

ABSTRACT

Title of Thesis: REFINING THE PSYCHOMETRIC HIGH-RISK PARADIGM:
EXAMINING NEGATIVE SYMPTOM TRAITS FOR THE
IDENTIFICATION OF SCHIZOTYPY

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Research supports social anhedonia's significance as a schizotypy indicator. However, social anhedonia is only one of several negative symptoms demonstrating an important relationship with premorbid functioning, medication response, and prognosis in schizophrenia. Despite these findings, the psychometric assessment of schizophrenia has focused primarily on social anhedonia. Negative symptom research indicates that avolition, apathy, and diminished emotional expression might be useful to include as potential schizotypy indicators. This thesis examined the relationship between social anhedonia and other negative symptom-related traits, in a college sample using factor analysis and taxometric analyses. Social anhedonia loaded on the same factor as diminished emotional expression and (low) positive affect and this factor was independent of a factor comprised of positive symptom traits (perceptual aberrations and magical ideation). Despite the strong relationship between social anhedonia and the

negative symptom traits, these other measures were not associated with the taxon identified by the RSAS.

REFINING THE PSYCHOMETRIC HIGH-RISK PARADIGM: EXAMINING
NEGATIVE SYMPTOM TRAITS FOR THE IDENTIFICATION OF SCHIZOTYPY

by

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CHAPTER 1. INTRODUCTION

Social anhedonia, the decreased capacity to experience pleasure from social relationships, is considered a core trait of schizophrenia and is thought to be a characteristic evident in those at risk for the development of this disorder (Meehl, 1962). Social anhedonia has been studied as a potential marker for the genetic liability for schizophrenia. As reviewed below, this research has been promising in that the questionnaire-based assessment of social anhedonia has identified individuals who are likely to develop schizophrenia-spectrum disorders (Kwapil, 1998). Unfortunately, the measurement of anhedonia-related characteristics has remained unchanged for over 20 years. This may be a significant problem, as our understanding of those characteristics associated with schizophrenia has expanded greatly in the last two decades. Specifically, the empirical literature within schizophrenia now clearly indicates that social anhedonia is but one characteristic within a constellation of related features (i.e., the negative symptoms; Andreasen, 1982).

In this thesis, it is argued that the psychometric high-risk paradigm needs to be expanded beyond the sole reliance on social anhedonia to include instruments that may tap a broader array of characteristics associated with schizophrenia proneness. Specifically, it is hypothesized that the assessment of individual differences related to negative symptoms other than social anhedonia (e.g., avolition, apathy, blunted affective expression) may be useful. We administered a battery of self-report questionnaires (from existing measures and new ones developed for the purposes of this research) to a college

sample in order to examine the convergent validity of negative-symptom-related characteristics in a nonclinical sample. Correlational and factor analyses were conducted to evaluate whether anhedonia does indeed converge with these negative symptom traits. The latent structure of negative-symptom-related characteristics was also examined to determine if it identifies a latent class of individuals consistent with the conjecture that these measures are core indicators of a taxon (Meehl, 1962) presumed to be that of schizophrenia proneness.

Chapter 1 begins with an introduction containing essential background information regarding the importance of social anhedonia and schizotypy in relation to schizophrenia, leading into a discussion of the significance of genetic factors in schizophrenia. Subsequently, existing psychometric measures of schizophrenia proneness are reviewed. Following this review, the limitations of current measures are addressed with a focus on the negative symptoms of schizophrenia. Chapter 2 describes the rationale for the current study, while Chapter 3 addresses methodological issues. The analyses and results are discussed in Chapter 4. Finally, Chapter 5 includes a discussion of the strengths and limitations of the current study, along with future directions for research.

Historical Discussion

Historically, deficits in the experience of emotion have been noted in schizophrenia. Social anhedonia, the inability to experience pleasure from social interactions, has long been identified as a central feature of the disorder. Kraepelin (1913, 1919) and Bleuler (1911, 1950) were among the earliest researchers to associate this apparent lack of desire for social contact, termed *asociality*, with a condition leading

to schizophrenia. However, they did not assign a central role to the loss of the experience of pleasure, and viewed it as only one in many symptoms describing an individual with schizophrenia. The clinical observations of Hoch (1910) and Kretschmer (1925) also pointed to a pattern of social withdrawal that appeared to characterize preschizophrenic individuals. Rado (1956) considered social anhedonia to be central in the development of schizophrenia. He proposed that anhedonia is a genetically transmitted defect that manifests itself in schizophrenics as well as “schizotypes”, those who display psychotic symptoms, although these symptoms do not develop into full-blown schizophrenia. This defect, according to Rado, restricts the normal experience of pleasure from social contact, including sexual function and interpersonal relationships. It also prevents joy of living, along with feelings of affection, love, and self-esteem. Rado’s theory was later expanded upon by Meehl (1962), who assigned even greater importance to the presence of anhedonia in schizophrenia.

Meehl’s Theory of Schizotypy

Meehl (1962, 1989), a proponent of the genetic basis of schizophrenia, coined the term “schizotaxia”, a neural integrative defect that appears to underlie this disease. He proposed that every nerve cell in the central nervous system of certain individuals was damaged and that this damage seriously impeded a person’s ability to function in a normal manner. Meehl further conjectured that schizotaxia inevitably leads to schizotypy, a personality exhibiting characteristics such as ambivalence, anhedonia (inability to experience pleasure), cognitive slippage, and interpersonal aversiveness.

Although he later minimized the role of anhedonia in his theory of schizotypy, proposing that “hypohedonia is one of a dozen normal-range (nontaxonic) individual

difference factors (dimensions) that raise or lower the probability of decompensation (Meehl, 1990, p.24), Meehl did not provide empirical support for this change in view. He postulated that the presence of several potentiators in an individual increases the likelihood that they will be diagnosed with a disorder. Meehl (1989) further stated that approximately 10% of schizotypal individuals would develop schizophrenia, if they were affected by a combination of genetic predispositions to certain traits (e.g., introversion, hypohedonia, anxiety) and negative life experiences (e.g., devastating occurrences in childhood or adulthood). Thus, a majority of schizotaxic individuals will never develop schizophrenia, although they may exhibit schizotypal personality traits. Meehl's theory of the genetic basis of schizophrenia led to considerable research supporting his assertion.

Social Anhedonia and Schizophrenia

Meehl (1962) observed that social anhedonia appeared to recur in schizophrenia, and described it as one of the most consistent and compelling signs of the disorder. Further research (Berenbaum & Oltmanns, 1992; Blanchard, Mueser, & Bellack, 1998; Chapman et al, 1976) has found that elevated social anhedonia is a replicable finding in schizophrenia. Although this behavioral sign is also associated with mood disorders, it is transient and prone to fluctuation; in schizophrenia, however, social anhedonia is an enduring trait which remains stable over time and is independent of symptom status (Blanchard, Horan, & Brown, 2001).

The Genetic Findings

The 'diathesis-stress model', which states that the interaction of a genetic predisposition to schizophrenia and an environmental stressor elevates a person's likelihood of developing the disorder, is commonly endorsed by researchers in the field

(Chapman & Chapman, 1996; Gottesman, 1991; Meehl, 1962). Twin studies provide the strongest support for this theory, as monozygotic twins of schizophrenics develop schizophrenia 45-50% of the time (Gottesman, 1991). As concordance rates of schizophrenia are considerably higher in monozygotic than dizygotic twins, there is clearly a genetic diathesis.

A number of reports have provided support for Meehl's theory of schizotypy, demonstrating a familial-genetic relationship between schizophrenia-spectrum personality disorders and schizophrenia such that biological relatives of schizophrenia patients have shown increased rates of these disorders (Gottesman, 1991; Kendler, 1988; Kety, Rosenthal, Wender, & Schulsinger, 1968; Parnas et al., 1993). These findings have been replicated in adoption studies (Kendler, Gruenberg, & Strauss, 1981; Kety et al., 1968) as well as family studies (Kendler et al., 1993).

Kety (1987) has shown that the incidence of schizophrenia-spectrum disorders in offspring is five times higher when both biological parents have schizophrenia. Further, relatives of individuals with schizophrenia consistently exhibit uncontrolled and antisocial behaviors; they also tend to be described as "eccentric, schizophrenia-like, and withdrawn" (Chapman & Chapman, 1994; Kendler, Thacker, & Walsh, 1996). A substantial portion of monozygotic twins of schizophrenia patients exhibit social isolation, in addition to experiencing interpersonal difficulties (Shields, Gottesman, & Hall, 1977).

In a landmark investigation of the prevalence of schizophrenia in the biological and adoptive parents, siblings, and half-siblings of individuals with schizophrenia, Kety et al. (1968) observed the presence of certain schizophrenia-like syndromes,

characterized by cognitive distortions, feelings of depersonalization, and physical and social anhedonia. Schizophrenia-related disorders had a 10% prevalence rate among the biological relatives of adopted individuals with schizophrenia, which was significantly higher than the rates among the relatives of control families. Further, in a modified replication of the previous study, Kendler et al. (1981) found that their results supported those of Kety et al. (1968), namely, that the biological relatives of individuals with schizophrenia exhibit schizophrenia-like syndromes at a significantly higher rate than relatives of controls.

In an extension of Kety's (1968) research, Kendler et al. (1981) conducted an independent analysis of the Copenhagen Sample of the Danish Adoption Study of Schizophrenia. He found a significantly higher prevalence of schizotypal personality disorder in biological relatives of adopted schizophrenics than in biological relatives of controls. Kendler et al. (1993) in the Roscommon Family Study provided further evidence supporting the genetic model. It was found that the lifetime prevalence of schizotypal personality disorder in the relatives of schizophrenic probands (6.9%) was significantly greater than in the relatives of controls (1.4%); however, relatives of probands with schizotypal personality disorder, psychotic affective illness, and nonpsychotic affective disorders did not differ from relatives of controls (Kendler et al., 1993). Additionally, Kety (1987, 1988) has shown that the occurrence of schizophrenia-spectrum disorders is considerably higher when offspring have two biological parents with a schizophrenia-spectrum disorder.

Relatives of probands with schizophrenia not only exhibit higher rates of the disorder; they display more social anhedonia as well. Two studies have found that social

anhedonia is elevated in relatives of individuals with schizophrenia. Katsanis, Iacono, & Beiser (1990) found social anhedonia to be more prevalent in first-degree relatives of individuals with schizophrenia and in relatives with psychotic affective disorders than in nonpsychiatric controls. Further, utilizing data from the Roscommon Family Study, Kendler et al. (1996) discovered that elevated social anhedonia scores were a significant predictor of proband diagnosis in relatives of schizophrenia patients compared with relatives of controls.

