

ABSTRACT

Title of thesis: VERBAL AND NONVERBAL EXPRESSIONS AS INDICATORS OF SOCIAL AND EMOTIONAL FUNCTIONING AMONG SOCIAL ANHEDONICS

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Social anhedonia has received increasing empirical attention and support as a vulnerability marker for the development of schizophrenia. Although social anhedonia implies a reduced capacity for pleasure, the relationship between this construct and the experience and expression of emotion remains unclear. The current study sought to better understand the emotional expression of anhedonics by examining the self-report of emotional experiences and social relationships. Results indicated that social anhedonics used fewer positive emotion words in social descriptions and fewer social words in positive experience descriptions. Social anhedonics did not use significantly fewer positive facial expressions than controls, although gender differences were observed. Correlations with symptom ratings were inconsistent. Thus, this research was able to integrate the study of social and emotional functioning to describe the emotional correlates of social anhedonia which adds to an accumulating body of knowledge on behavioral characteristics for identifying individuals at putative risk for schizophrenia-spectrum disorders.

VERBAL AND NONVERBAL EXPRESSIONS AS INDICATORS OF SOCIAL AND
EMOTIONAL FUNCTIONING AMONG SOCIAL ANHEDONICS

by

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CHAPTER 1. INTRODUCTION

BACKGROUND AND CONCEPTUAL FORMATION OF SCHIZOTYPY

Schizophrenia is an extremely debilitating and complex disorder that affects almost 1% (Gottesman, 1991) of the U.S. population. The disorder is costly for the individuals who suffer from schizophrenia, family members, and society at large. A competent and high functioning individual who develops schizophrenia can deteriorate dramatically, losing an ability to function socially, occupationally, and intellectually. Furthermore, this disorder costs the country in excess of \$70 billion annually (Wyatt, Henter, Leary, & Taylor, 1995) in direct care and aftercare costs as well as lost earnings (Lenzenweger & Dworkin 1998). The study of individuals who are at risk for developing schizophrenia, yet have not decompensated into psychosis can provide crucial information on the identification of the genetic and environmental etiological factors that potentiate the development of schizophrenia, and such research has focused on clarifying the genotypic and phenotypic determinates of schizophrenia. This line of inquiry also has direct implications for the development of prevention and treatment strategies.

The scientific study of individuals at risk for developing schizophrenia began with Rado and Meehl's theorizing on the symptoms and constructs that mark a genetic vulnerability for the development of schizophrenia. Rado (1962) described a genetic theory of schizophrenia that “traces its etiology to an inherited predisposition, transmitted to an offspring from both parents by a Mendelian mechanism (Rado, 1962, p. 1).” Rado’s genetic theory also involves the differentiation between the schizophrenic genotype and the schizophrenic phenotype. The genotype is defined as the inherited cause of development and remains unchanged throughout life. The phenotype is the

actual outcome of development and refers to the structure and function of the organism as it appears in the environment. The theory of schizotypal organization is primarily concerned with the concept of the schizophrenic phenotype. An individual who possesses this phenotype is referred to by Rado as a schizotype. He argues that a schizotype has two inherited defects: an integrative pleasure deficiency (or anhedonia) and a proprioceptive diathesis (or a proneness to distorted awareness of bodily self).

Building on Rado's observations and theorizing, Meehl, in his seminal 1962 paper, introduced the concept of schizotaxia to describe a genetically based "neural integrative defect" that was the basic pathophysiology of schizophrenia. He viewed schizotaxia as an aberration in some parameter of a single cell function, which may be manifested in the functioning of central nervous systems. Essentially, what he described is a general neuronal and brain system deficit. He further conjectured that through the process of social learning, all individuals with schizotaxia would develop a personality structure referred to as schizotypy, which is the behavioral manifestation of the latent vulnerability (schizotaxia) for developing schizophrenia. Meehl argued that all schizotaxic individuals become schizotypic in personality organization, regardless of their social learning history; yet, not all schizotypic individuals will become schizophrenic. What makes schizotaxia etiologically specific is its role as a necessary condition; one cannot go on to display schizotypy and then schizophrenia unless one was first schizotaxic. The majority of schizotypes will remain compensated while a minority, disadvantaged by biological, personality, and other environmental weaknesses, will go on to develop schizophrenia.

Meehl also advanced four core symptoms or behavioral traits that characterize schizotypy: cognitive slippage, ambivalence, interpersonal aversiveness, and anhedonia. Cognitive slippage refers to thought disorder and associate dyscontrol. Ambivalence is defined as the simultaneous experience of extremely positive and extremely negative feelings towards an object or person. Interpersonal aversiveness is the experience of social fear, distrust, expectation of rejection, and conviction of one's own unloveability. Finally, anhedonia refers broadly to a pleasure deficit that can occur in either the social or physical realm. Meehl postulated that the base rate of the schizotypy taxon (i.e., those having the schizogene) in the general population is approximately 10% (Meehl, 1962). Depending on the social environment and the presence of other genetic characteristics, the schizotype could manifest any degree of symptom outcome, from being well compensated, as expressed in “normal” functioning to schizophrenia-spectrum personality disorders, to suffering from the deleterious impact of schizophrenic symptoms (Kwapil, 1998).

SOCIAL ANHEDONIA

Some recent lines of inquiry suggest that, of Meehl’s four core symptoms, social anhedonia may be a promising indicator for the vulnerability towards developing psychosis and, specifically, schizophrenia (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Kwapil, 1998; Blanchard, Bellack, & Mueser, 1994). Anhedonia was described by Meehl as a “quasi-pathognomonic sign” that “is one of the most consistent and dramatic behavioral signs of the disease” (Meehl, 1962; p. 829). Since the original formulation of his theory of schizotypy, however, Meehl (1990) has modified his view on social anhedonia. In this paper he indicated that “hypohedonia is one of a dozen normal-

range individual differences factors that raise or lower the probability of decompensation (Meehl, 1990, p. 939)". Thus, the revision of Meehl's theory gave hypohedonia a secondary role as a symptom of schizotypy and one that was not specific to developing schizophrenia. Nevertheless, several lines of research have recently offered evidence that is more compatible with Meehl's original formulation of schizotypy (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Kwapil, 1998).

Chapman Scales

Based on the theories of Rado and Meehl, Chapman, Chapman, and Raulin (1976) developed self-report questionnaires of anhedonia designed to measure stable differences in the way individuals experience pleasure. Scales were constructed to tap two sources of pleasure, physical and social-interpersonal. The Physical Anhedonia Scale (PAS) assesses the experience of pleasure related to taste, sight, touch, and smell. The Social Anhedonia Scale (SAS) samples interpersonal pleasure such as talking and being with people. Most of the research conducted on the Chapman anhedonia questionnaires has provided evidence supporting the validity of these scales by demonstrating that individuals with higher scores on the PAS and SAS tend to show a range of deficits similar to those observed in schizophrenic patients, though in an attenuated form (Blanchard, et al., 1994).

The Chapman's initially regarded physical anhedonia as being a more promising indicator than social anhedonia for identifying those who are schizophrenia-prone. They believed that physical anhedonia more likely reflected the biological defect that has been described extensively by theorists such as Rado and Meehl. They also speculated that social anhedonia was likely affected by social pressure and social desirability biases

(Chapman, et al., 1976). Consistently replicated null findings of the original SAS were believed to result from the inclusion of items that identified individuals exhibiting social anxiety, few of whom would be expected to develop psychosis. Chapman and colleagues therefore decided to revise the SAS in order to increase the discrimination between individuals simply exhibiting social anxiety versus the less common, schizoid withdrawal. This new version became the Revised Social Anhedonia Scale (RSAS: Eckblad, Chapman, Chapman, & Mishlove, 1982) a measure found to better identify individuals exhibiting true schizoid withdrawal, a trait-like indifference to people, as opposed to avoidant withdrawal, which can be transient and result from social anxiety, hypersensitivity, or depression (Mishlove & Chapman, 1985). The 40-true/false-item RSAS includes items such as “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).

Subsequent research on social anhedonia appeared to contradict the Chapman's initial theory that physical anhedonia was a stronger indicator of psychosis-proneness than social anhedonia. Rather, studies have revealed that social anhedonia, as measured by the RSAS, is in fact a more robust indicator risk for developing psychosis (Chapman, et al., 1994; Kwapil, 1998). However, physical anhedonia is a type of anhedonia that is subsumed under Meehl's original conceptualization and description of anhedonia as a core symptom of schizotypy. While physical anhedonia has not been shown to exclusively predict the development of schizophrenia-spectrum disorders, some research has uncovered relationships between physical anhedonia and other kinds of deficits (i.e., social and emotional) that are prevalent in schizophrenia. Therefore, because physical

anhedonia is one type of anhedonia originally described by Meehl and because it may still have relevance to certain behavioral deficits observed in schizophrenia, the relevance on physical anhedonia will be occasionally discussed herein, and is interpreted within Meehl's broad framework of schizophrenic risk.

