment. Similarly, Diaz et al. (2003) reported that social anhedonia participants exceeded control participants on interview ratings of both negative and psychotic-like (positive) symptoms. Nevertheless, these counterintuitive, but replicated, findings leave the question of whether this can best be understood conceptually (i.e., the nature of the construct of social anhedonia and its relationship to dimensions of schizotypy) or methodologically (i.e., the extent to which the scale actually assesses the construct). It may well be that the Revised Social Anhedonia Scale is a better multidimensional measure of schizotypy than a pure

measure of the negative dimension. Note that the present findings that the confirmatory factor analyses only identified positive and negative dimensions of schizotypy should not imply that there are only two factors underlying the construct. Positive and negative symptom dimensions are the most widely reported factors of schizotypy and schizophrenia; however, our focus on these factors admittedly reflects the nature of the measures administered.

CLINICAL IMPLICATIONS OF THE PRESENT FINDINGS
The present study indicates that schizotypic traits are associated with social dysfunction, consistent with the impairment seen in schizophrenia. This raises clinical concerns because social impairment in nonpsychotic people with schizotypy may serve both as a marker of premorbid impairment and as a stressor that contributes to the transition into schizophrenia-spectrum disorders. Poor premorbid functioning is often characterized by social withdrawal and disinterest. While the expressed emotion literature suggests that not all social contact is beneficial, social contact generally provides a number of protective features that socially anhedonic people may lack. This is especially problematic for schizotypic people who are beginning to experience prodromal symptoms, such as unusual beliefs and perceptual experiences, because they may fail to seek social support and clinical intervention. Kwapil (1998) found that social anhedonia predicted the development of schizophrenic-spectrum disorders in an undergraduate sample at a 10-year follow-up assessment, despite levels of baseline dysfunction similar to controls. The deterioration of the socially anhedonic group may reflect, in part, the participants moving from structured social environments (parents' home and college) to environments lacking inherent social support.

It remains unclear the extent to which symptoms of social anxiety serve as an early indicator of schizotypy predictive of the development of spectrum disorders, given that social anxiety likely develops and worsens as a consequence of paranoid ideation and social rejection. The expression of negative affect tends to be associated with a more favorable prognosis in patients with schizophrenia, as is primarily positive-symptom schizophrenia, although the combination of positive and negative symptoms is associated with the most severe outcomes. However, the presence of depression and anxiety in premorbid or prodromal schizotypy appears to increase the risk of transition into psychosis (e.g., Yung et al., 2003). This suggests that, while positive symptoms and their correlates may be indicative of a better prognosis for patients with schizophrenia, the distress associated with social anxiety may contribute to the development of clinical psychosis. The present findings suggest that the assessment of social impairment should aid in the early identification of people at risk for schizophrenia and spectrum disorders. Furthermore, early intervention strategies should address specific patterns of social dysfunction.

REFERENCES
American Psychiatrie Association. (1980). Diagnostic and statistical manual of mental disorders (3rd edition). Washington, OC: Author.
American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders (4th edition-text revision). Washington, DC: Author.
Anderson, J.C., & Gerbing, D.W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. Psychometrika, 49,155-173.
Andreason, NC. (1999). A unitary model of schizophrenia: Bleuler's fragmented "phrene" as schizencephaly. Archives of General Psychiatry, 56,781-793.
Arndt, S., Alliger, R.J., & Andreasen, N.C. (1991). The distinction of positive and negative symptoms. The failure of a two-dimensional model. The British Journal of Psychiatry, 158,317-322.
Bentall, R.P., Claridge, G.S., & Slade, P.D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. British Journal of Clinical Psychology, 28, 363-375.
Bentler, P.M., & Bonnet, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin, 88, 588606.
Bentler, P.M., & Chou, CP. (1987). Practical issues in structural equation modeling. Sociological Methods of Research, 16, 78-117.
Bilder, R.M., Mukherjee, S., Rieder, R.O., & Pandurangi, A.K. (1985). Symptomatic and neuropsychological

components of defect states. Schizophrenia Bulletin, 11,409-419.

Bleuler, E.P. (1950). Dementia praecox or the group of schizophrenias (J. Zinkin, Trans.). New York: International Universities Press. (Original work published 1911)

Brown, L.H., Silvia, P.J., Myin-Germeys, L, & Kwapil, T.R. (2007). When the need to belong goes wrong: The expression of social anhedonia and social anxiety in daily life. Psychological Science, 19, 778-782.

Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In L.M. Collins & J.L. Horn (Eds.), Testing structural equation models (pp. 136-162). Thousand Oaks, CA: Sage.

Chapman, L.J., & Chapman, J.P. (1983). Infrequency Scale. Unpublished test (copies available from T.R. Kwapil, Department of Psychology, University of North Carolina at Greensboro, Greensboro, NC 27402-6170).

Chapman, L.J., Chapman, J.P., & Kwapil, T.R. (1995). Scales for the measurement of schizotypy. In A. Raine, T. Lencz, & S. Mednick (Eds.). Schizotypal personality disorder. Cambridge, England: Cambridge University Press.

Chapman, L.J., Chapman, J.P., Kwapil, T.R., Eckblad, M., & Zinser, M.C. (1994). Putatively psychosis-prone subjects 10 years later. Journal of Abnormal Psychology, 103,171-183.

Chapman, L.J., Chapman, J.P., & Miller, E.N. (1982). Reliabilities and intercorrelations of eight measures of proneness to psychosis. Journal of Consulting and Clinical Psychology, 50,187-195.

Chapman, L.J., Chapman, J.P., & Raulin, M.L. (1976). Scales for physical and social anhedonia. Journal of Abnormal Psychology, 85,374-382.

Chapman, L.J., Chapman, J.P., & Raulin, M.L. (1978). Body image aberration in schizophrenia. Journal of Abnormal Psychology, 87,399-407.

Claridge, G., McCreery, C, Mason, O., Bentall, R., Boyle, G., Slade, P., & Popplewell, D. (1996). The factor structure of "schizotypal" traits: A large replication study. British Journal of Clinical Psychology, 35,103-115.

Diaz, M.A., Dickerson, L.A., & Kwapil, T.R. (2003). A two-year follow-up assessment of schizotypic young adults. Schizophrenia Research, 60,167-168.

Eckblad, M.L., & Chapman, LJ. (1983). Magical ideation as an indicator of schizotypy. Journal of Consulting and Clinical Psychology, 51,215-225.

Eckblad, M.L., Chapman, L.J., Chapman, J.P., & Mishlove, M. (1982). The Revised Social Anhedonia Scale. Unpublished test (copies available from T.R. Kwapil, Department of Psychology, University of North Carolina at Greensboro, P.O. Box 26170, Greensboro, NC 27402-6170).

Fleeson, W., Malanos, A.B., & Achille, N.M. (2002). An intraindividual process approach to the relationship between extraversion and positive affect: Is acting extraverted as "good" as being extraverted? Journal of Personality and Social Psychology, 83,1409-1422.

Goldstein, M.D., & Strube, M. (1994). Independence revisited: The relation between positive and negative affect in a naturalistic setting. Personality & Social Psychology Bulletin, 20,57-64.

Gooding, D.C., & Iacono, W.G. (1995). Schizophrenia through the lens of a developmental psychopathology perspective. In DJ. Cohen & D. Cicchetti (Eds.), Developmental psychopathology (pp. 535-580). New York: John Wiley &Sons.

Gottesman, I.I. (1991). Schizophrenia genesis: The origins of madness. San Francisco: Freeman.

Kashdan, T.B. (2004). The neglected relationship between social interaction anxiety and hedonic deficits: Differentiation from depressive symptoms. Anxiety Disorders, 18,719-730.

Kraepelin, E. (1919). Dementia praecox and paraphrenia. Edinburgh, Scotland: Livingstone. (Original work published 1913)

Kwapil, T.R. (1998). Social anhedonia as a predictor of the development of schizophrenia-spectrum disorders. Journal of Abnormal Psychology, 107, 558-565.

Kwapil, T.R., Silvia, PJ., Myin-Germeys, L, Anderson, AJ., Coates, S.A., & Brown, L.H. (2008). The social worlds of the socially anhedonic: Exploring the daily ecology ofasociality. Manuscript submitted for publication.

Lewandowski, K.E., Barrantes-Vidal, N., Nelson-Gray, R.O., Clancy, C, Kepley, H.O., & Kwapil, T.R. (2006). Anxiety and depression symptoms in psychometrically identified schizotypy. Schizophrenia Research, 83, 225-235.

Liddle, P.F. (1987). The symptoms of chronic schizophrenia: A re-examination of the positive-negative dichotomy. British Journal of Psychiatry, 151, 145-151.