In summary, the above research clearly points to the heritability of schizophrenia. This research further shows that although relatives of individuals with schizophrenia may not evidence the full disorder, a range of characteristics is present, including those in the DSM diagnoses of schizotypal personality disorder. Finally, social withdrawal and social anhedonia appear to be present in those individuals at known genetic risk for the disorder. These findings are consistent with Meehl's (1962) theory of schizotypy and specifically support the importance of social anhedonia in identifying schizotypes.

Psychometric Measures in the Assessment of Schizophrenia Proneness

Given the above findings in support of Meehl's theory, a practical consideration is how to detect these traits that are associated with schizotypy. In identifying a low base rate phenomenon (conjectured to be 10% for schizotypy), the development of questionnaires is ideal because these measures can be used to rapidly screen a large number of individuals at minimal cost. The following paragraphs review some of the questionnaires developed for use in a psychometric high-risk paradigm (i.e., the research strategy of using self-reported traits to identify individuals at heightened risk for psychopathology).

The primary measures designed to assess schizophrenia proneness were developed by Loren and Jean Chapman and are based on Meehl's (1962) theory of schizotypy (Chapman et al., 1976; Chapman, Chapman, & Raulin, 1978; Eckblad & Chapman, 1983). Rather than developing a single scale, the Chapmans' designed five different psychometric measures to identify high-risk individuals. Each measure was intended to distinguish traits found to be associated with schizophrenia, including anhedonia, perceptual aberrations, magical ideation, and a lack of conformity to societal norms. Coefficient alphas for each of the scales were in the .80s, and test-retest reliabilities had ranges of .75 to .85 (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994).

The Physical Anhedonia Scale (Physical Anhedonia; Chapman et al., 1976), originally a 40-item measure, was revised (Revised Physical Anhedonia Scale; Chapman & Chapman, 1978) and now consists of 61 items measuring a deficit in the experience of pleasure derived from taste, touch, sight, and smell. Example items include "Beautiful scenery has been a great delight to me (keyed false)", and "It has often felt good to massage my muscles when they are tired or sore (keyed false)."

Second, the Social Anhedonia Scale (Social Anhedonia; Chapman et al., 1976) is a 48-item true-false scale assessing a deficit in pleasure from interpersonal sources. A revised version of this self-report measure (Revised Social Anhedonia Scale; Eckblad, Chapman, Chapman & Mishlove, 1982) excluded items tapping social anxiety and focuses on a schizoid lack of interest in social interaction. This true/false inventory contains 40 items measuring a deficit in interpersonal relationships (e.g., "Having close

friends is not as important as many people say” (keyed true), and “If given the choice, I would much rather be with others than be alone” (keyed false).

Third, the Perceptual Aberration Scale (Chapman et al., 1978), a 35-item true-false self-report measure, assesses schizophrenia-like distortions and perceptions of one’s own body and surroundings. Example items include “Sometimes I have felt that I could not distinguish my body from other objects around me” (keyed true) and “I have sometimes felt that some part of my body no longer belongs to me” (keyed true).

Fourth, the Magical Ideation Scale (Eckblad & Chapman, 1983) is a 30-item true-false instrument that measures unconventional beliefs about causation that are considered invalid by the dominant culture. Example items include “Sometimes I have felt that I could not distinguish my body from other objects around me” (keyed true) and “I have sometimes felt that some part of my body no longer belongs to me” (keyed true).

Finally, the Impulsive Non-Conformity Scale (Chapman et al., 1984) consists of 51 true-false items designed to assess impulsivity, lack of empathy, and failure to abide by societal norms. Example items include “When I want something, delays are unbearable (keyed true)”, and “I always let people know how I feel about them, even if it hurts them a little” (keyed true).

The results of a major 10-year longitudinal study provide the most compelling evidence regarding the validity of these measures as indicators of schizophrenia proneness (Chapman, Chapman, Kwapil, Eckblad & Zinser, 1994). Chapman et al. (1994) administered their measures to a large sample of undergraduates, identified extreme scorers on each scale, and conducted clinical assessments at baseline and at 10-year follow-up. Results indicated that the Physical Anhedonia Scale and Impulsive Non-

Conformity Scale did not predict the development of schizophrenia or psychosis. Interestingly, perceptual aberration and magical ideation did not specifically predict schizophrenia but did predict the development of other psychotic disorders and a range of other forms of psychopathology (Chapman et al., 1994). Elevated social anhedonia scores appeared to interact with magical ideation to predict the highest rates of psychosis (21%) as compared to the other groups.

In an extension of the previous study, Kwapil (1998) investigated the ability of the Revised Social Anhedonia Scale to predict the development of schizophrenia-spectrum disorders, independent of the Magical Ideation Scale. At 10-year follow-up, analyses indicated that high scorers on the Revised Social Anhedonia Scale showed higher rates of schizophrenia-spectrum disorders (24%) than any other group, in addition to poorer overall functioning. Additionally, only the Revised Social Anhedonia Scale predicted full-blown schizophrenia-spectrum disorders, thereby supporting the use of social anhedonia as a predictor of schizophrenia proneness (Kwapil, 1998).

Consistent with the findings from the Chapmans' longitudinal work, other research has found that social anhedonia is elevated in those at known genetic risk for schizophrenia. As reviewed earlier, Kendler et al. (1996) found that elevated scores on a shortened version of the Revised Social Anhedonia Scale were able to differentiate relatives of probands with schizophrenia from relatives of controls, in addition to relatives of patients with nonaffective psychoses, psychotic affective illnesses, and nonpsychotic affective illnesses.

In addition to studying how social anhedonia is predictive of schizophrenia-spectrum disorders, investigators have sought to examine the latent structure of this

construct. Recall that Meehl (1962) proposed that schizotypy was a taxon or latent class of individuals (a distinct subgroup in the general population that has the schizogene). Meehl conjectured that this taxon had a base rate of approximately .10 (Meehl, 1989, 1990). Given his theoretical conjectures, Meehl developed analytic procedures that permit one to a) determine if the latent structure of a set of indicators is taxonic rather than just dimensional, and b) determine what the base rate of this taxon is. Using these taxometric procedures, Blanchard, Gangestad, Brown, & Horan (2000) discovered that social anhedonia demonstrated a taxonic structure with a base rate similar to that conjectured for schizotypy (approximating 10%). Thus, it appears that these findings are consistent with Meehl's conjecture of a latent class of individuals who are predisposed to developing schizophrenia.

Limitations of Social Anhedonia

Although research has shown social anhedonia to be a promising indicator of Meehl's theory of schizotypy (Blanchard et al., 2001; Kwapil, Miller, Zinser, Chapman, & Chapman, 1997; Chapman, et. al., 1994; Katsanis, Iacono, Beiser, & Lacey, 1992), there are limitations in its ability to predict schizophrenia proneness. While individuals reporting social anhedonia exhibit elevated rates of schizophrenia-spectrum disorders, only a minority eventually develop clinical psychosis (Kwapil, 1998). One possible explanation is that although social anhedonia appears to be a reliable indicator of schizophrenia proneness, other factors also impact the development of psychopathology.

Another consideration is that social anhedonia measures only one aspect of a broader domain and thus may provide a limited index of key characteristics of schizotypy. Research in schizophrenia suggests that social anhedonia may be related to

other negative (Andreasen, 1982) or deficit (Carpenter, 1988) symptom characteristics including alogia (poverty of speech), avolition (decreased motivation), and blunted affect (restricted facial and emotional expressiveness) (Johnstone, Owens, Frith, & Crow, 1986; Andreasen, 1982; Bleuler, 1950; Kraepelin, 1919). A brief literature review will establish the importance of negative symptoms in schizophrenia.

Negative Symptoms in Schizophrenia

Bleuler, who coined the term “schizophrenia” in 1950, described a number of pathognomonic symptoms that appeared to be present in each schizophrenia patient. He identified symptoms such as abnormalities in association, affect, ambivalence, relationship to reality, attention, volition, and sense of identity as fundamental to schizophrenia. Subsequent research has supported his observations and has established the importance of negative symptoms in the disorder (Crow, 1980; Earnst & Kring, 1997; Perlick, Mattis, Stastny, & Silverstein, 1992).

Negative features represent the loss of some normal function (Johnstone et al., 1986) and are characterized by blunted affect (lack of expression), alogia, avolition-apathy (lack of motivation/desire for goal-directed activities), and anhedonia-asociality (inability to experience pleasure from social or physical stimuli) (DSM-IV; APA, 1994). Blunted affect, commonly observed in schizophrenia, occurs as facial immobility and an apparent lack of overt expression. A person with blunted affect consistently has poor eye contact, limited body language, and a clearly diminished range of emotional expressiveness, as measured by facial displays and vocal intonations (DSM-IV; APA, 1994). Alogia (poverty of speech) is reflected by brevity of speech. An individual with alogia tends to communicate with short and often uninformative comments, possibly

signifying emptiness of thought (DSM-IV; APA, 1994). Avolition-apathy is characterized by lack of energy, decreased interest in daily activities, and lowered personal drive/motivation. A person with this characteristic has a difficult time initiating or completing tasks, attending to his/her personal appearance, or seeking or maintaining employment/engaging in schoolwork (Andreasen, 1982). A person who demonstrates anhedonia or asociality does not derive pleasure from social interactions. This is manifested by a disinterest in other people.

The neurologist Hughlings-Jackson (1931) equated the brain's organization to that of an onion, where each new layer represented an increase in civilization and higher-order functioning. Jackson related his theory to schizophrenia, suggesting that positive symptoms such as delusions and hallucinations emerged when a higher cortical regulator had been lost and the activity from a lower level erupted out of control. Conversely, negative symptoms represented the loss of higher centers in the brain. Further research has made an important distinction between these features; namely, that although they are manifestations of the same disease, they result from different biological processes (Crow, 1980), respond differently to medication (Bogerts, Falkai, Degreef, & Lieberman, 1991; Perlick et al., 1992), and have a different prognosis. While the biological processes underlying positive symptoms are potentially reversible, those underlying negative features are not (Johnstone et al., 1986; Ovchinnikov, 1968). Evidence for the efficacy of antipsychotic drugs has been established (Brier et al., 1994; Buchanan, Breier, Kirkpatrick, Ball, & Carpenter, 1998); however, these studies merely assessed the overall improvement of positive, depressive, and/or extrapyramidal symptoms (Marder, & Meibach, 1994; Rosenheck et al., 1997; Rosenheck et al., 1999). A considerably smaller

number of studies have examined whether overall improvement includes primary negative symptoms, or if only secondary negative symptoms are ameliorated (Kirkpatrick, Buchanan, Ross, Carpenter, 2001). Finally, Strauss, Carpenter, & Bartko (1974) suggested that while positive symptoms often fluctuate, disorders of personal relationships and negative symptoms are more fundamental and stable, and thus have important prognostic implications.