Research has revealed that the RSAS appears to be an accurate measure of the latent liability for developing schizophrenia. Chapman and colleagues, in a 10-year follow-up study, found that individuals identified by both the Revised Social Anhedonia Scale (RSAS) and the Magical Ideation Scale (MagID) were at the greatest risk for developing psychosis (21% of the psychosis group obtained high scores on the SAS and MagID, as compared to 5% of the Per-Mag group, 14% for those high on Per-Mag and reporting psychotic-like experiences, and 1.3% of controls; Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994). Also, in a subsequent analysis, Kwapil (1998) found that 24% of a social anhedonia group was diagnosed with a schizophrenia-spectrum disorder at the follow-up, compared with only 1% of the control group. The social anhedonia group also exceeded controls on severity of psychotic-like experiences and had poorer overall adjustment at the follow-up. Prediction of schizophrenia-spectrum disorders by the RSAS was not improved by the use of other psychosis-proneness scales or symptom ratings from the initial assessment. Additionally, elevated ratings of social anhedonia have repeatedly been found to be characteristic of individuals with schizophrenia (e.g., Berenbaum & Oltmanns, 1992; Blanchard, et al., 1994; Blanchard, Mueser, & Bellack, 1998; Chapman, et al., 1976; Katsanis, Iacono, & Beiser, 1990) and in relatives of schizophrenic individuals. In a study of self-report measures of schizotypy as indices of familial vulnerability to schizophrenia, the RSAS, as compared to other Chapman scales

and Eysenck's Psychoticism scale, was the only questionnaire measure that was found to be elevated in biological relatives of individuals with schizophrenia (Kendler, Thacker, & Walsh, 1996).

While anhedonia scores of individuals with schizophrenia have consistently been found to be elevated, anhedonia has not always distinguished schizophrenia from other disorders such as depression and bipolar disorder (Schuck, Leventhal, Rothstein, & Irizarry, 1984). Berenbaum and Oltmanns (1992) found that schizophrenics, with or without blunted affect, and depressed patients reported significantly greater scores on the SAS than did controls. Schizophrenics with blunted affect and depressed patients also reported greater physical anhedonia than did controls (Berenbaum & Oltmanns, 1992). Also, Katsanis et al. (1990) found that there were no differences between first episode patients with schizophrenia, schizophreniform, or affective disorder (depression and bipolar) with psychotic features on either the SAS or PAS. These studies indicate that trait anhedonia may not be unique to schizophrenia.

There are several factors that could be contributing to the anhedonia measure's seeming lack of specificity. One possible explanation is that although anhedonia occurs in both schizophrenia and affective disorders, the reason for elevated anhedonia differs across the diagnostic groups. Specifically, it has been hypothesized that elevated anhedonia reflects an enduring, trait-like characteristic in schizophrenia but is transient and related to a clinical state among patients with affective disorders (Bernstein & Riedel, 1987; Katsanis, Iacono, Beiser, & Lacey, 1992). Blanchard, Horan, & Brown (2001) tested this hypothesis by examining the temporal stability of elevated trait social anhedonia in schizophrenia and depression. Data indicated that compared with controls,

individuals with schizophrenia and with depression reported equally elevated social anhedonia during an inpatient hospitalization. Between-groups analyses showed that at a 1-year follow-up, recovered depressed patients reported significant declines in social anhedonia and were no longer different from control participants. The differences could not be accounted for merely by clinical improvement, since the schizophrenia group demonstrated similar improvement in overall symptoms at the follow-up (Blanchard, et al., 2001). Thus, in schizophrenia, the RSAS appears to primarily reflect trait variance, whereas in patients with depression, this scale reflects both trait and state variance. This finding has had significant impact on methods used for examining social anhedonia and on the interpretation of findings of elevated anhedonia among schizophrenia patient populations.

Anhedonia and Social Functioning

Several studies have consistently reported that anhedonia is related to poor social and premorbid functioning in schizophrenia. Premorbid adjustment is determined by the nature and quality of one's social and sexual relations prior to the onset of illness (Mueser, Bellack, Morrison, & Wixted, 1990). Chapman et al., 1976 reported that among a schizophrenia group, physical and social anhedonics had significantly poorer premorbid social-sexual activity or achievement than hedonic patients. This observation is consistent with Meehl's theory that anhedonia underlies social withdrawal and isolation observed in schizophrenia. Katsanis, et al., (1992) also found that schizophrenia patients with elevated scores of physical and social anhedonia had poorer heterosexual and social-personal premorbid functioning than those patients without elevations in anhedonia. Finally, Blanchard et al. (1998) extended these findings to demonstrate that anhedonia is

related to current social functioning in the community in a group of stabilized schizophrenia outpatients. This study demonstrated that anhedonic schizophrenia subjects evidenced poorer current social functioning than controls as measured by their report on the Social Adjustment Scale II (Schooler, Hogarty, & Weissman, 1979) in an interview. However, there are other studies that have failed to find a unique relationship between anhedonia and premorbid adjustment in schizophrenia (Schuck et al., 1984; Garnet, Glick, & Edell, 1993). These studies are characterized by methodological flaws, suggesting that these results should be interpreted with caution (Blanchard, 1998). For instance, in the Schuck et al. (1984) study, premorbid adjustment was measured by self-report ratings that did not explicitly refer to functioning prior to the onset of illness. The subjects used in the Garnet et al. (1993) study were very young (mean age = 16.9) and apparently not in their first-episode. Thus, to the degree that this sample had early onset with multiple episodes of the illness, ratings of premorbid adjustment could be confounded by functioning post-onset. Taken together, the findings indicate that anhedonia is most likely related to premorbid social functioning in schizophrenia, although the exact nature of this relationship remains unclear (Blanchard, 1998).

In addition to examining poor premorbid adjustment, it is also informative to study how anhedonia is related to current social skill and functioning. A few studies have evaluated the association between physical anhedonia and social competence assessed with role-play measures in nonclinical samples. Responses of anhedonic subjects were significantly less competent, more terse (Beckfield, 1985), less socially skilled (Haberman, Chapman, Numbers, & McFall, 1979), more avoidant, and more odd (Numbers & Chapman, 1982) than those of control subjects in a role play task which

prompted subjects with an audio cassette recording of various simulated social encounters.

Blanchard and colleagues (1994) evaluated the relationship between the Chapman anhedonia scales and behavioral indices of social competence in schizophrenia. This study, which examined social skill in a simulated social encounter (role play), revealed that neither physical nor social anhedonia was related to role-play measures of social skill performance for patients with schizophrenia, schizoaffective disorder, or bipolar disorder. This finding may reflect methodological or sample differences from the studies that examined college students as described above. The Blanchard, et al. (1994) study used only negatively valenced, conflictual, social interactions; therefore, these results may not generalize to positively valenced, affiliative, social situations. It is quite possible that anhedonia may be related to the skills required for positively valenced, affiliative, interactions. In addition, it appears that anhedonia may be associated with lower premorbid functioning but not necessarily related to the ability to emit appropriate social behaviors when required, as in a structured role play. While all the studies described above indicate that anhedonia is clearly relevant to understanding the debilitating social impairment seen in schizophrenia, it is partly because such studies have only examined one or two aspects of social functioning that the nature of anhedonia's contribution to various elements of social functioning and the uniqueness of anhedonia's role in the social impairment of schizophrenia requires further study.

Anhedonia and Dimensions of Emotion

It has been described above that social anhedonia represents an underlying risk for developing psychosis and that this construct is related to some aspects of social

functioning, but not all. What remains unclear is how this social aspect of anhedonia is related to emotional functioning. In the literature, anhedonia has been described as having a direct relationship with the development of negative mood states, decreased positive emotional experiences, and decreased anticipation of a positive emotional experience. As will be demonstrated below, the literature discusses anhedonia in emotional terms, yet the exact nature of the relationship between anhedonia and emotion remains unclear.

In his description of anhedonia, Rado (1962) emphasized the emotional quality of anhedonia. He characterized anhedonia as a pleasure deficit but also viewed anhedonia as being related to an increase in negative emotions such as fear and rage. Rado's proposal was that increased negative affectivity was the consequence of anhedonia. Meehl (1962) also suggested that anhedonia results in what he termed "aversive drift," (the tendency to experience life as stressful, characterized in part by interpersonal fear), a form of affective disturbance in schizophrenia. He describes aversive drift in schizophrenia as the tendency for activities, people, and places "to take on a burdensome, threatening, gloomy, negative emotional charge" (Meehl 1990, p.21). Such a proposal would indicate that anhedonia is characterized by decreased trait positive affect (PA) and increased trait negative affect (NA). Therefore, Blanchard, et al., (1998) hypothesized that emotional dysfunction within schizophrenia could be thought of as decreased PA and increased NA as compared to normal individuals. However, the evidence that social anhedonia is related to emotional dysfunction is inconsistent.

Blanchard, et al., (1994) found that physical anhedonia, but not social anhedonia, was related to attenuated reports of positive affect following the viewing of affect-

eliciting films in schizophrenia and schizoaffective disorder patients. Based on these results, the authors suggested that the SAS may only identify affective responding when an individual is confronted with socially relevant stimuli. In other words, the SAS may only be related to affective experience within a social context. However, Blanchard, et al. (1998) reported that both social and physical anhedonia were negatively correlated with a marker of trait PA. Furthermore, social anhedonia was positively correlated with a marker of trait NA. Thus, this study concluded that anhedonia, particularly as measured by the RSAS, appeared to be correlated with both low PA and high NA. Recently, however, Saperstein, Mann, & Blanchard (2004) presented findings to support the conclusions of Blanchard, et al., (1994). RSAS scores were not associated with measures of NA or PA among schizophrenia patients, but instead were significantly associated with items measuring diminished social drive and diminished sense of purpose.