Little, T.D., Cunningham, W. A., Shahar, G., & Widaman, K.F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. Structural Equation Modeling. 9,151-173.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test the significance of the mediated effect. Psychological Methods, 7,83-104.

Mason, O., Claridge, G., & Williams, L.M. (1997). Questionnaire measurement of schizotypy. In G. Claridge (Ed.), Schizotypy: Implications for illness and health. Oxford: Oxford University Press.

Mattick, R.P., & Clarke, J.C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. Behaviour Research and Therapy, 36,455-470.

Meehl, P.E. (1962). Schizotaxia, schizotypy, schizophrenia. American Psychologist, 17, 827-838.

Meehl, P.E. (1990). Toward an integrated theory of schizotaxia, schizotypy, and schizophrenia. Journal of Personality Disorders, 4,1-99.

Pallanti, S., Quercioli, L., & Hollander, E. (2004). Social anxiety in outpatients with schizophrenia: A relevant cause of disability. American Journal of Psychiatry, 161,53-58.

Peralta, V., Cuesta, MJ., & de Leon, J. (1992). Positive versus negative schizophrenia and basic symptoms. Comprehensive Psychiatry, 33,202-206.

Rado, S. (1956). Psychoanalysis of behavior. New York: Grune & Stratton.

Raine, A., Lencz, T., & Mednick, S.A. (Eds.). (1995). Schizotypal personality. New York: Cambridge University Press.

Raine, A., Reynolds, C, Lencz, T., Scerbo, A., Triphon, N., & Kim, D. (1994). Cognitive-perceptual, interpersonal and disorganized features of schizotypal personality. Schizophrenia Bulletin, 20,191-201.

Reynolds, CA., Raine, A., Mellingen, K., Venables, P.H., & Mednick, S.A. (2000). Three-factor model of schizotypy: Invariance across culture, gender, religious affiliation, family adversity, and psychopathology. Schizophrenia Bulletin, 26, 603-618.

Robins, L.N., et al. (1984). Lifetime prevalence of specific psychiatric disorders in three sites. Archives of General Psychiatry, 41,949-958.

Stefanis, N.C., Hanssen, M., Smirnis, N.K., Avramopoulos, D.A., Evdokimidis, I.K., Stefanis, CN., Verdoux, H., & Van Os, J. (2002). Evidence that three dimensions of psychosis have a distribution in the general population. Psychological Medicine, 2, 347-358.

Stefanis, N.C, Smyrnis, N., Avramopoulos, D., Evdokimidis, L, Ntzoufras, L, & Stefanis, CN. (2004). Factorial composition of self-rated schizotypal traits among young males undergoing military training. Schizophrenia Bulletin, 30, 335-350.

Torgersen, S., Skre, L, Onstad, S., Edvardsen, J., & Kringlen, E. (1993)."True" schizotypal personality disorder: A twin study. American Journal of Psychiatry 150, 1661-1667.

Tsuang, M.T., Stone, W.S., & Faraone, S.V. (2000). Toward reformulating the diagnosis of schizophrenia. American Journal of Psychiatry, 157, 1041-1050.

Venables, P.H., & Bailes, K. (1994). The structure of schizotypy, its relation to subdiagnoses of schizophrenia and to sex and age. British Journal of Clinical Psychology, 33, 277-294.

Vittengl, J. R., & Holt, C. S. (1998). A time-series study of mood and social interaction. Motivation and Emotion, 22, 255-275.

Vollema, M.G., & Hoijtink, H. (2000). The multidimensionality of self-report schizotypy in psychiatric populations: An analysis using multidimensional Rasch models. Schizophrenia Bulletin, 26, 565-575.

Vollema, M.G., & van den Bosch, RJ. (1995). The multidimensionality of schizotypy. Schizophrenia Bulletin, 21, 19-31.

Watson, D. (2000). Mood and temperament. New York: Guilford.

Wilcox, R. R., & Muska, J. (2001). Inferences about correlations when there is heteroscedasticity. British Journal of Mathematical and Statistical Psychology, 54, 39-47.

Yung, A.R., Phillips, L.J., Yuen, H.P., Francey, S.M., McFarlane, CA., Hallgren, M., & McGorry, P.D. (2003). Psychosis prediction: 12-month follow up of a high-risk ("prodromal") group. Schizophrenia Research, 60, 21-32.