In an analysis of the agreement across negative symptom scales, Fenton & McGlashan (1992) found high rates of concordance, suggesting that they identified a specific construct. Factor analytic studies are often conducted in order to determine whether negative symptoms reflect a common factor and one that is distinct from positive symptoms. A number of exploratory factor analyses have identified three separate and distinct factors that commonly manifest themselves in schizophrenia: a negative factor, a positive factor, and a disorganization factor (Andreasen et al., 1995; Malla, Norman, Williamson, Cortes, & Diaz, 1993a; Thompson & Meltzer, 1993). Similarly, confirmatory factor analyses have supported the existence of a three-factor model to define the structure of schizophrenia (Brekke, DeBonis, & Graham, 1994; Cuesta & Peralta, 1995; Smith, Mar, & Turoff, 1994).

While positive and negative symptoms were originally thought to have a negative (Andreasen & Olsen, 1982) or positive relationship (Kay, 1987), a considerable amount of evidence has found them to be uncorrelated (Johnstone, Owens, Gold, Crow, & Macmillan, 1981; McKenna, Lund, & Mortimer, 1989). Further, research has shown that there is no difference in the severity of positive and thought disorder symptoms in deficit and nondeficit patients (Carpenter et al., 1988). It appears that no relationship exists

between the deficit/nondeficit distinction and positive and thought disorder symptoms (Carpenter et al., 1988; Gur et al., 1991; Ribeyre et al., 1994).

Clinical Significance of Negative Symptoms

The significance of negative symptoms in schizophrenia can be best understood as they relate to other aspects of schizophrenia (Earnst & Kring, 1997). A link has been established between negative symptoms and poor premorbid, social, occupational, and sexual functioning (Addington & Addington, 1993; Levitt, Shenton, McCarley, Faux, & Ludwig, 1994; Peralta, Cuesta, & DeLeon, 1995). Mukherjee, Reddy, & Schnur (1991) demonstrated a relationship between difficulties in social functioning, flat affect, and poverty of speech in adolescence. Based on their findings, they were also able to propose an association between attentional impairment, poverty of content of speech, and poor performance in school. Relatedly, DeLeon, Peralta, & Cuesta (1993) found that flat affect and poverty of speech are more highly correlated with poor premorbid functioning than the other negative symptoms.

Empirical research has documented the relationship between negative symptoms and neurotransmitters (Earnst & Kring, 1997). Patients with more severe negative symptoms have been found to have lower cerebrospinal homovanillic acid levels (Lindstrom, 1985; Pickar et al., 1990), and it has been proposed that decreased prefrontal dopamine activity may lead to negative symptoms (Weinberger, 1987). Negative symptoms have been implicated in the identification of cognitive impairment, unsatisfactory response to antipsychotic medication, and poor prognosis (Bogerts et al., 1991; Perlick et al., 1992). In addition, a correlation between negative symptoms and structural brain abnormalities has been identified. Negative symptoms appear to be

associated with decreased frontal metabolism. Positron emission tomography (PET) studies have found that patients with schizophrenia demonstrate decreased activity in the frontal lobe (Andreasen et al., 1992; Buchsbaum, 1990). Animal studies show that frontal lesions produce social withdrawal and deficits in emotion similar to the responses observed in humans with lesions in the same area (Wolkin et al, 1992). Several PET studies have documented a correlation between negative symptoms and decreased frontal metabolism (Schroder, Buchsbaum, Siegel, Geider, & Niethammer, 1995; Siegel et al, 1993). Relatedly, neuropsychological performance appears to be correlated with negative symptoms, as demonstrated by poor performance on tests designed to measure frontal lobe functioning and tests tapping domains such as attention, memory, and nonverbal recognition tasks (Bilder & Goldberg, 1987; Perlick et al., 1992).

A more recent refinement to the study of negative symptoms has been the identification of primary, enduring negative symptoms that are unrelated to other factors and are stable across clinical status. Carpenter et al. (1988) first conceptualized the idea of the existence of a separate and distinct disease within the schizophrenia syndrome. They proposed that a subgroup of individuals with schizophrenia manifest enduring and idiopathic negative symptoms (e.g., negative symptoms not due to secondary factors such as medication, social withdrawal resulting from paranoia, depression, or intensive focus on positive symptoms). The distinction is an important one, as both primary and secondary negative symptoms manifest themselves in the same way despite very different causes. Carpenter et al. (1988) based their deficit syndrome concept on the avolitional process in schizophrenia described by Kraepelin in 1971. Symptoms such as restricted affect, diminished emotional range, poverty of speech, curbing of interests, diminished

sense of purpose, and diminished social drive comprise the deficit syndrome (Carpenter et al., 1988). It is estimated that approximately 15% of first-episode and 25-30% of more chronic schizophrenia patients belong to the deficit syndrome of schizophrenia (Kirkpatrick, Buchanan, Ross, & Carpenter, 2001).

Deficit schizophrenia, consisting of individuals with primary, enduring negative symptoms that are idiopathic to the illness rather than to secondary factors, appears to be related to greater social and physical anhedonia, decreased depression, less suicidal ideation and severe delusions, as compared to nondeficit schizophrenia. In addition, deficit schizophrenia patients exhibit less paranoia, substance abuse, and awareness of dyskinetic movements (Kirkpatrick et al., 2001). The deficit syndrome is also characterized by more frequently exhibited dyskinetic movements (Fenton & McGlashan, 1994), decreased likelihood of close interpersonal relationships (Fenton & McGlashan, 1992), greater cognitive impairments (Buchanan et al., 1994), poorer social and occupational functioning (Kirkpatrick et al., 1996), and less response to new-generation antipsychotic medications as compared to nondeficit and positive schizophrenia (Lieberman et al., 1994; Miller, Perry, Cadoret, & Andreasen, 1994). Thus, it appears that patients with deficit syndrome symptoms have a more severe course of illness and a poorer prognosis than nondeficit patients.

A genetic link has been established in deficit schizophrenia. Research has shown higher rates of schizophrenia in the relatives of deficit schizophrenia patients, as compared to relatives of probands with nondeficit schizophrenia (Dollfus, Ribeyre, & Petit, 1996; Kirkpatrick et al., 2001). In addition, social withdrawal has been observed to be considerably more severe in relatives of deficit schizophrenia patients, and individuals

with a deficit syndrome sibling are three times more likely to have the deficit rather than the nondeficit subtype themselves (Kirkpatrick, Ross, Walsh, Karkowski, & Kendler, 2000). Therefore, it appears that further study of the enduring, idiopathic symptoms of schizophrenia will prove beneficial.

In summary, social anhedonia is part of a larger group of negative symptoms. Deficits in affect, motivation, attention, and speech have also been identified by a number of researchers as fundamental to schizophrenia. Factor analytic studies suggest that these characteristics reflect a common factor that is independent from positive symptomatology, and research provides evidence that individuals with one negative symptom are likely to exhibit other negative symptoms as well. A link has also been established between negative symptoms and poor prognosis, medication response, and general functioning.

Summary of Current Knowledge

The significance of social anhedonia in relation to schizophrenia has been well supported. Considerable evidence suggests that it appears to be a valuable indicator of schizophrenia proneness. However, social anhedonia is only one of a constellation of negative symptoms. Numerous investigations have supported the importance of negative symptoms in schizophrenia, primarily relating to premorbid functioning, medication response, and prognosis. Research also supports the assertion that individuals who exhibit one negative symptom are likely to manifest others as well. Despite these findings, the psychometric assessment of schizophrenia has remained unchanged over the last 20 years and has focused primarily on social anhedonia. Psychometric measures designed to

assess a number of negative symptom-related characteristics may prove more useful than those designed to measure a single characteristic.

CHAPTER 2. RATIONALE

The present study sought to develop a broader assessment of negative-symptom-related characteristics for use in psychometric high-risk studies. The clinical literature on negative symptoms indicates that characteristics including avolition, apathy, and blunted or diminished emotional expression might be useful to include with social anhedonia as potential indicators of schizotypy. As will be discussed below, a review of existing personality scales was conducted to identify promising measures that might tap the negative symptom domain. In those instances where an existing measure could not be identified, an effort was made to develop a scale that would comprise item content that is similar to the negative symptom interviews. These measures were administered with the Revised Social Anhedonia Scale to a large college sample.

The psychometric characteristics of these scales were analyzed to assess whether the individual scales showed adequate reliability (internal consistency). Subsequently, correlational and factor analyses were conducted to determine: a) if the measures identified a single negative symptom-related factor; and b) if this factor was independent of other non-negative characteristics (such as the positive schizotypy traits of perceptual aberration and magical ideation). Finally, a series of taxometric analyses were conducted to examine the latent structure of negative-symptom related characteristics. If these negative-symptom characteristics tap schizotypy, then Meehl's (1962) theory would predict that a taxonic structure would be evident with a base rate approximating that expected for schizotypy (e.g., 10%). The current study is the first investigation to incorporate the use of other negative symptom measures with social anhedonia measures to identify individuals at risk for developing schizophrenia.

Summary of Study Aims

1. To examine the psychometric properties of the individual measures to determine reliability.
2. To conduct correlational and factor analyses to determine whether putative negative symptom indicators seem to identify a common factor and are independent of positive symptom characteristics.
3. To conduct taxometric analyses to determine whether indicators of negative symptoms identify a latent class or taxon with a base rate approximating 10%.

CHAPTER 3. METHODOLOGY

Subjects were selected from the PSYC 100 pool at the University of Maryland, College Park (UMCP). Participants were administered a self-report measure containing questions related to their thoughts, feelings, interests, and social preferences. This study received approval from the Institutional Review Board at UMCP in October 2002. Selection and recruitment was independent of race and gender.

Participants

605 undergraduates enrolled in an introductory psychology course at the University of Maryland, College Park participated in the study (See Table 1 for demographic information). Participants accessed the Experimetrix scheduling system online, viewed the posted experiment, and enrolled on an electronic sign-up form.

Each subject completed a 184-item self-report questionnaire (individual scales and items summarized below). Written and oral consent were obtained before administration of the measure. Following completion of the questionnaire, participants were fully debriefed as to the nature of the study. References for local mental health services were available if necessary. Each subject received 1 hour of research credit.

Procedures and Measures

Characteristics such as deficits in emotional expression, lack of desire for interpersonal contact, and the absence of goal motivation and interest in daily activities—termed negative symptoms—have been commonly identified in schizophrenia (Bleuler, 1919; DSM-IV; APA, 1994; Kraepelin, 1913, 1919). Although inventories have been developed to measure these specific features (Scale for the Assessment of Negative Symptoms; Andreasen, 1981; Positive and Negative Symptom Scale; Kay, Fiszbein, &

Olper, 1987; Schedule for the Deficit Syndrome; Kirkpatrick, Buchanan, McKinney, Alphas, & Carpenter, 1989), they were designed to be administered in an interview format, rather than as self-report instruments. Therefore, an extensive literature search was conducted to locate existing self-report measures that seemed to tap these negative symptom constructs.