The evidence seems to suggest that social anhedonia more accurately represents affective functioning limited to the social domain. An alternate explanation for these results is that anhedonia reflects more of a deficit in approach or anticipatory pleasure rather than consummatory pleasure (Germans & Kring, 2000; Klein, 1984). The behavioral deficit associated with anhedonia may be the inability or lack of desire to approach or participate in pleasurable activities; yet, once in a pleasurable situation, anhedonic individuals may derive as much pleasure from the situation as nonanhedonic individuals (Keltner & Kring, 1998). There are also some methodological limitations inherent in the studies described above that make causal interpretation difficult. It may be the case that affect-eliciting films or self-report questionnaires of general temperament are inaccurate measures of affective experience that occurs in the "real world." Because

of the empirical uncertainties inherent in this literature, alternative modalities for measuring affect and more naturalistic observations are needed before the relationship between anhedonia and emotion can be clarified. Next, the literature on emotional experience and expression in schizophrenia will be discussed in order to describe the current state of knowledge in this area, determine how applicable these findings are for the study of the risk for developing schizophrenia, and outline the limitations of this research.

THE EXPERIENCE AND EXPRESSION OF EMOTION IN SCHIZOPHRENIA

Research suggests that social anhedonia is related to some aspects of social functioning in those with schizophrenia and those at risk for developing the illness. However, due to conflicting findings and a paucity of research, it remains unclear how anhedonia is related to emotional functioning. Examining the available literature on emotion in schizophrenia will inform the current study by providing a context of current knowledge and experimental methodologies upon which to undertake a study on the risk factors and emotional deficiencies in non-ill, at-risk individuals. Next, the findings from emotion research within schizophrenia will be described.

Background

Emotions play a central role in any human being's life. Emotions help us organize our thoughts and actions in order to respond to challenges faced everyday in the environment. Keltner and Gross (1999) define emotions as, "episodic, relatively short-term, biologically based patterns of perception, experience, physiology, action, and communication that occur in response to specific physical and social challenges and opportunities" (p.468). Emotions can be conceptualized as being composed of a number

of components, including expressive, feeling or experiential, and physiological. It is the coordination of these components that ultimately serves the individual, enabling the demonstration of competence or deficiency within a number of important intra- and interpersonal circumstances (Keltner & Kring, 1998).

Historically, affective features of schizophrenia were considered an integral part of schizophrenia. Kraepelin (1971) described emotional indifference in schizophrenia as involving the lack of joy or affection. Bleuler (1950) considered affective disturbance to be a fundamental symptom of schizophrenia. In describing the affective symptoms of schizophrenia, Bleuler noted that a discrepancy was apparent between schizophrenic patients' outward displays and their reports of emotional experience. Rado (1953) postulated a somewhat different theory on affectivity in schizophrenia. He suggested that anhedonia was primary and suggested that schizophrenics' lack of outward expression was due to an inability to experience emotions, at least pleasurable ones. This is in contrast to Bleuler's view that schizophrenics may experience strong emotions behind their affectively flat expressions. In Rado's conceptualization, low expressivity is construed as an accurate reflection of the patient's internal state. His theory appears to be confined to positive emotions in that expressive deficits are specific to positive affect. In this view, negative or "emergency" emotions were, in fact, experienced more strongly by the patient, perhaps as a result of the lack of experienced positive emotions.

It is Bleuler's view that has received the most support and replications in the literature; individuals with schizophrenia often describe experiencing strong emotions after viewing affect-eliciting stimuli (both positive and negative), but express a dearth of visible signs of emotion (Berenbaum & Oltmanns, 1992; Kring, Kerr, Smith & Neale,

1993; Kring & Neale 1996). The observed discrepancy between schizophrenic's experience and outward expression of emotion has been referred to as the inhibition hypothesis (Kring, et al., 1993). Thus, both Kraepelin and Bleuler regarded a lack of outward display of emotion as a central feature of schizophrenia, which has since been supported by recent laboratory studies.

Emotional Functioning in Schizophrenia

Studies of emotional functioning in schizophrenia have generally revealed that individuals with schizophrenia have increased negative mood and demonstrate a disjunction between reports of emotional experience and expression. Negative mood states have been found to presage relapse in retrospective (Herz & Melville, 1980) and prospective studies (Subotnik & Nuechterlein, 1988). These negative mood states, such as depression, anxiety and hostility, are not merely co-morbid with schizophrenia, nor are they secondary to the illness, but rather the negative affective state precedes the onset of schizophrenia. High risk studies have also reported negative affective states as dominant in schizophrenic patients before they decompensated into the illness. Research as part of the Copenhagen longitudinal project (Cannon & Mednick, 1993; John, Mednick, & Schulsinger, 1982; Mednick, Parnas, & Schulsinger, 1987) concluded that teacher reports of school behavior predicted schizophrenia and borderline schizophrenia and successfully distinguishing these groups from each other as well as from other outcomes. The preschizophrenic patients were described as more lonely, isolated, socially inept, tense, and anxious than children who later developed other disorders or remained healthy (John et al., 1982).

A study by Berenbaum & Oltmanns (1992) was the first to examine the

disjunction of emotion and expression in schizophrenia. In this study, subjects were presented with emotion-eliciting stimuli involving low cognitive demand (i.e., tasting different flavored drinks) and stimuli involving high cognitive demand (viewing film clips from selected movies). The schizophrenics who exhibited blunted affect were the least facially expressive in their responses to the affect-eliciting stimuli as compared to non-blunted schizophrenics and depressed patients and normal controls. However, the blunted schizophrenics did not differ in their reported emotional experiences, suggesting that blunted affect in schizophrenia may be primarily a disturbance of expression and not of the ability to feel, or at least report, emotional experiences.

Kring and Neale (1996) investigated the three components of emotion: behavioral/expressive, experiential/subjective, and physiological among unmedicated schizophrenia patients. Emotion researchers have argued that it is the combination of these indicators that comprise emotion and that any one indicator used alone is not sufficient to describe emotion (Lang, Rice, & Sternbach, 1972). The results indicated that patients reported experiencing as much emotion during positive and negative films as controls, and in some cases they reported experiencing more than controls. An unexpected finding was that schizophrenia patients displayed greater skin conductance reactivity to the positive and neutral films than controls. Patients were experiencing emotion arousal levels similar to controls, yet expressing their emotional experience in subtle, microexpressive displays, undetectable to an interviewer or coder observing the patient. The results of this study provide additional support for the inhibition hypothesis, the disjunction between the expressive and subjective experience response system of emotion in schizophrenia (Kring & Neale, 1996).

Meehl (1962) described anhedonia as a diminished capacity to derive pleasure from social or physical experiences; yet while the term “pleasure” is an emotional description used to describe an internal mood state, empirical research has yet to determine the nature of the relationship between anhedonia and emotional experience. Looking to the studies of emotion in schizophrenia is beneficial for attempting to elucidate the developmental etiology of emotional disturbance in schizophrenia. For example, it remains unclear whether anhedonia in schizophrenia is an antecedent, consequence, or a concomitant of the disorder. If it is found that emotional disturbances predate the onset of schizophrenia, then claims about the causal importance of this disturbance can be made with more certainty (Kring, 1999). Unfortunately prior studies on emotion in schizophrenia have left these issues relatively unexplored. The findings from studies of emotion and their methodological approaches are useful for informing the study of social anhedonia; yet, examination of this construct that is known to have social implications would be incomplete without consideration of emotional functioning within a social context.

INTEGRATING THE STUDY OF EMOTIONAL AND SOCIAL FUNCTIONING

The integration of the study of emotional and social functioning is vital because these two areas of functioning are intertwined and mutually informative. Integrating the study of emotional and social functioning is crucial for understanding the underlying mechanisms, behavioral consequences, and etiology of psychological symptoms within schizophrenia and other disorders. In the study of social anhedonia, it is crucial to examine social and emotional aspects of functioning together, since social anhedonia may either result from or contribute to an individual's negative social and emotional

experiences. More research is needed to determine the precise emotional nature of social anhedonia by examining multiple areas of functioning. Ascertaining the impact of social anhedonia on emotional and social functioning, which the current study seeks to do, and defining how these characteristics interact in the development of schizophrenia will be vital in furthering our understanding of schizophrenia-risk

The Significance of an Integrative Approach

There have only been a few researchers who have attempted to study social deficits in the context of emotion dysfunction (Blanchard & Panzarella, 1998; Keltner & Kring, 1998; Keltner & Haidt, 1999). Keltner and Kring (1998) put forth two reasons why the integrative study of the social function of emotions within psychopathology is a compelling approach: 1) Basic research on emotion and social interaction provides a conceptual framework for considering possible causes and consequences of emotional disturbance as well as potential interventions. 2) Studying the social consequences of emotional disturbances can elucidate how emotions contribute to adaptive social interactions and relationships (Keltner & Kring, 1998).