The search engine “PsycINFO” was used to conduct a general search of the words “schizophrenia, negative symptoms, avolition, alogia, blunted affect, negative affect, and schizotype”. Additionally, a review was conducted of the work of major theorists in the negative symptom domain of schizophrenia (e.g., Andreasen, 1981; Bleuler, 1911; Crow, 1980; Kirkpatrick, 2001; Kraepelin, 1919; Meehl, 1962). However, although valuable and informative, these articles did not contain or reference self-report measures of negative symptoms. The next step was to conduct a comprehensive review of the personality literature with the intent of finding scales that appeared to measure individual constructs reflected within the negative symptom domain. Again utilizing PsycINFO, the words “avolition, goals, motivation, striving, interest, boredom, satisfaction, alogia, speech, silence, negative affect, affective flattening, blunted affect, emotion, emotional expression, five-factor model” etc., were each extensively researched, with encouraging results. Although no scale currently exists for the measurement of alogia (poverty of speech), several others tapping the remaining negative symptom constructs of avolition, apathy, and blunted affect were discovered, and will be briefly discussed in the next section. Other negative symptoms required the development of new self-report scales. Each negative symptom construct and its proposed self-report measurement is described below.

Basis for Selection and Development

Two well-validated inventories measure the negative and deficit syndrome constructs, respectively. The Scale for the Assessment of Negative Symptoms (Andreasen, 1981) and the Schedule for the Deficit Syndrome (Kirkpatrick et al., 1989) assess the symptom factors via observation and questioning conducted by the interviewer. These instruments were used as a guide in the selection and development of the self-report measures of the negative symptom constructs. The names of the negative symptom domains are slightly different in the two scales; however, descriptions of the domains are similar and will be elaborated upon in the following paragraphs. Table 2 provides an overview of the Scale for the Assessment of Negative Symptoms and the Schedule for the Deficit Syndrome.

Assessment of Negative Symptoms

Affective Flattening-Blunting

Diminished emotional expression is a core feature of negative symptoms. As summarized in Table 2 affective flattening, or blunting, is described by the Scale for the Assessment of Negative Symptoms as a decrease in spontaneous movement, facial expression, and eye contact. The Schedule for the Deficit Syndrome refers to a paucity of facial expression in the subscale Restricted Affect, and the interviewer is required to rate his perception of the interviewee's range of expressiveness and vocal inflection.

In the current study, blunted emotional expression was measured by the Emotional Expressivity Scale (Kring, Smith, & Neale, 1994; see Appendix A), a 17-item true/false self-report questionnaire. Example items include, "I am often considered indifferent by others (keyed true)" and "I can't hide the way I'm feeling" (keyed false).

Reliability of the Emotional Expressivity Scale has been found to be extremely high, with $\alpha = .91$ as an average across seven administrations (Kring et al., 1994). The test-retest correlation after four weeks was .90. In a study by Kring et al. (1994), the Emotional Expressivity Scale showed considerable convergent validity when it demonstrated positive relationships with other measures of expressiveness (i.e., Big Five; McCrae & Costa, 1987; Satisfaction With Life Scale; Diener, Emmons, Larsen, & Griffin, 1985; Affect Intensity Measure; Larson, 1984; Family Expressiveness Questionnaire; Halberstadt, 1986). The Emotional Expressivity Scale is also high in discriminant validity, as it is unrelated to conceptually different constructs such as self-esteem, agreeableness, or culture (Kring et al., 1994). Finally, in a study evaluating the correlation between facial expression as observed on videotape and self reported expressivity (Kring et al., 1994), a significant positive relationship between the two was found. This suggests that individuals who display more facial expressions are also more likely to report higher levels of general expressiveness, thus supporting the Emotional Expressivity Scale as an accurate measure of general expressivity.

Diminished Emotional Range

In addition to deficits in emotional expression, Carpenter et al. (1988) considers lack of emotional experience as a feature of the deficit syndrome. Although not assessed directly in the Schedule for the Assessment of Negative Symptoms, diminished emotional range is described by the Schedule for the Deficit Syndrome as a deficit in the intensity and range of emotional experience. Questions such as “Do other people seem to enjoy things more than you do?” and “Tell me about something that happened to make you

happy—what did that feel like?” are designed to address the realm of diminished emotional range.

Research suggests that diminished trait positive affectivity may be a particularly important feature of the deficit syndrome, while increased negative affectivity is not (Horan & Blanchard, 2003). Specifically, positive affectivity is lower in deficit vs. nondeficit schizophrenia, while negative affectivity is elevated in both. Further, evidence has supported a broad correlation between positive affect and the frequency of pleasant events, social activity, and interpersonal satisfaction experienced by an individual (Watson, Clark, & Tellegen, 1988). Similar decreases in positive affectivity have been found in social anhedonics (Gooding, Davidson, Putnam, & Tallent, 2002).

The General Temperament Survey (Clark & Watson, 1990) is a self-report measure that assesses personality traits and that consists of 3 primary scales: Positive Temperament, Negative Temperament, and Disinhibition. To assess the positive affect domain, the 11-item Positive Affectivity subscale (see Appendix B) contained in the Positive Temperament scale was used. The Positive Affectivity subscale measures enthusiasm and enjoyment of life. It contains items such as “I am usually enthusiastic about the things that I do” (keyed true) and “I can easily find ways to liven up a dull day” (keyed true). While psychometric data are not available for this subscale, it is a part of the Positive Temperament scale, which has demonstrated high internal consistency reliabilities (.86; Watson & Clark, 1991b) and has showed high stability coefficients (.72; Watson & Clark, 1991b) over a two-month interval. The Positive Temperament Scale is also high in convergent validity, in that it only measures constructs that appear to cluster within the domain (i.e., extraversion, joviality, self-assurance, attentiveness) and does not

measure those with which it is unrelated (i.e., negative affectivity, disinhibition; Watson & Clark, 1991b).

Anhedonia

The Scale for the Assessment of Negative Symptoms includes a number of items tapping the anhedonia-asociality realm. These items include questions regarding an individual's interests, activities, social relationships, and desire for intimacy and closeness. Relatedly, the Schedule for the Deficit Syndrome analyzes diminished social drive (the degree to which an individual desires social interaction) with questions assessing desire to be alone and initiation of social activities.

Social anhedonia was measured with the existing Revised Social Anhedonia Scale (Eckblad et al., 1982; see Appendix C). This is a 40-item true-false self-report questionnaire designed to assess diminished pleasure derived from interpersonal sources. The original Social Anhedonia Scale (Chapman et al., 1976) was revised to eliminate items measuring social anxiety and to focus on those assessing schizoid withdrawal (Mishlove & Chapman, 1985). Example items from the Revised Social Anhedonia Scale include: "If given the choice, I would much rather be with others than be alone" (keyed false), and "I attach very little importance to having close friends" (keyed true). The Revised Social Anhedonia Scale has demonstrated good internal consistency and discriminant validity (Blanchard et al., 1998; Chapman, Chapman, & Miller, 1982; Mishlove & Chapman, 1985) and high test-retest reliability over a 90-day period (Blanchard et al., 1998). Interview-based reports of current social withdrawal, isolation, and less enjoyment from interpersonal sources are also related to high scores on the

Revised Social Anhedonia Scale; therefore, the construct validity of this scale is supported (Mishlove & Chapman, 1985).

Avolition-Apathy

Avolition-apathy is a broad domain containing a number of related constructs such as impersistence and anergia.

Impersistence

The Scale for the Assessment of Negative Symptoms identifies this construct as a failure to complete tasks at work or school. Similarly, the Diminished Sense of Purpose subscale in the Schedule for the Deficit Syndrome seeks to determine the extent to which a person fails to initiate or sustain goal-directed activity due to inadequate drive, and the degree to which a person posits goals for his/her life. An impersistent individual may have difficulty finding or keeping a job; if a student, there may be a pattern of dropping courses before completion, failing to attend classes, and neglecting to do homework. Further, it is improbable that s/he will have goals for which s/he is actively working to achieve.

To tap this domain involving a decrease in goal orientation, we used the Achievement Scale (see Appendix D) from the Multidimensional Personality Questionnaire (Tellegen & Waller, in press), a personality measure that is considered by some scholars to be the best representation of the major dimensions in individual personality and that has excellent convergent and discriminant validity (Church and Burke, 1994). The Achievement Scale is a 21-item measure assessing personal striving and fulfillment of goals and has been shown to have excellent structural integrity (Church & Burke, 1994). Example items include statements like: “People say that I drive myself

hard” (keyed true), and “Striving for excellence means more to me than almost anything else” (keyed true).

Physical anergia

Physical anergia is described by both the Scale for the Assessment of Negative Symptoms and the Schedule for the Deficit Syndrome as a deficit in spontaneous activity. An individual with physical anergia finds him/herself unable to initiate activities and engages primarily in mindless, physically inactive tasks for long periods of time. A 10-item Anergia Scale (see Appendix E), which measures individual sense of purpose and activity, was created for this study. Example items include “I spend much of my time watching TV or playing computer games when I should be working” (keyed true), and “Most anytime I would rather sit and daydream than do anything else” (keyed true). This scale differs from the Achievement Scale in that it measures time spent in directionless pastimes rather than focusing on the actual accomplishment of goals.

Curbing of Interests

Although somewhat related to avolition-apathy, interest is assessed differently in the Schedule for the Deficit Syndrome. This construct is identified by the degree to which a person is interested in day-to-day activities and the world around him/her. Sample questions include “What do you find interesting?” and “Can you tell me about a big news story you’ve heard recently?”

To evaluate this tendency, the Interest Scale (see Appendix F), a 7-item instrument assessing interest in daily activities, was developed. Examples from the Interest Scale include “I don’t keep up with the news” (keyed true) and “I have so many interests, I don’t have time to do everything” (keyed false).

Alogia

Alogia entails poverty of speech, poverty of content of speech (i.e., little information conveyed despite adequate amount of words, due to vagueness, repetition, or clichéd speech), and increased latency of response. While both the Scale for the Assessment of Negative Symptoms and the Schedule for the Deficit Syndrome measure this construct, assessment is dependent on interviewer ratings, and at this time it is unclear how to measure an individual's ability to determine the amount of information s/he conveys to others. This difficulty is reflected in that there are currently no self-report inventories that measure alogia or that provide instruction on ways to tap this domain; therefore, it will not be addressed in this study.