This approach has significance for the study of emotion dysfunction within schizophrenia. Keltner and Kring's theory holds that emotional expression and experience provide important information about the sender's emotions, intentions, orientation to the relationship, and well-being; events or objects in the environment; and the conditions of social relations. Disturbances in emotional experience and expression, therefore, are likely to disrupt relationships in important ways. For example, a disturbance in the intensity, type, and timing of emotional expressions would deprive interaction partners of valuable information about ongoing interactions. A disturbance in

experience would likewise compromise the nature of information about one's current relationships (Keltner & Kring, 1998).

Keltner and Kring (1998) also argue that there are two other important ways that emotions coordinate social interactions. Emotions evoke complementary and similar emotions in others that motivate behaviors that benefit social relationships, and the perception of emotion and anticipated elicitation of emotions in others serve as incentives for certain social behaviors. The social-functional approach to studying emotions can be a valuable tool when trying to empirically study the degree of impact that a disorder like schizophrenia, or carrying the genetic liability for schizophrenia, can have on an individual's daily living.

A recent study by Aghevli, Blanchard, & Horan (2003) examined the degree to which the disjunction between emotional experience and expression in schizophrenia extended to the interpersonal domain. The authors examined subjective ratings of emotional experience and facial expression ratings of emotional experience during a role play test, which was created specifically for use with chronic psychiatric patients and provided simulated social situations that participants must engage in. Consistent with prior research, schizophrenics showed significantly less facial emotional expressivity despite compatible levels of experienced emotion with controls. By using a simulated social situation, this study extended findings from previous studies that used non-social stimuli, such as film clips or flavored drinks (Berenbaum & Oltmanns, 1992; Kring and Neale, 1996; Kring et al., 1993).

Trait NA and PA have been found to be related to social functioning variables. Blanchard et al. (1998) found that poor social functioning of patients was associated with

greater NA and social anxiety. Alternatively, trait PA was a unique predictor of social functioning in schizophrenia in that greater trait PA was related to better functioning.

The integration of social and emotional research has been used in studies of genetically at-risk subjects followed throughout their lives. Fish (1987) found that children at the greatest risk for schizophrenia reported feelings of depression, loneliness, and rejection by peers. These children also tended to have poor interpersonal relationships. These problems only grew worse with time as Fish noted that by age three, half of the most disturbed schizophrenia risk subjects displayed blunted-detached affect and were isolated. By the time this group reached adulthood, all six met criteria for schizophrenia-spectrum disorders (Fish, 1987).

In summation, the global emotional and social deficits of individuals with schizophrenia have a significant impact on functional ability in both domains. The literature is clear that emotional deficiency serves to adversely impact social experience. While it is less clear whether poor social functioning has an impact on emotional capacity, decreased social skill and competence have been correlated with an increased risk for the development of schizophrenia. It is only through the integration of the study of emotional and social functioning that insight and understanding can be gained into the way that social and emotional deficits affect one's environment and the impact that environment has on the disease process.

A lack of outward displays of emotion in schizophrenia was a key component of early theories and continues to receive support as a general, behavioral marker or symptom of schizophrenia. But, while an individual with schizophrenia may exhibit a deficit in emotional expression, recent investigations suggest that these persons

experience comparable levels of emotional arousal when compared with normal individuals without schizophrenia. However, there are difficulties inherent in obtaining laboratory measurements of emotional experiences and many studies suffer from methodological limitations of such paradigms. It cannot be determined whether the emotional experiences that are induced in a laboratory setting are comparable in valence and arousal levels to the levels of emotions experienced in naturalistic settings. Furthermore, many studies have not integrated social aspects of emotional experience, and instead have utilized emotional stimuli of a non-social nature. Thus, the generalization of these findings into an individual's everyday life in the natural environment where social and emotional domains are constantly interacting is problematic. Traditional methodology, in this area, appears to be limited for accurately conceptualizing the social aspects of emotional functioning.

Language is a tool through which individuals express their emotional states and communicate with others in social situations. The descriptions that individuals offer when asked open ended questions about themselves provides rich, qualitative information beyond yes/no or true/false responses gathered from a questionnaire or scale. By using one's own language, one has a chance to respond in any way that he or she chooses ; even a lack of language provides valuable information, offering insight into the deficits that individual may have when communicating with others and expressing him or herself. Additionally, since spoken language is both an expression of inner concerns and processes, and is the primary interpersonal medium (Rosenberg & Tucker, 1979), one's ability to use language can be conceptualized as having a strong relationship with one's overall social effectiveness within the environment. It is likely the case that if someone

experiences difficulty in linguistic expression that he or she will be largely ineffective in maintaining meaningful social relationships.

Content or speech analysis is one promising methodological alternative for measuring emotional and social experiences that could potentially overcome the limitations inherent in laboratory-induced emotional studies. Studies have indicated that content analysis appears to be reliable and valid in assessing individual differences and psychopathology (Pennebaker & King, 1999). It also allows for the examination of almost any linguistic domain, including an individual's use of emotionally and socially relevant words. This methodological approach could prove very useful for gaining a strong understanding of social anhedonic's emotional and social experiences, in their own words; such data has the advantage of being derived from minimal mood manipulation from an interviewer or from experimental stimuli. Perhaps there is a specific linguistic style of those individuals at heightened risk for developing schizophrenia that, if delineated, could be predictive of their social and emotional functioning. The content analysis approach will be described and evaluated for its effectiveness in a study of social and emotional functioning of social anhedonics.

CONTENT ANALYSIS AS A POTENTIAL INDICATOR OF SOCIAL AND EMOTIONAL FUNCTIONING

History and Development

The way in which people use words conveys a great deal of information about themselves, their audience, and the situations they are in. It has been suggested that the words people use are diagnostic of their mental, social, and even physical states.

Philosopher Paul Ricoeur (1976) argued that the way we describe events defines the meaning of the events and that these meanings help us maintain a grasp on reality.

Similar assumptions are implicit in much of the work in sociolinguistics (Eckert, 1999; Tannen, 1994), narrative and discourse analyses (Schiffrin, 1994), and communication research (Robinson & Giles, 2001).

Content analysis began evolving in the late 1950's as a methodology designed to assess psychological dimensions in children and adults through the analysis of the content and form of their verbal behavior (Gottschalk & Hambridge, 1955). Several groundbreaking methodologies emerged that primarily involved grouping words derived from speech samples or interactions between physician and patient, into categories and examining individual differences in word usage across these categories (Gottschalk and Gleser, 1969; Weintraub, 1989; Stiles, 1992).

The first computerized content analysis method, called the General Inquirer (Stone, Dunphy, Smith, & Ogilvie, 1966), analyzed verbal samples on a word-by-word basis. Similar to the Gottschalk method, this program was intended to tap clinical syndromes and psychodynamic themes (Berry, Pennebaker, Mueller, & Hiller, 1997). A number of word-based text analysis programs followed, many of which were guided by psychoanalytic themes (Bucci, 1995; Horowitz, Milbrath, & Stinson, 1995).

Content Analysis and Psychopathology

The literature on content analysis suggests that this method is useful for studying clinical psychopathology and social and emotional functioning. The words people choose can be used to reliably discriminate groups of patients who have been diagnosed with somatization disorder, bipolar disorder, and schizophrenia (Pennebaker, 2002). Several studies that relied on the General Inquirer method indicated that text analyses could accurately distinguish schizophrenia (Taylor, Reed, & Berenbaum, 1994), cancer

proneness (Spence, Scarborough, & Ginsberg, 1978), suicidal tendencies (Thomas & Duszynski, 1985) and depression (Schnurr, Rosenberg, & Oxman, 1992).

The few studies that have examined content analysis in schizophrenia have employed the General Inquirer method, or other lesser known methods (i.e., Affective Dictionary Ulm; Dahl, Holzer, & Berry, 1992), and have consistently found that individuals with schizophrenia use language and words differently from those without the disease. Taylor, et al., (1994) found that speech characterized by formal thought disorder (FTD) successfully differentiated schizophrenia patients from patients in a manic episode; 80% of schizophrenics had some FTD (e.g., illogical and incoherent speech) as compared with only 6.5% of classic manic patients. Oxman, Rosenberg, and Tucker (1982) demonstrated that speech differences were found between patients with paranoid schizophrenia and those with nonparanoid schizophrenia, suggesting that different mechanisms may underlie the speech disorders within patient groups, highlighting the potential specificity of speech patterns among individuals with schizophrenia. In addition, Mete, Scnurr, Rosenberg, Oxman, Doganer, and Sorias (1993) were able to replicate, in Turkey, the finding that schizophrenia patients used greater allusions to thought processes, a higher number of references to “impractical” institutional concerns/politics, and male schizophrenia subjects showed an increased use of artistic references, suggesting a violation of cultural norms in relation to gender and lexicon. Another study by Leichsenring & Sachsse (2002) examined verbally expressed emotion categories (e.g., love, surprise, anger, fear, contentment, anxiety, etc.) among groups of acute and chronic schizophrenia patients, neurotic disorder and borderline patients. Chronic schizophrenia patients expressed anger, fear, anxiety, and emotions in general

significantly less frequently than normal participants. These results support the notion that individuals with schizophrenia, especially patients with chronic schizophrenia, show a reduction of expressed positive and negative emotions compared to normal controls and other patient groups and indicate that emotions can be validly assessed by content analytical procedures.

Language use can also reflect personality style, thereby identifying an enduring individual difference. Pennebaker and King (1999) found that the ways people express themselves in words and the dimensions of language that are used are stable over time. In this study, writing samples were obtained three ways: daily diaries kept by inpatients in an addiction treatment center, daily class writing assignments on a variety of provided topics by summer school students, and published abstracts from members of the Society for Experimental Social Psychology. Reliability analyses indicated large and significant main effects for a variety of categories, including word count, positive and negative emotions, cognitive mechanisms, and social and physical word categories (Pennebaker and King, 1999). This suggests that the ways in which people express themselves in words are stable across time and situational context. The dimensions of language that are reliable are impressively diverse as well, ranging from highly specific articles to general emotional language. Pennebaker & King (1999) also examined the validity of word categories by exploring the relationship of word usage with gender, age, parental education, self-reported SAT scores, and course grades. They found that people high in Immediacy were more likely to be female, young, have lower SAT verbal scores and exam grades, and to have parents with lower levels of education; also, the more that people made distinctions in their writing, the better their health or health-related

behaviors. Therefore, word usage categories appear to discriminate between various demographic groups and dimensions of behavior. It has been shown that reliable linguistic styles can be identified over time and can discriminate between behavior, psychiatric disorder, and personality characteristics. It is through this identification that an understanding can be gained of how an individual experiences the world and how his or her thoughts and feelings are conveyed.

Word Use as a Reflection of Situational and Social Processes

It is a common observation that what is said and how it is said changes depending on one's current situation. Voice characteristics and other nonverbal cues shift depending on the formality of the situation, the nature of the audience, and the degree to which the speaker is integrated with or excluded from the other actors.

Although a large body of research within psychology and sociology has addressed how language varies as a function of social situations, very little research has examined how word use varies among types of social encounters (Pennebaker, Mehl, & Neiderhoffer, 2003). There are, however, a few exceptions, one of which is a study by Cegala (1989) which sought to identify the linguistic correlates of engagement and detachment in conversations. Findings indicated that degree of involvement in an interaction was related to linguistic style use; highly dispositionally involved individuals used greater amounts of certainty expressions, a higher degree of verbal immediacy, and more relational pronouns (e.g., we, us, our; Pennebaker et al., 2003). A study by Berry, et al., (1997) found that language plays a crucial role in social perception and interaction. In this study, linguistic dimensions accounted for a significant and substantial proportion of variance in the observer's impression of the target person beyond that explained by

traditionally studied person perception variables such as physical attractiveness, nonverbal expressiveness, and facial maturity, and linguistic categories were the strongest predictors of perceived competence (Berry et al., 1997). Niederhoffer & Pennebaker, 2002 examined linguistic style matching (LSM) between two strangers getting to know one another by interacting in live computer chat rooms. The study found that participants converged on the types of language that they used in the interactions across measures of word count as well as for a variety of linguistic devices that were unrelated to content (i.e., social, cognitive categories; Niederhoffer & Pennebaker, 2002).

These studies point to the important role that linguistic style and content play in a variety of social interactions that an individual may face. Linguistic usage in a social situation is influenced by one's personality traits, serves to regulate and maintain conversation, and may even be more important in determining the other participant's overall impression of competence than other physical, salient factors. These results further indicate that speech content can vary as a function of the interaction that occurs with an experimenter as part of research participation in a controlled laboratory setting versus the interaction that occurs with a social peer in a naturalistic environmental setting.

It remains unclear how emotional and social functioning directly relates to social anhedonia and risk for schizophrenia. The limitations of prior studies on emotion in schizophrenia have contributed to this dearth of knowledge. Methodological flaws inherent in traditional, laboratory measures make the generalization of these findings problematic. Content analysis appears to be a novel approach that may provide useful and rich information on subjective emotional and social experiences, above and beyond that delineated from traditional, laboratory measures. Rather than generating mere data

points, content analysis provides subjective reports that can be analyzed and interpreted in a multitude of ways, thereby increasing knowledge of how that individual experiences and expresses naturally occurring social and emotional stimuli. It is argued herein that this novel methodology is a more accurate way to measure social and emotional experiences than traditional laboratory-induced mood states and questionnaire approaches.

FACIAL EXPRESSION – A NONVERBAL MEASURE OF SOCIAL AND EMOTIONAL FUNCTIONING

Even though content analysis can be conceptualized as one potential indicator of the expression of emotional and social experiences, nonverbal or facial measures of emotional expression have been prominent in the schizophrenia literature. Therefore, in attempting to integrate the schizophrenia literature on emotion with the available research on content analysis within psychopathology, including facial expression analysis could be informative in clarifying the relationship between linguistic style usage and social and emotional impairment in those at-risk for schizophrenia development.

There are two competing hypotheses that underlie the association between verbal and nonverbal indicators of emotional experience. A number of studies (Berenbaum & Oltmanns, 1992; Kring et al., 1993; Kring & Neale, 1996; Aghevli, et al., 2003) have supported the view that a disconnect exists between the experience and expression of emotion in schizophrenia. Thus, a hypothesis derived from this line of research would indicate that at-risk individuals may report, with language, emotional experiences comparable to those of controls, yet be less facially affective and expressive in their descriptions. This hypothesis views speech as a form of self-report of the experience of social and emotional processing. The alternative hypothesis is related to research on flat

affect in schizophrenia (Alpert, Rosenberg, Pouget, & Shaw, 2000). This work argues that there are some individuals with schizophrenia who demonstrate flat affect, a cardinal sign of the negative syndrome of schizophrenia. In flat affect, all domains of expression, including facial, vocal and gestural domains, are reduced. From this perspective, speech production is viewed as another form of the expression of emotional experiences that may not accurately reflect the individual's true experience of the emotional state. Therefore, it can be hypothesized that those at-risk for developing schizophrenia would be expected to display deficits in the areas of both content analysis and facial expressions. In either case, an analysis of facial displays will help elucidate the precise nature of the relationship between word usage and emotional experience and expression and social functioning.

History and Development

Theorizing on the role of emotional expression in humans began as early as 1873 when Darwin proposed that facial expressions of emotion had evolved in the human species as a basic mechanism for social communication. He stated that facial expressions, "...reveal the thoughts and intentions of others more truly than do words, which may be falsified." (cited in Morrison, Bellack, & Mueser, 1988). Other theorists such as Izard (1971, 1982) have acknowledged that facial expression is the principal mechanism of emotional expression, serving both expressive and regulative functions.

There has been a resurgence of interest in facial expression in the past 20 years. Tomkins (1962) defined the subjective experience of emotion as the feedback from facial muscular changes and he provided a theoretical rationale for studying the face as a means of learning about personality and emotion. The face is also believed to influence a

person's emotional experience by providing signals to others about how the person feels (Ekman, Friesen, & Ancoli, 1980). Ekman et al., 1980 put forth that the viability of proposals that facial expression plays important, perhaps multiple, roles in the experience of emotion depends on the capability of the face to show distinctive expressions, such as fear, anger, disgust, and happiness, and to vary with the felt differences in the intensity of emotion. The authors subsequently proved that facial expressions serve just such purposes (Ekman et al., 1980; Ekman, 1989).

Facial expressions have a direct relationship with social and emotional functioning. The face influences a person's emotional experience by providing signals to others about how that person feels. Facial expressions are one important way in which humans are able to communicate their emotional state to others (Ekman, et al., 1980). Initiating a socially appropriate emotional facial response and being able to correctly perceive someone else's emotional state is crucial to an individual's ability to functioning effectively in social situations. Animal studies have demonstrated that monkeys which have been subjected to experimental isolation regimens that destroy or impair social behaviors fail to either send or receive adequate nonverbal messages when paired with other monkeys (Miller, 1967; Miller, Caul, & Mirsky, 1967). This finding emphasizes the negative social ramifications of an impaired ability to effectively communicate using nonverbal expressions. Therefore, because emotions are intimately connected with the process of social communication, the study of social facets is incomplete without an analysis of emotional signals, such as facial expressions (Morrison, et al., 1988).

Facial Expression Analysis and Schizophrenia

Within schizophrenia, nonverbal behavioral components of emotion, such as facial expression and posture, were the focus of early clinical descriptions by Bleuler (1950) and Kraepelin (1971). These theorists mainly commented on the apparent mismatch between schizophrenia patients' nonverbal emotion displays and their subjective experience of emotion. Over the years, this line of inquiry within basic emotion research has established that, compared to nonpatient controls, schizophrenia patients are less facially expressive both of positive and negative emotions, yet they report experiencing as much positive and negative emotion while viewing emotion-eliciting films or pictures (Berenbaum & Oltmanns, 1992; Dworkin, Clark, Lipsitz, Amador, Kaufmann, Opler, White, & Gorman, 1993; Kring & Earnst, 1999; Kring et al., 1993; Kring & Neale, 1996).