Assessment of Positive Symptoms

Positive symptoms such as delusions and hallucinations have been said to occur when cortical regulators in the brain are lost and the activity from a lower level erupts out of control (Hughlings-Jackson, 1931). Conversely, negative symptoms have been described as a deficit in normal functioning. A goal of the current study was to determine whether negative symptom traits cohere and describe a common construct and if this factor is independent of the positive symptom characteristics. To that end, the Magical Ideation Scale (Eckblad & Chapman, 1983; see Appendix G) was used to identify individuals who may be at risk for psychotic and mood disorders. The Magical Ideation Scale is a 30-item true-false questionnaire that measures belief in forms of causation that are considered invalid and magical, such as "I have sometimes felt that strangers were reading my mind" (keyed true). Validation of the Magical Ideation Scale as a measure of invalid magical beliefs comes from findings that individuals who received high scores on

this scale combined with the Revised Social Anhedonia Scale received significantly higher ratings of psychotic-like experiences and schizotypal symptoms than controls (Chapman et al., 1994; Kwapil et al., 1997). The combination of the two instruments appears to identify psychosis-prone individuals before they decompensate into psychosis (Chapman et al., 1994).

The Perceptual Aberration Scale (Chapman et al., 1978; see Appendix H) assesses psychosis-proneness. This 35-item scale consists of 28 true-false items that tap into distortions in perceptions regarding one's own body and 7 true-false items that tap into other perceptual distortions. Example items include "Sometimes I have felt that I could not distinguish my body from other objects around me" (keyed true) and "I have sometimes felt that some part of my body no longer belongs to me" (keyed true). Validation of the Perceptual Aberration Scale as a measure of perceptual distortions comes from findings that high scorers exceed controls on a number of psychotic-like experiences such as thought transmission, passivity experiences, aberrant beliefs, social withdrawal, and a composite score for schizotypal features (Chapman, Edell, & Chapman, 1980; Edell & Chapman, 1979).

Invalidity Scale

The Infrequency Scale (Chapman & Chapman, unpublished; see Appendix I) consists of 13 true-false items that are endorsed in one direction by most respondents and was used to assess invalid responding. Aberrant endorsements of several items suggest an invalid response pattern (e.g., "I find that I often walk with a limp, which is the result of a skydiving accident" (keyed false). Consistent with the guidelines proposed by the

Chapmans' (unpublished scale; see Appendix I), invalid responders were defined as participants who received a score of 3 or higher on the Infrequency Scale.

CHAPTER 4. RESULTS

Overview

The purpose of this study was to broaden the psychometric method through which schizotypy is assessed by incorporating negative symptom-related characteristics in addition to social anhedonia. The internal consistency of each of the measures (Cronbach's alpha) was examined first. Following that, correlational analyses were conducted to assess the relationship between the measures, specifically to determine if social anhedonia was correlated with other putative negative symptom traits. Next, factor analyses were employed to determine if negative symptom traits formed a common factor independent of positive symptoms. Finally, taxometric methods were used to examine the latent structure of the negative-symptom scales. 605 undergraduates participated in the current study. However, information from 79 (13%) students was eliminated based on invalid responding; thus, the total N was 526 (See Table 1).

Analyses

Internal Consistency

Chronbach's alphas were computed to assess the internal consistency of the scales (see Table 3 for descriptive data for each scale). The Revised Social Anhedonia, Perceptual Aberration, Magical Ideation, Emotional Expressivity, and Achievement scales demonstrated high internal consistencies, with alphas of .81 or higher. The Positive Affectivity Scale demonstrated an adequate validity of .77. One of the two newly created negative symptom measures, the Anergia Scale, achieved an acceptable alpha of

.63. However, the Interest Scale contained 7 items and demonstrated an unacceptably low alpha (.30). This raised concerns regarding the usefulness of this measure. Because of its low alpha, the Interest Scale was not included in subsequent analyses.

Correlational Analysis

Correlational analyses were conducted to examine the relationship between social anhedonia and each individual scale (see Table 4). A trend was observed such that the positive symptoms generally demonstrated low to modest correlations with social anhedonia (i.e., Perceptual Aberration, $r = .32$; Magical Ideation, $r = .18$) and high correlations with each other ($r = .67$). As expected, the Revised Social Anhedonia Scale showed significant negative correlations with the Emotional Expressivity ($r = -.54$) and Positive Affectivity ($r = -.50$) scales, suggesting that people who feel little desire for social relationships are also likely to report that they are less expressive and have low positive affectivity. The Revised Social Anhedonia Scale was moderately correlated with the Anergia Scale ($r = .32$). This signified a lack of motivation and direction in individuals who report feeling a limited need for relationships with others. Interestingly, the relationship between the Revised Social Anhedonia and Achievement Scales ($r = -.04$) was not significant. This may indicate that individuals who report low desire for interpersonal contact are not necessarily likely to report low levels of achievement as well.

Unlike social anhedonia, Magical Ideation and Perceptual Aberration only demonstrated weak correlations with Emotional Expressivity and Positive Affectivity. This suggests that these positive symptom traits are unrelated to affective domains in the current sample.

Factor Analysis

Factor analyses were conducted to determine whether the negative symptom traits cohere and describe a common construct and if this factor was independent of the positive symptom characteristics. An initial principal-components analysis yielded an eigenvalue scree suggestive of 3 factors. Factors were extracted using principal-axis factoring and oblimin rotated. Thus, we identified scales on the basis of a 3-factor solution. Eigenvalues were 1.0 or higher, and accounted for 70.6% of the variance in the matrix (See Table 5).

Results indicated that Anergia and Achievement, atypical with expectations, loaded on a factor separate from the other negative symptom scales. They comprised the dimension interpreted as Motivation and Involvement in Daily Activities. The Magical Ideation and Perceptual Aberration Scales loaded on the second factor and were interpreted as Positive Symptoms. Scales loading on the third factor included the Emotional Expressivity, Social Anhedonia, and Positive Affectivity Scales. This dimension was interpreted as Deficits in Emotion and Social Relationships.

These findings indicate that negative symptoms comprise a clear factor distinct from the positive symptom traits. The results also suggest that the negative symptom domain can be split into two categories, one relating to personal striving and ambition and the other relating to emotional experience.

Taxometric Analysis

Overview

While results from correlational and factor analyses indicated that social anhedonia shares a relationship with positive emotionality and negative symptom characteristics, the question as to whether a latent taxon indicative of schizotypy exists in this population still remained. To address this question, two taxometric procedures were implemented. First, MAXCOV (Maximum Covariance; Meehl, 1973) analyses were conducted in an attempt to replicate previous studies and determine whether the Revised Social Anhedonia Scale was able to identify a taxon in the data. Second, the Revised Social Anhedonia Scale was paired with each individual Negative Symptom Scale and MAMBAC (Mean Above Minus Below A Cut; Meehl & Yonce, 1994) analyses were employed to assess whether the combination of measures would prove effective in identifying a taxon.

MAXCOV

MAXCOV analyses, which require at least three indicators, were utilized to determine whether the data measured a latent taxon or dimension and then to estimate the taxon base rate. In this procedure, one indicator is selected as an “input variable”. Equal-interval cuts are made along the input variable to create subsamples. Within the subsamples, covariances between a pair of other indicators (“output variables”) are computed. When indicators covary due to their ability to discriminate two taxa, the covariance between the output variables will vary as a function of intervals on the input variable. Specifically, the maximum covariance should exist in the interval most closely approximating an equal mix of the two latent taxa (the HITMAX interval); small covariances should exist in intervals of near-pure samples of members of one taxon or the complement taxon (see Meehl, 1973; Meehl & Golden, 1982; Meehl & Yonce, 1996).

For taxonic indicators, covariance curves take on a distinctive peak at the point of maximum covariance. For purely dimensional data, covariance peaks are not identifiable and covariance plots are either flat or inconsistently peaked.

Because all possible indicators can be used as an input variable, MAXCOV can be applied to multiple combinations of input and output variables. If true taxa underlie the indicators, results should corroborate one another. All intervals represent single scores on the input variable, except the most extreme high interval.

Base Rate Estimates

MAXCOV-HITMAX allows estimation of the base rates of the latent taxa. Consistency of these estimates is a crucial aspect of the taxometric procedures. If true taxa underlie the indicators, the taxometric results should be coherent and, hence, all base rate estimates should be fairly similar. If no true taxa exist, it would be highly surprising that different covariance curves would yield consistent base rate estimates and, therefore, consistent base rate estimates strongly corroborate a taxonic model (e.g., Meehl, 1995a).

When the base rates of the two taxa in the full population are skewed no more than 20/80, the HITMAX interval will generally not be an extreme one and, hence, the covariances as a function of input intervals will peak somewhere in the middle of the distribution. When base rates are highly skewed (with one base rate $<.10$), however, the HITMAX interval may be an extreme interval and the covariance curve may slope sharply upward toward one end of the distribution (Meehl, 1995a). Korfine & Lenzenweger (1995) found extreme HITMAX intervals in their taxometric analyses of the Physical Anhedonia Scale (Chapman et al., 1978), consistent with a low base rate taxon.

Identification of a Taxon: Revised Social Anhedonia Scale

In order to examine the latent structure of social anhedonia, at least three indicators are needed; however, only one scale was being utilized. To test this scale, a strategy previously used by Blanchard et al. (2000) was adopted, in which the Revised Social Anhedonia Scale was analyzed in an attempt to determine whether the construct it measured was taxonic or dimensional. In the study, principal-components analysis of the Revised Social Anhedonia Scale items indicated four factors. The first factor was interpreted as pertaining to a domain signifying a Lack of Importance of Close Friends. The five items loading on this factor included “I attach very little importance to having close friends” (keyed true) and “Having close friends is not as important as many people say” (keyed true). The second dimension, consisting of 7 items, was called Lack of Involvement with Others, and contained items such as “I think that people too often assume that their daily activities and opinions will be interesting to me” (keyed true) and “People often expect me to spend more time talking with them than I would like” (keyed true). “If given a choice, I would much rather be with others than be alone” (keyed false) and “I prefer hobbies and leisure activities that do not involve other people” (keyed true) were examples of the 8 items loading on the third factor, Preference for Being Alone. The fourth dimension, Lack of Emotional Attachment, included 8 items like “I feel pleased and gratified as I learn more and more about the emotional life of my friends” (keyed false) and “I sometimes become deeply attached to people I spend time with” (keyed false). Internal consistency reliabilities ranged from .57 (Lack of Emotional Attachment) to .70 (Preference for Being Alone).