In paradigms that have incorporated a social interaction, schizophrenia patients are also less expressive than nonpatients (Krause, Steimer, Sanger-Alt, & Wagner, 1989) and other patient groups (e.g., Parkinson's disease, depression, alcohol abuse) that have features similar to negative symptoms (Davison, Frith, Harrison-Read, & Johnstone, 1996). A study by Gottheil, Paredes, Exline, & Winkelmayr (1970) found that schizophrenia patients demonstrated less congruence between their verbal and nonverbal affective messages than a control group. While there was a significant positive correlation between judge's ratings of verbal and nonverbal expressions of control participants, the schizophrenia group's verbal and nonverbal responses were not significantly correlated. These effects did not appear to be due to the influence of medication, length of the story, ratings of likeability or understandability, or with length of hospitalization. Thus, basic emotions studies such as these have been able to confirm

empirically the early clinical descriptions of Bleuler, Kraepelin, and others and indicate that schizophrenia patients manifest a disjunction among emotion response components (Kring & Earnst, 1999).

There is some empirical evidence to suggest that individuals with schizophrenia are exhibiting facial expressions, but that these expressions go unobserved by the naked human eye. Kring & Earnst (1999) found that schizophrenia patients emit the same level of unobservable facial muscle activity, as measured by EMG recordings, as controls. However, it has been suggested that this observation may better reflect a component of a concomitant neuromotor dysfunction (Dworkin, et al., 1996). There are several confounding variables that could be contributing to diminished displays of emotions in subjects with schizophrenia, such as side effects from medication or institutionalization effects. For this reason, the study of individuals free from years of effects of the disease sequelae, yet at hypothesized risk for developing schizophrenia, becomes valuable. Collins, Blanchard and Biondo (2004) found that social anhedonics displayed significantly more constricted facial affect compared to controls during an interaction with a clinician. Kring, Smith, and Neale (1994) also reported that social anhedonia was negatively correlated with a well validated self-report measure of emotional expressivity (Kring et al., 1994), such that greater social anhedonia was related to less self reported outward displays of emotion. These results suggest that like schizophrenics, socially anhedonic individuals may also demonstrate a deficit in emotional expressivity.

CHAPTER 2. PROPOSED STUDY

RATIONALE

Social and Emotional Deficit Indicators for the Development of Schizophrenia

In recent years the construct of social anhedonia has received increasing empirical attention and support as a vulnerability marker for the development of schizophrenia (Berenbaum & Oltmanns, 1992; Blanchard, et al., 1994; Blanchard, et al., 1998; Kwapil, 1998). While this construct implies a reduction in pleasure, it is unclear if social anhedonia represents a deficit in emotional experience. Prior studies support the contention that anhedonia may not relate to emotion; however, these studies have relied on nonsocial laboratory stimuli that may not accurately reflect social and emotional experiences within anhedonics. More naturalistic observation methods are needed in order to increase understanding of how individuals at risk for developing schizophrenia function socially and emotionally.

Examining social and emotional functioning deficits will be crucial for future research that attempts to understand how these environmental factors interact with a latent, possibly genetic, vulnerability towards developing schizophrenia. Emotions provide structure to social interactions, guiding, evoking, and motivating the actions of individuals in ways that enable him or her to meet goals and maintain good relationships; therefore, the study of one domain would be incomplete without also consideration of the other. In addition, investigating these areas of functioning within a group of individuals high in social anhedonia will provide further evidence on the validity of the construct for identifying those who will go on to develop schizophrenia. Therefore, differences

between how social anhedonics and controls discuss their emotional and social experiences will be explored. The current study seeks to understand the degree to which these individuals describe positive emotional experiences as being social in nature and social experiences as being positive in nature. The investigation of verbal and nonverbal expressions during an interview for certain emotional and social questions is a full integration of the study of social and emotional functioning and will provide valuable information on the way in which each area of functioning is affected by the other.

Two emerging and promising methodologies for such an investigation are content and facial expression analysis. The linguistic structure and usage of emotional and social descriptions among social anhedonics can provide insight into how these individuals experience their social and emotional environments and will provide a more rich and full description of the schizotypal phenotype. The literature on content analysis suggests that this is a reliable method for assessing individual differences (Pennebaker & King, 1999) and even psychopathology, such as schizophrenia (Taylor, et al., 1994). This method allows for the analysis of an individual's communication style that cannot be assessed by subjective self-report or even by clinical observation that occurs concurrently with the interview.

One of the most robust findings to emerge on emotion in schizophrenia is that compared with nonpatients, schizophrenia patients display fewer observable positive and negative facial expressions of emotion in response to a variety of emotion-eliciting stimuli (Kring, 1999). A measure of facial expression will significantly add to our ability to understand the communication pattern and style of individuals hypothesized to be at risk for schizophrenia. It may be the case that social anhedonics exhibit a similar

disconnect between reported emotional experience and observed facial expression that is found in schizophrenia. It has been further suggested that the two main modalities for receiving information regarding emotion are visual, specifically facial expressions, and auditory (Edwards, Jackson, & Pattison, 2002). Therefore, an analysis of emotional experience within schizophrenia or in those at-risk would be incomplete without a measure of emotional expression (i.e., facial expression). However, content and facial expression analyses have not yet been conducted on socially anhedonic individuals.

Conclusions

An accumulation of findings provides evidence that individuals who are elevated in trait-like social anhedonia are at heightened risk for developing schizophrenia and psychotic illnesses. However, details about the etiology of social anhedonia and the mechanism of the development of heightened risk that anhedonia confers on an individual is currently unknown. There is also compelling evidence that individuals who have already developed schizophrenia are impaired socially and emotionally; yet the relationship of social anhedonia with emotional functioning, in those without a psychotic illness, is unclear. Given the overlap of social and emotional functioning in the “real world,” it is necessary to begin to study these construct together in order to increase awareness of how these behavioral factors interact to increase the risk for developing psychotic illness or protect an individual from decompensation.

DETAILS OF THE CURRENT STUDY

Utilizing previously video-tape recorded structured interviews, the current study will perform a word count analysis to examine how many affective words are used by social anhedonics and controls in their descriptions of social relationships. In addition,

we will also examine how many socially-relevant words are used to describe positive and enjoyable experiences. We will also perform a facial expression analysis to determine how nonverbal cues relate to verbal descriptions of social and emotional experiences. The goal of the present study is to contribute to the present conceptualization of social anhedonia as a risk factor for the development of schizophrenia by describing the emotional and social correlates of anhedonics using the novel methodology of speech analysis.

The study will examine the following hypotheses:

Between group hypotheses:

1. Social anhedonics will use fewer positively valenced emotional words to describe their relationships with family and friends as compared to control participants.
2. Social anhedonics will use fewer socially relevant words to describe positive experiences than control participants.
3. Social anhedonics will display fewer positively valenced facial expressions during social and emotional descriptions as compared to control participants.

Within group hypothesis:

4. A paucity of socially relevant and positively valenced emotion words in anhedonic's responses will be related to higher scores on IPDE and SDS items that inquire about social or emotional experiences.

CHAPTER 3. METHODS

PARTICIPANTS

Identification of a community sample

The current study will examine a community sample of individuals to broaden our understanding of schizophrenia-proneness. Typically, studies have utilized a convenience sample of high-functioning college students attending reputable and well-known universities. We obtained a more representative and diverse community sample through initial screening that was conducted by the University of Maryland Survey Research Center (SRC). The SRC collected telephone numbers that were within a 15-mile radius of the University of Maryland, College Park campus. These numbers were randomly dialed to recruit participants. A member of the SRC staff invited subjects to complete a mailed questionnaire for \$15.00. The 18-year olds that agreed to participate (N=3,494) were mailed a consent form and screening questionnaire which included the Revised Social Anhedonia Scale (RSAS; Eckblad, et al., 1982), a measure designed to identify the presence of social anhedonia. Demographic and contact information such as gender, ethnicity, socioeconomic status, education level, mailing address, and phone numbers were collected from all participants at the initial screening. Selection and recruitment were independent of educational status or socioeconomic status.

Recruitment

Next, returned questionnaires (N=2,483) were used to assign subjects to group status, either the social anhedonia or control group. Individuals scoring 1.9 standard deviations above the mean were assigned to the social anhedonia group (N=86).

Individuals scoring lower than 0.5 standard deviations above the mean were assigned to

the control group (N=89). These cut-off scores have been widely used throughout the literature and seem to effectively identify a deviant, anhedonic group and an appropriate control group (Blanchard, et al., 1998; Blanchard, et al., 2001). Subjects were excluded if they endorsed more than 3 items on the Infrequency Scale (Chapman et al., 1976). This exclusionary methodology has been used consistently in psychometric research and in conjunction with the RSAS (e.g., Chapman et al., 1994; Kawpil et al., 1998). The Infrequency Scale is designed to identify those individuals who may be responding randomly in order to allow these invalid responses to be eliminated. Control participants were selected to match social anhedonia participants on gender and race. All subjects provided informed consent.