In the current study, the same four factors of the Revised Social Anhedonia Scale were used to assess whether they identified a taxon in the data. One indicator was selected as an “input variable”, with 3 possible pairs of output variables associated with each input variable. Figure 1 shows the covariance curves and base rates for each of the four factors used as an input variable. For these graphs, covariances for the possible combinations of output variables were averaged and, hence, each data point represents three covariances. As too few cases (fewer than 25) had the highest possible scores on each variable to obtain a reliable covariance estimate, extreme scorers were combined for the most extreme interval.

The current study replicated previous data in that in all plots the covariance curve slopes upward to the right end of the scale, a result consistent with a low-base-rate taxon. Base rates were somewhat higher than earlier studies have found, with a range of .09 to .19. The mean of .15 represents the best estimate of the base rate.

MAMBAC

MAMBAC (Meehl, 1995; Meehl & Yonce, 1996) was utilized to examine the taxonicity of the Revised Social Anhedonia Scale and each negative symptom measure. If a taxon was detected, MAXCOV analyses would then be used to determine whether they obtained results similar to the MAMBAC results. However, if the data did not indicate the presence of a taxon, the MAXCOV procedure would not be necessary.

In MAMBAC, indicator pairs are used with each serving as an input variable. Cases are sorted based on scores from the input variable and a sliding cut is then moved across this input variable. Differences on the second (output) indicator are examined between the mean of cases above a cut and the mean of cases below the cut. Two

MAMBAC curves are computed for each pair of indicators with each serving as an input indicator. Taxonic results show a clear convex upward appearance or a steep rightward sweeping peak in lower base rate conditions. Nontaxonic results are indicated by a concave or dish-shaped curve (Meehl, 1995).

In the MAMBAC curves presented in Figure 2, no taxometric curves were evident or consistent with a low base rate taxon. The curves for the Revised Social Anhedonia and Anergia Scale were ambiguous and therefore uninterpretable, and the remaining curves clearly failed to show the concave pattern associated with taxonicity.

Additionally, base rate estimates varied widely, with values ranging from .33 to 1.00; again, this is a result better accounted for by dimensionality and not taxonicity. In summary, MAMBAC with the Revised Social Anhedonia Scale and each individual scale indicated a nontaxonic structure.

CHAPTER 5. DISCUSSION

Social anhedonia has been established as a putative indicator of schizotypy and is a replicable finding in schizophrenia. However, social anhedonia is only one of a number of negative symptom characteristics that has been observed in schizophrenia. In this study, we sought to determine if negative symptom traits (such as reduced emotional expression, avolition, anergia) and social anhedonia jointly identified a taxon with a base rate approaching that conjectured by Meehl (1962) for schizotypy (i.e., 10%). If obtained, such a finding might indicate that the addition of other negative symptom trait measures to the established Revised Social Anhedonia Scale would improve the psychometric identification of schizotypy.

First, it was necessary to examine the psychometric properties of the individual measures to determine internal consistency. This step was essential because low internal consistency (i.e., .40 or lower) may indicate inadequate measurement of the dimension that the scale was intended to assess. The current study found adequate levels of internal consistency for each scale except the Interest Scale, which was subsequently eliminated from the analyses.

Next, correlational analyses were conducted to assess the relationship between the Revised Social Anhedonia Scale and the other negative symptom trait measures. The finding that the Revised Social Anhedonia Scale was moderately correlated with the Anergia Scale supported literature identifying amotivation as a negative symptom trait commonly observed in high social anhedonia scorers as well as individuals exhibiting

other traits in the negative symptom domain (DSM IV; APA, 1994; Kirkpatrick & Buchanan, 1990). Correlational analyses also revealed a strong negative relationship between the Revised Social Anhedonia, Emotional Expressivity, and Positive Affectivity Scales. This is consistent with previous findings examining the expression of emotion in schizophrenia, which indicate a disjunction between the experience, expression, and self-report of emotion. In a study of emotional experience and expression in schizophrenia and depression, Berenbaum & Oltmanns (1992) found that while their subjective experience of emotion was the same, schizophrenics were significantly less expressive than controls. Further, evidence from Blanchard, Bellack, & Mueser (1994) demonstrated a negative association between physical anhedonia and trait positive affect in schizophrenia and schizoaffective patients. Additional research assessed physiological and emotional responding and the accuracy of self-reported trait affectivity in a study of socially anhedonic and normal undergraduates (Gooding et al., 2002). Results from this study indicated that social anhedonics were more likely to report considerably lower positive affect and higher negative affect than controls even if their physiological responses did not differ.

A modest correlation was found between the Revised Social Anhedonia Scale and the Perceptual Aberration and Magical Ideation Scales. Thus, it appears that social anhedonia is associated with affective traits, while the positive schizotypy scales are not. This further supports the divide between the negative and positive symptom domain, as documented by numerous studies (Andreasen et al., 1995; Malla et al., 1993a; Thompson & Meltzer, 1993). Finally, the relationship between the Revised Social Anhedonia and

Achievement Scales was not significant, indicating that those who do not desire interpersonal relationships will not necessarily report low levels of achievement as well.

Third, factor analyses were employed to examine whether the negative symptom scales identified a common construct that was separate from the positive symptom domain. Consistent with and extending numerous previous studies (Andreasen et al., 1982; Eaton et al., 1995), these results indicated a 3-factor solution, and made a distinction between the positive and negative symptom factors. The segregation between these domains has been well-established, and this replication of prior research establishes the validity of the negative symptom scales. The negative symptom domain was split into two categories, one addressing motivation/interest in daily activities, and one describing overall emotional experience. This finding was surprising because this study's hypotheses assumed that all of the negative symptoms would be highly correlated with one another. Additionally, although recent evidence has pointed to a divide in the negative symptom domain (Kulhara & Avasti, 2003), it has not been a commonly reported finding. The current study suggests that a distinction can be made between negative symptoms as they relate to emotional expression and social relationships and negative symptoms as they relate to lethargy and motivation.

Finally, taxometric procedures were employed to a) replicate present findings that the Revised Social Anhedonia Scale can identify a schizotypy taxon in the population, and b) to analyze the ability of the negative symptom scales to identify a latent class or taxon with a base rate approximating 10%. Results from the current study indicated that the latent structure of social anhedonia was taxonic. This was an important finding, as it replicated research conducted by Blanchard et al. (2000), in which analyses showed the

construct measured by the Revised Social Anhedonia Scale to be taxonic with a base rate approximating .10. As such, this study provides further support for the Revised Social Anhedonia Scale as an accurate measure of schizotypy. The higher base rates that were found in the current study may be attributed to the relatively small sample size, and to the truncated range of responses.

Contrary to expectations, the current study did not support the ability of the Negative Symptom Scales to identify a taxon in the population. Specifically, although a relationship exists between social anhedonia and the other negative symptom trait measures, these additional measures do not appear to be taxonic indicators. Thus, we cannot conclude that the Negative Symptom Scales improve the ability of the Revised Social Anhedonia Scale to identify a latent taxon indicative of schizotypy in the population.

Limitations of the Present Study

A limitation to the study concerns the sample that was used. First, comparison to previous studies indicates that a total N of 526 is relatively small for taxometric purposes (Blanchard et al., 2000). Due to the reduced number of high-range scorers, it was necessary to combine responses from several response categories into one category, thus resulting in the problem of overestimated base rates. Lower base rates might have been obtained in a larger sample. Second, the current study utilized a non-probabilistic college sample. Prior research has shown that individuals in college are considerably higher-functioning and exhibit less pathology than community samples (Newman, Moffitt, Caspi, & Silva, 1998; Robins et al., 1984), suggesting that the generalizability of results may be limited. It would be useful to determine through further studies whether the same

results would be obtained if a larger undergraduate sample or a community sample was used.

A further limitation is that independent assessments of clinical status were not utilized in the current study. Specifically, because diagnostic interviews were not used to assess the presence of pathology in the participants, it is unclear whether the Revised Social Anhedonia Scale identified a taxon that is truly schizotypy or whether it merely identified participants who endorsed negative symptomatology (i.e., depressed individuals). To address this question, future research might incorporate structured or semi-structured interviews into the study design to eliminate participants with affective disorders that may complicate the interpretation of the results.

Directions for Future Research

The finding in this study, namely that the Negative Symptom Scales do not improve the ability of the Revised Social Anhedonia Scale to identify a taxon indicative of schizotypy, suggests interesting directions for future study. Given that previous research identifies several negative symptom traits in schizotypy (Andreasen, 1982; Rado, 1956; Meehl, 1962, 1989), the finding that only social anhedonia was able to identify individuals with this predisposition was unexpected.

The use of a college sample in the current study may have limited the generalizability of the results. However, it is difficult to state with certainty that the inability of the Negative Symptom Scales to expose a taxon was due to the use of an unrepresentative undergraduate population because the Revised Social Anhedonia Scale identified a taxonic structure in the same population. One reason for this result may be that the Revised Social Anhedonia Scale has been shown by a number of studies to demonstrate a high level of validity, while the newly-created Negative Symptom Scales

are being examined for the first time in this study and may lack sufficient discriminability. Future research might utilize a more representative community sample in an effort to determine whether more pronounced motivational and affective traits are present and whether these traits will prove more useful in identifying a latent taxon indicative of schizotypy.

Finally, while the Negative Symptom Scales utilized in the current study may not be taxonic indicators, it is interesting that Social Anhedonia was found to be related to Emotional Expressivity and Positive Affectivity, and that all of these traits loaded on a common factor. It is possible that these other negative symptoms are dimensional indicators that could potentiate schizotypy outcome. Prior research has shown that only a small percentage of schizotypes eventually decompensate into schizophrenia (Kwapil, 1998). Perhaps a future study could employ a longitudinal design to evaluate whether these other affective traits potentiate clinical outcomes. Specifically, it might be useful to investigate whether social anhedonics who display lower emotional expressivity and positive affectivity ultimately have a poorer prognosis and outcome than those with higher levels of these affective traits.

Table 1. *Demographic Variables (N = 526)*

Age	M (SD)	18.97 (1.73)
Sex	N (%)	
	Male	229 (43.5)
	Female	297 (56.5)
Ethnicity	N (%)	
	Asian	61 (11.6)
	Black	54 (10.3)
	Latino/a	30 (5.7)
	White	381 (72.4)

Table 2. Summary of Interview Measures for Negative or Deficit Symptoms

Scale for the Assessment of Negative Symptoms

Schedule for the Deficit Syndrome

Affective flattening/Blunting ■ Decreased spontaneous movements ■ Unchanging facial expression ■ Poor eye contact ■ Paucity of expressive gestures ■ Affective nonresponsivity	Restricted Affect ■ Unchanging facial expression ■ Reduced expressive gestures ■ Diminished vocal inflection
Not directly addressed by the SANS	Diminished Emotional Range ■ Intensity and range of emotional experience
Anhedonia-Asociality ■ Recreational interests and activities ■ Sexual interest and activity ■ Ability to feel intimacy and closeness ■ Relationships with friends and peers	Diminished Social Drive ■ Degree to which person seeks/wishes for social interaction
Alogia ■ Poverty of speech ■ Poverty of content of speech ■ Increased latency of response	Poverty of Speech ■ Little information conveyed despite adequate amount of words, due to vagueness, repetition, or clichéd speech
Attentional Impairment ■ Work inattentiveness ■ Inattentiveness during mental status testing	Not directly addressed by the SDS
Avolition-Apathy ■ Impersistence at work or school ▶ Failure to complete tasks ▶ Failure to seek employment ■ Physical anergia ▶ Failure to initiate activity ▶ Mindless, physically inactive tasks ■ Subjective component ▶ “I don’t care about anything” ▶ Lack of drive/energy	Diminished Sense of Purpose ■ Degree to which patient posits goals for his/her life ■ The amount of time passed in aimless activity ■ Extent to which patient fails to initiate or sustain goal-directed activity due to inadequate drive
Not directly addressed by the SANS	Curbing of Interests ■ Degree to which person is interested in the world around him/her

Table 3.*Descriptive Statistics for Scales*

Scale	Alpha	Mean (SD)
Social Anhedonia	.82	7.72 (5.43)
Perceptual Aberration	.88	5.21 (5.42)
Magical Ideation	.82	8.18 (5.14)
Emotional Expressivity	.91	9.67 (5.27)
Positive Affectivity	.77	7.92 (2.66)
Achievement	.81	12.19 (4.53)
Anergia	.63	2.90 (1.98)
Interest	.30	5.26 (1.26)

Table 4.*Intercorrelations of Self-Report Scales (N = 526)*

Measure	1	2	3	4	5	6	7
1. Social Anhedonia	----						
2. Emotional Expressivity	-.54**	----					
3. Positive Affectivity	-.50**	.45**	----				
4. Achievement	-.04	.02	.35**	----			
5. Anergia	.32**	-.20**	-.42**	-.53**	----		
6. Perceptual Aberration	.32**	-.13**	-.07	.07	.17	---	
7. Magical Ideation	.18**	.00	.12**	.06	.13**	.67**	----

* p < .05

** p < .01

Table 5.
Principal Axis Solution, Oblimin Rotation

	Component		
	1	2	3
Achievement	-.644	.106	.224
Anergia	.485	.155	.066
Magical Ideation	.054	.823	-.107
Perceptual Aberration	-.013	.776	.114
Emotional Expressivity	-.113	-.055	-.645
Social Anhedonia	.005	.191	.770
Positive Affectivity	-.436	.205	-.748

Note: Highest factor loadings are bolded.

Figure 1.

Covariance curves and base rates for the Revised Social Anhedonia Scale (N = 526)

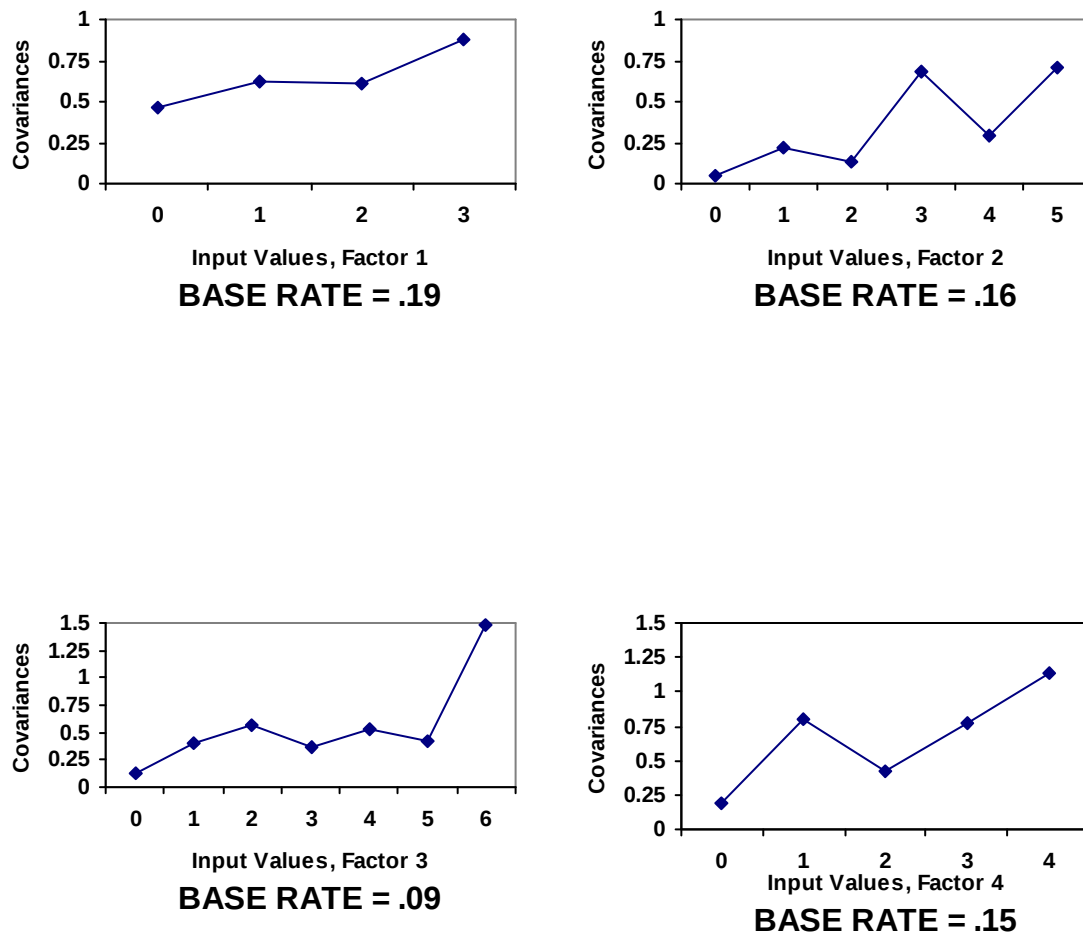
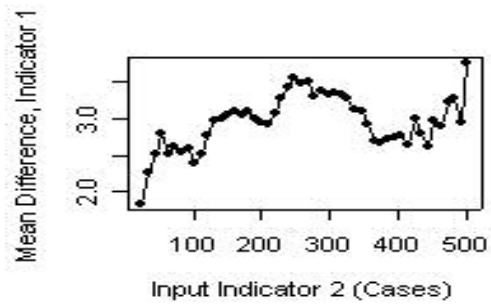
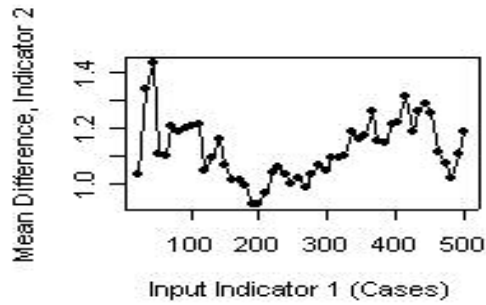
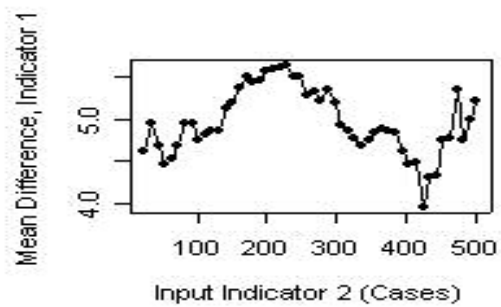
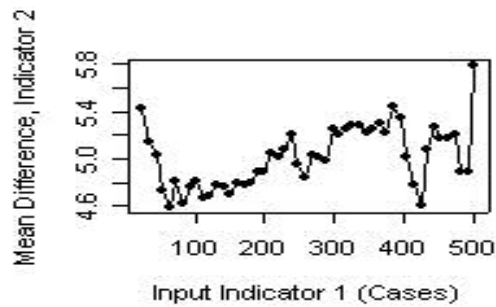


Figure 2. MAMBAC consistency curves for the Negative Symptom Scales

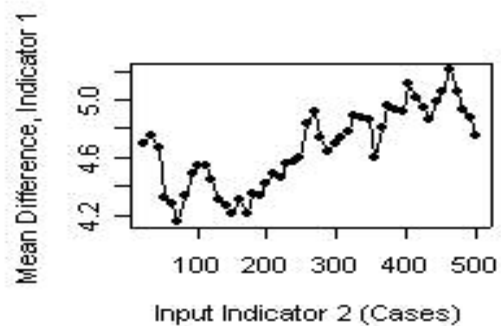
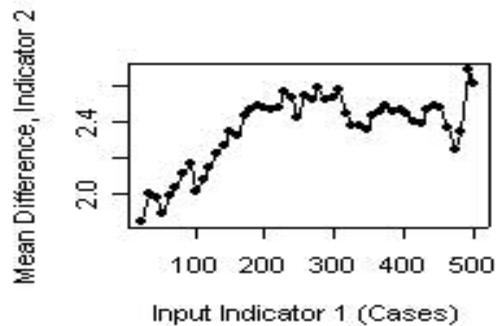
Social Anhedonia and Anergia



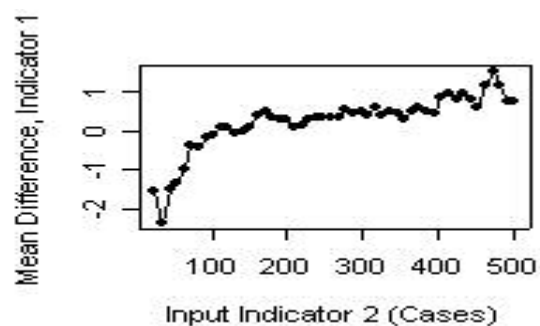
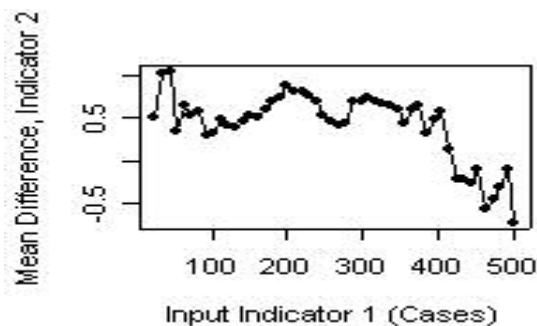
Social Anhedonia and Emotional Expressivity



Social Anhedonia and Positive Affectivity



Social Anhedonia and Achievement



APPENDIX A

Emotional Expressivity Scale

1. I think of myself as emotionally expressive. (-)
2. People think of me as an unemotional person.
3. I keep my feelings to myself.
4. I am often considered indifferent by others.
5. People can read my emotions. (-)
6. I display my emotions to other people. (-)
7. I don't like to let other people see how I'm feeling.
8. I am able to cry in front of other people. (-)
9. Even if I am feeling very emotional, I don't let others see my feelings.
10. Other people aren't easily able to observe what I'm feeling.
11. I am not very emotionally expressive.
12. Even when I'm experiencing strong feelings, I don't express them outwardly.
13. I can't hide the way I'm feeling. (-)
14. Other people believe me to be very emotional. (-)
15. I don't express my emotions to other people.
16. The way I feel is different from how others think I feel.
17. I hold my feelings in.