Potential subjects identified by this selection process were contacted by telephone, E-mail, or were mailed a letter inviting them to participate in the proposed study. During recruitment, each subject was informed that the study would take between 3-5 hours to complete and that they would receive \$100 for completion of all study tasks. Subjects were also informed to refrain from alcohol or drug use 24 hours prior to their scheduled appointment. Upon arrival to the study site, each participant reviewed and signed a consent form which specified the study tasks, risks involved, and participant rights.

During the recruitment process, every effort was made to ensure that the groups did not differ by gender or ethnicity. Chi-squared analyses revealed that there were no significant differences between the social anhedonia and control groups on either gender $\chi^2(1, N = 175) = .164, p < .05$ or ethnicity $\chi^2(4, N = 175) = 1.527, p < .05$.

MEASURES

Revised Social Anhedonia Scale (RSAS)

The Revised Social Anhedonia Scale is a 40-item, true-false, self-report questionnaire that measures a decrease in the experience of pleasure that is derived from interpersonal/social interactions. This measure was used to select and group participants into an experimental (social anhedonia) and control group. It includes such items as, “Having close friends is not as important as many people say,” (keyed true) and, “A car ride is much more enjoyable if someone is with me,” (keyed false). Evidence indicates that the scale is a valid measure of a social pleasure deficit; high scorers on the RSAS also exhibited current social withdrawal and isolation (but not loneliness) based on interviewer reports and individually reported less enjoyment from and need for social contact (Mishlove & Chapman, 1985). The RSAS has been shown to be internally consistent and has demonstrated high test-retest reliability over a 90 day period ($r = 0.79$; Blanchard, et al., 1998; Mishlove & Chapman, 1985). Findings of elevated social anhedonia in schizophrenia patients (Blanchard, et al., 1998; Chapman et al., 1976) and their family members (Katsanis et al., 1990; Kendler et al., 1996), cross-sectional studies showing elevated schizophrenia-spectrum disorder dimensional scores in social anhedonics (Brown, Blanchard, & Horan, 1998) and longitudinal studies of the development of schizophrenia-spectrum disorders in social anhedonics (Kwapil, 1998) all support the validity of the RSAS as a measure of schizotypy.

International Personality Disorder Examination (IPDE)

The schizotypal, schizoid, and paranoid sections of the International Personality Disorder Examination (IPDE; Loranger, Andreoli, Berger, Buchheim, Channabasavanna, Coid, Dahl, Diekstra, Ferguson, Jaccobsberg, Janca, Mombour, Pull, Ono, Regier,

Santorius, & Sumba, 1995) were administered to assess for the presence of schizophrenia-spectrum personality disorders. The IPDE is a modified version of the Personality Disorder Examination (PDE) which is designed to assess personality disorders in both the DSM-IV and International Classification of Disease-10 (ICD-10) classification systems. This semi-structured interview taps into unusual thinking or beliefs, unusual perceptual experiences, suspicious and paranoid ideation, inappropriate or constricted affect, odd/eccentric behavior or appearance, relationships with others, and social anxiety. Both DSM-IV categorical diagnoses and dimensional scores of personality disorders can be determined from the IPDE. Reports of interrater reliability in joint interviews have demonstrated an overall weighted kappa for individual definite personality disorders to be .57 for the DSM-III-R and .65 for the ICD 10 (Loranger, Santorius, Andreoli, Berger, Buchheim, Channabasavanna, Coid, Dahl, Diekstra, Ferguson, Jacobsberg, Mombour, Pull, Ono, & Regier, 1994). For temporal stability, kappas for the presence or absence of a personality disorder were .62 for DSM-III-R and .59 for ICD-10. Interrater reliability was higher for dimensional scores with ICCs ranging from .79 to .94 for the DSM-III-R and .86 to .93 for the ICD-10. Temporal stability for dimensional scores was also high with ICCs ranging from .68 to .92 for DSM-III-R and from .65 to .86 for ICD-10. The IPDE has been successfully used in several studies of schizophrenia-spectrum disorders in putatively psychosis-prone subjects (e.g., Blanchard & Brown, 1999; Brown, et al., 1998; Chapman et al., 1994) and socially anhedonic individuals have been shown to exhibit higher IPDE dimensional symptom ratings than non-anhedonic individuals at baseline and follow-up assessments (Blanchard, 2005; Kwapil, 1998).

For the present study, we are interested in coding subject responses to specific IPDE items that inquire, "Who are the most important people in your life?" "In what way are they important?" "Do you enjoy close relationships or being part of a family?" "Tell me about it...what do you enjoy and why?" "What kinds of activities do you enjoy?" Other items on the IPDE will not be considered for analyses in this study.

Schedule for the Deficit Syndrome (SDS)

The deficit syndrome of schizophrenia is a trait-like subtypology of the disorder that is characterized by primary and enduring negative symptoms. The Schedule for the Deficit Syndrome (SDS; Kirkpatrick, Buchanan, McKenney, Alphas, & Carpenter, 1989) assesses the presence of key features of the deficit syndrome and includes sections on Restricted Affect, Diminished Emotional Range, Poverty of Speech, Curbing of Interests, Diminished Sense of Purpose, and Diminished Social Drive. For the present study, we will only be coding the items that ask, "What do you really enjoy in life?" "Tell me about something that happened to make you happy—what did it feel like?" The validity of the deficit-nondeficit distinction using the SDS has been demonstrated in studies indicating the temporal stability of this categorization (Fenton & McGlashan, 1992) and differences between these two subtypes in neuropsychological performance (Wagman, Heinrichs, & Carpenter, 1987), structural brain abnormalities (Buchanan et al., 1993), and measures of anhedonia (Kirkpatrick & Buchanan, 1990). The SDS has been shown to have adequate interrater agreement and internal consistency (Fenton & McGlashan, 1992; Kirkpatrick et al., 1989).

Linguistic Inquiry and Word Count (LIWC)

Pennebaker, Francis, & Booth (2001) developed the Linguistic Inquiry and Word Count (LIWC), a computer-based technique that computes the percentage of words within various categories that writers or speakers use in normal (i.e., nonclinical) speech samples. The word count approach assumes that the general concepts that a person is attempting to express can be captured by examining the specific words a person uses to make up the concept. The LIWC program is more advanced than previous programs in that it was intended to be free from any theoretical orientation. The LIWC program was originally developed as part of a study that examined the effects of disclosure to long-term measures of health and well-being (Berry & Pennebaker, 1993; Pennebaker, 1989). The authors found that the process of translating traumatic or emotionally laden thoughts, feelings, and memories into language—either verbally or through writing—had striking physical and psychological benefits.

Language categories were carefully constructed and independently rated by judges and these ratings were then compared with comparable LIWC analyses of the same text file (Pennebaker & Francis, 1996/1999). On the broadest level, dictionary scales that are built into the program tap into five general text dimensions: positive emotions, negative emotions, cognitive mechanisms, content domains, and language composition (Berry, et al., 1997). The LIWC computer software program searches for 2300 words or word stems within any given text file. The search words have previously been categorized by independent judges into over 70 linguistic dimensions including standard language categories (e.g., articles, prepositions, pronouns, etc.), psychological processes (e.g., positive and negative emotion categories, cognitive processes, self-discrepancies), relativity-related words (e.g., time, verb tense, motion, space), and

traditional content dimensions (e.g., sex, death, home, occupation). The creation and selection of these primary LIWC categories was guided by research within social, health, and clinical psychology. The categories of negative and positive emotion words were based on findings in the literature on affect (Costa & McCrae, 1985; Watson & Pennebaker, 1989), mood and emotion (Gross & Levinson, 1993), and tap dimensions such as anger, depression, guilt, optimism, and serenity. Cognitive mechanisms involve words that reveal different modes of thought, including categories such as self-reflection (e.g., understand, think), discrepancy or undoing (e.g., should, would, could), causation (e.g., because, effect), and achievement or striving (e.g., attempt, solve, achieve). LIWC also measures a number of subordinate categories. For example, in addition to counting all the negative emotion words, LIWC is programmed to additionally calculate the number of words related to five subscales of negative emotion words that specifically reflect anger, depression, paranoia, anxiety, and guilt (Pennebaker, et al., 2003). In addition, a user of this program can create his or her own dictionaries and categories to examine and count whatever category of words is desired. The stringent approaches that were used to develop this particular computer program and its increasingly widespread use in various fields makes it one promising tool for the assessment of speech domains, such as emotionally and socially charged word usage, in most individuals.

The study of linguistic usage is linked to the study of emotion and social functioning. Pennebaker & Graybeal (2001) suggest that talking about emotional topics with other people can serve the same purpose as writing about emotional topics which was found to be related to improvements in health, behavior, grades, and acquisition of job skills (Pennebaker 1997). Also, it was found that consistent writing about emotional

topics changed the ways that individuals interacted with others; there were changes in patterns of speaking, use of self-references, and use of positive emotions. These were the first results to suggest that writing or talking about emotional experiences can help people to become more socially integrated with their social networks (Finkenauer & Rime, 1998).