APPENDIX B

General Temperament Survey (Positive Affectivity Scale)

1. I have the ability to approach tasks in such a way that they become interesting or fun.
2. I lead a very interesting life.
3. People would describe me as a pretty enthusiastic person.
4. I can easily find ways to liven up a dull day.
5. In my life, interesting and exciting things happen every day.
6. I live a very full life.
7. I can make a game out of some things that others consider work.
8. I like to stir up some excitement when things are getting dull.
9. I am often playful around other people.
10. I often feel lively and cheerful for no particular reason.
11. I am usually enthusiastic about the things that I do.

APPENDIX C

Revised Social Anhedonia Scale

1. I feel pleased and gratified as I learn more about the emotional life of my friends. (-)
2. I am usually content to just sit alone, thinking and daydreaming.
3. When someone close to me is depressed, it brings me down also. (-)
4. Although I know I should have affection for certain people, I don't really feel it.
5. My relationships with other people never get very intense.
6. I prefer hobbies and leisure activities that do not involve other people.
7. When others try to tell me about their problems and hang-ups, I usually listen with interest and attention. (-)
8. Although there are things that I enjoy doing by myself, I usually seem to have more fun when I do things with other people. (-)
9. There are things that are more important to me than privacy. (-)
10. Making new friends isn't worth the energy it takes.
11. I never had really close friends in high school.
12. When things are going really good for my close friends, it makes me feel good too. (-)
13. I prefer watching television to going out with other people.
14. A car ride is much more enjoyable if someone is with me. (-)
15. I like to make long distance phone calls to friends and relatives. (-)
16. In many ways, I prefer the company of pets to the company of people.
17. When I am alone, I often resent people telephoning me or knocking on my door.
18. It made me sad to see all my high school friends go their separate ways when high school was over. (-)
19. Having close friends is not as important as many people say.
20. People are usually better off if they stay aloof from emotional involvements with most others.
21. Knowing that I have friends who care about me gives me a sense of security. (-)
22. I sometimes become deeply attached to people I spend a lot of time with. (-)
23. People sometimes think I'm shy when I really just want to be left alone.
24. Just being with friends can make me feel really good. (-)
25. People who try to get to know me better usually give up after awhile.
26. I could be happy living all alone in a cabin in the woods or mountains.
27. When I move to a new city, I feel a strong need to make new friends. (-)
28. I 'm much too independent to really get involved with other people.
29. My emotional responses seem very different from those of other people.
30. When things are bothering me, I like to talk to other people about it. (-)
31. People often expect me to spend more time talking with them than I would like.
32. There are few things more tiring than to have a long, personal discussion with someone.
33. I don't really feel very close to my friends.
34. If given the choice, I would much rather be with others than be alone. (-)

- 35. I have often found it hard to resist talking to a good friend, even when I have other things to do. (-)
- 36. I find that people too often assume that their daily activities and opinions will be interesting to me.
- 37. I attach very little importance to having close friends.
- 38. Playing with children is a real chore.
- 39. I have always enjoyed looking at photographs of friends. (-)
- 40. It's fun to sing with other people. (-)

APPENDIX D

Achievement Scale

1. I often keep working on a problem even if I am very tired. (-)
2. I see no point in sticking with a problem if success is unlikely.
3. I play hard and I work hard. (-)
4. I enjoy putting in long hours. (-)
5. I don't enjoy problems that can't be solved quickly and easily.
6. People say that I drive myself hard. (-)
7. I often go on working on a problem long after others would have given up. (-)
8. I work just hard enough to get by without overdoing it.
9. I like to try difficult things. (-)
10. I like hard work. (-)
11. In my work I have learned not to demand perfection of myself.
12. I prefer to work alone.
13. Some people say that I put my work ahead of too many other things. (-)
14. I am not a terribly ambitious person.
15. I push myself to limits. (-)
16. I find it really hard to give up on a project when it proves too difficult. (-)
17. I see no point in spending time on a task that is probably too difficult.
18. Striving for excellence means more to me than almost anything else. (-)
19. I like the kind of work that requires my close attention. (-)
20. I don't like to do more than is really necessary in my work.
21. I set extremely high standards for myself in my work. (-)

APPENDIX E

Anergia Scale

1. I don't set goals for myself.
2. I often think about my plans for the future. (-)
3. It's hard for me to just sit around; I need to be active. (-)
4. Most anytime I would rather sit and daydream than do anything else.
5. I don't just think about my goals, I work hard to achieve them. (-)
6. I very often have a difficult time getting motivated to do my schoolwork or chores.
7. I spend much of my time watching TV or playing computer games when I should be working.
8. I have projects in mind all the time, things to do. (-)
9. Much of the time I just sit around doing nothing.
10. I often find myself with nothing to do—time on my hands.

APPENDIX F

Interest Scale

1. I find few things interesting.
2. I like to read about new things that interest me. (-)
3. I don't keep up with the news.
4. I don't have any hobbies or activities that interest me.
5. I have so many interests, I don't have time to do everything. (-)
6. My daily life is full of things that keep me interested. (-)
7. I like to learn more about new things. (-)

APPENDIX G

Magical Ideation Scale

1. I almost never dream about things before they happen. (-)
2. I have sometimes felt that strangers were reading my mind.
3. I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me.
4. When introduced to strangers, I rarely wonder whether I have known them before. (-)
5. I have sometimes sensed an evil presence around me, although I could not see it.
6. At times, I have felt that a professor's lecture was meant especially for me.
7. I have wondered whether the spirits of the dead can influence the living.
8. I have worried that people on other planets may be influencing what happens on earth.
9. People often behave so strangely that one wonders if they are part of an experiment.
10. I have sometimes been fearful of stepping on sidewalk cracks.
11. Good luck charms don't work. (-)
12. I have sometimes had the passing thought that strangers are in love with me.
13. Some people can make me aware of them just by thinking about me.
14. I think I could learn to read others' minds if I wanted to.
15. I have never had the feeling that certain thoughts of mine really belonged to someone else. (-)
16. Numbers like 13 and 7 have no special powers. (-)
17. I have felt that there were messages for me in the way things were arranged, like in a store window.
18. I have had the momentary feeling that I might not be human.
19. I have felt that I might cause something to happen just by thinking too much about it.
20. I have never doubted that my dreams are the products of my own mind.
21. Things sometimes seem to be in different places when I get home, even though no one has been there.
22. If reincarnation were true, it would explain some unusual experiences I have had.
23. Horoscopes are right too often for it to be a coincidence.
24. The hand motions that strangers make seem to influence me at times.
25. I have had the momentary feeling that someone's place has been taken by a look-alike.
26. I have noticed sounds on my records that are not there at other times.
27. It is not possible to harm others merely by thinking bad thoughts about them. (-)
28. The government refuses to tell us the truth about flying saucers.
29. I have occasionally had the silly feeling that a TV or radio broadcaster knew I was listening to him.
30. At times I perform certain little rituals to ward off negative influences.

APPENDIX H

Perceptual Aberration Scale

1. I have felt that my body and another person's body were one and the same.
2. Occasionally I have felt as though my body did not exist.
3. My hands or feet have never seemed far away. (-)
4. I can remember when it seemed as though one of my limbs took on an unusual shape.
5. I have felt as though my head or limbs were somehow not my own.
6. I sometimes have had the feeling that my body is abnormal.
7. I have sometimes felt that some part of my body no longer belongs to me.
8. Now and then, when I look in the mirror, my face seems quite different than usual.
9. It has seemed at times as if my body was melting into my surroundings.
10. Sometimes I have had feelings that I am united with an object near me.
11. I have never felt that my arms or legs have momentarily grown in size. (-)
12. Sometimes I feel like everything around me is tilting.
13. Sometimes part of my body has seemed smaller than it usually is.
14. I sometimes have to touch myself to make sure I'm still there.
15. Sometimes people whom I know well begin to look like strangers.
16. I sometimes have had the feeling that some parts of my body are not attached to the same person.
17. I have never had the passing feeling that my arms or legs have become longer than usual. (-)
18. Parts of my body occasionally seem dead or unreal.
19. Sometimes I have had a passing thought that some part of my body was rotting away.
20. My hearing is sometimes so sensitive that ordinary sounds become uncomfortable.
21. Often I have a day when indoor lights seem so bright that they bother my eyes.
22. At times I have wondered if my body was really my own.
23. Sometimes I have felt that I could not distinguish my body from other objects around me.
24. Occasionally it has seemed as if my body had taken on the appearance of another person's body.
25. I have sometimes had the feeling that my body is decaying inside.
26. I have had the momentary feeling that my body has become misshapen.
27. I have sometimes felt confused as to whether my body was really my own.
28. The boundaries of my body always seem clear. (-)
29. I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.
30. For several days at a time I have had such a heightened awareness of sights and sounds that I cannot shut them out.
31. I have had the momentary feeling that the things I touch remain attached to my body.
32. Sometimes when I look at things like tables and chairs, they seem strange.
33. Sometimes I have had the feeling that a part of my body is larger than it usually is.
34. I have felt that something outside my body was a part of my body.
35. Ordinary colors sometimes seem much too bright for me.

APPENDIX I

Infrequency Scale

1. Sometimes when walking down the sidewalk, I have seen children playing.
2. I cannot remember a single occasion when I have ridden on a bus. (-)
3. At times when I was ill or tired, I have felt like going to bed early.
4. I believe that most light bulbs are powered by electricity.
5. On some mornings I didn't get out of bed immediately when I first woke up.
6. Driving from New York to San Francisco is generally faster than flying between these cities.
7. There have been times when I have dialed a telephone number only to find that the line was busy.
8. I find that I often walk with a limp, which is the result of a skydiving accident. (-)
9. I go at least once every two years to visit either northern Scotland or some part of Scandinavia. (-)
10. There have been a number of occasions when people I know have said hello to me.
11. On some occasions I have noticed that some other people are better dressed than myself.
12. I have never combed my hair before going out in the morning. (-)
13. I cannot remember a time when I talked with someone who wore glasses. (-)

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