To date, there are no studies which have utilized word count procedures among individuals identified to be at-risk for developing psychopathology. In the present study, we will apply the LIWC program to the social anhedonia and control groups to count subject's use of words within two domains: socially-relevant words and positively-valenced emotional words. Although not a primary hypothesis, we will also report on participant's use of negative emotional words in their descriptions of social relationships. This data will be readily available from the semi-structured interviews and may be informative for delineating the communication patterns of anhedonics. For the interview questions identified above, we will transcribe each subject's speech into two separate files - one for descriptions of social relationships and another for descriptions of emotional experiences - that are then run through the LIWC program. The program will count the number of socially relevant words used to describe positive experiences, and conversely, the number of positively or negatively valence emotional words used to describe social experiences and relationships.

Facial Affective Coding System (FACES)

In the study of emotion and self-expression, the way in which someone communicates is equally as important as what is communicated. Behavioral and non-verbal aspects of communication provide a great deal of information about how an

individual is feeling or thinking in response to a question. Therefore, these aspects are equally as important to consider as word content when undergoing a study of emotion and social functioning.

The development of measurement systems for facial expressions began with Ekman and Friesen (1976, 1978) when they developed the Facial Action Coding System (FACS). This system was designed to measure specific facial muscle movements. They subsequently refined this approach with a second system, EMFACS, an abbreviated version of FACS that assesses only those muscle movements believed to be associated with emotional expressions.

Kring & Sloan (1991) developed a new coding system that is theoretically aligned with a dimensional model of emotion, the Facial Expressive Coding System (FACES). This model asserts that affective expression is comprised of two broad dimensions: valence and arousal (Russell, 1980). Valence refers to the hedonic quality (pleasure or displeasure) of affect-related stimuli, and arousal refers to the felt activation associated with such stimuli (Kring, Feldman-Barrett, & Gard, 2003). Researchers have argued that the variance of emotional experience is best captured by these two dimensions (Watson, Clark, & Tellegen, 1988). Additionally, research supports the two dimensional model of affect as being present in patients with schizophrenia and schizoaffective disorder, as well as for nonpatient community residents. Therefore, this model appears to be valid and applicable to populations not typically included in the studies of the structure of affective experience (Kring, et al., 2003). FACES is also a less time consuming alternative and provides richer information about the frequency, intensity, valence, and duration of facial expressions.

The current study will use FACES to code subject's facial expressions in response to open-ended questions during an interview. Interrater agreement has been demonstrated to be high ($r = 0.70-1.00$; Kring & Sloan, 1991) and the FACES system converges with ratings made using Ekman's rating system for facial expressions (EMFACS) (Ekman, 1982).

FACES defines an emotional expression as a change from a neutral to a non-neutral display and back again to a neutral display. If a subject goes from one non-neutral display to another non-neutral display of a different valence, the second display is counted as a separate expression. For each expression, coders note the duration (in seconds), the valence (positive or negative) and the intensity (from 1=low to 4=very high). Non-emotional facial movements such as yawning, sneezing or facial tics are not coded as facial expressions. FACES also includes an additional section for coders to rate the degree to which a subjects expresses each of a number of individual emotions (e.g. anger, happiness, amusement) as well as an overall rating of the subject's expressivity.

Facial expression ratings are intended to be independent of the influences imposed upon listening to someone's speech. Therefore, the FACES ratings will be made with the audio portion of the videotapes turned off in order to prevent contamination. Coders will be blind to IPDE or SDS ratings and to group assignment. To control for the confounding influence of subject familiarity with word content or facial expression, we plan to have separate coders for the LIWC and for FACES.

It is within this two-dimensional framework that the facial expressions of individuals with schizophrenia, or at risk for developing schizophrenia, can be accurately and effectively captured. Research has examined verbal and nonverbal expression in the

schizophrenia population and has shown that a disjunction exists. However, an approach that compares emotional experience with emotional expression has not yet been extended to individuals psychometrically identified as at risk for developing psychosis. Further study of the way in which at-risk individuals express their emotional states verbally and nonverbally has implications for the elucidating the developmental and etiological trajectory of the illness.

PROCEDURE

Assessment of Social Anhedonia

A large group of 18-year olds living within the community were identified by a random-digit-dial method. This group was asked to complete the RSAS and Infrequency Scale as part of the initial screening questionnaire. Participants were then invited to participate in the study based on either a high or low score on the RSAS.

Diagnostic Interview

Subjects were not screened for diagnostic status prior to inclusion in the study. Psychiatric diagnoses were determined using the Structured Clinical Interview for DSM-IV Axis I disorders, Patient Edition-Research Version (SCID-I; First, Gibbon, Spitzer & Williams, 1996). The SCID is a semi-structured interview that has been widely used in studies of psychosis proneness and provides thorough coverage of current psychotic disorders and past psychiatric history. Modules assessing mood disorders, psychotic disorders, and substance use disorders were included in this study. Inter-rater reliability has been demonstrated using previous versions of the SCID, with kappas greater than 0.60 (Williams, Gibbon, First, & Spitzer, 1992).

Each participant's level of functioning was rated by an interviewer with the

Global Assessment Functioning Scale (GAFS; APA 1994). As with the original Global Assessment Scale (GAS; Endicott, Spitzer, Fleiss, & Cohen, 1976), the GAFS is a standardized scale that provides a rating of overall adjustment ranging from marked psychopathology at the low end (0) to superior functioning at the high end (100). The GAFS has been used in other studies of psychosis proneness (e.g., Chapman et al., 1994). In addition, Goldman, Skodol, and Lave (1992) found that the GAFS is superior to other measures in assessing Axis V, “adaptive functioning”.

Additionally, subjects were interviewed using the IPDE and SDS. The IPDE assesses dimensional schizoid, schizotypal, and paranoid personality disorder symptoms and the SDS measures primary and enduring negative symptoms features (measures described in detail above). For all interview measures, doctoral students in clinical psychology conducted the SCID, IPDE, and SDS interviews and were trained by a Ph.D. level clinician with extensive research experience. Participants are informed that all clinical interviews will be videotaped using an unconcealed camera. This is to allow for regular supervision purposes.

Linguistic and Facial Coding

As diagnostic interviews have already have been completed, the major task of the current study will be to implement the coding procedures on existing videotapes. Three coders, a graduate student and two advanced undergraduate, will be trained to perform oral transcriptions and FACES ratings. Two coders will be needed for FACES and the third coder will transcribe the speech samples. For FACES ratings, agreement between the two coders will be established during a training period using videos of subjects that are not included in the study. During the training period, coders will be supervised by

Dr. Blanchard and will discuss the procedures for the transcription of subject's speech and the facial expression ratings. Once allcoders have an understanding of how to accurately rate these dimensions, they will begin rating tapes individually and agreement will be calculated statistically across the entire set of transcriptions and ratings. The criterion for agreement during training will be an r of 0.8.

Once the interrater-reliability criterion is met, the coders will begin evaluating tapes independently and periodic random checks of their agreement will be conducted to prevent coder drift. If drift occurs, coders will resume training meetings with Dr. Blanchard until the criterion is reached again.

One undergraduate research assistant will be responsible for transcribing speech samples from existing video-taped diagnostic interviews. This will involve typing out subject's and interviewer's speech just as it occurs, with absolutely no changes. Next, according to procedures described by Pennebaker, et al. (2001), the speech samples will be revised in order for accurate interpretation by the LIWC program. The transcriber will also make note of the individual that is performing the interview so that subsequent analyses may take into account interviewer bias and individual variance factors. Finally, the revised speech samples will be checked and analyzed using the LIWC program.

DESIGN CONSIDERATIONS

Content analysis, as proposed in the current study, is not without its limitations. The speech samples used in content or linguistic analysis have traditionally been obtained by free-flowing speech that can last between 5-15 minutes. The present study will examine speech samples derived from a semi-structured clinical interview. Such speech will be subject to and influenced by the interviewer, the nature of the questions being

asked, the amount of psychopathology endorsed, or the individual's experience of course of the interview itself. Likewise, the amount of speech available for analysis will vary by individual subjects. Some participants, including social anhedonics, may be more loquacious whereas others may be more withdrawn, or some may be asked follow-up questions to responses whereas others may not. However, the speech samples obtained from the semi-structured interviews are produced by the subject with minimal prompting from the experimenters. Content and facial expression analysis methods differ from the common practice in the literature of inducing an emotional response from subjects by having them view emotion-eliciting film clips. Therefore, despite some minor limitations specific to this study, the methodology appears promising and further study is needed to elucidate the potential impact that linguistic style and content may have in the area of schizotypy.

We chose to examine and assess responses for certain items of the IPDE and SDS and not the entire batteries. This decision was based on the hypotheses to be explored; we are only interested in assessing responses to questions that pertain directly to either social relationships or positive emotional experiences. Although the primary focus of this study is on content and facial expression analyses, we will also be using the numerical dimensional scores from these items in data analysis. We will be interested to know whether or not low scores on these items are correlated with linguistic emotional and social description deficits and with a lack of positive facial expression. Therefore, coding will only require the examination of selected IPDE and SDS items.

We also chose to code existing videotaped interviews as opposed to collecting an entirely new data set. The data that was available for this study, while part of a larger

longitudinal study, is extremely valuable for scientific inquiry. The subjects ascertained represent an ethnically, culturally, intellectually, and economically diverse sample from the community. This aspect of the sample overcomes a major limitation within the schizotypy and psychosis-proneness literature. Also, the measures that were administered during the diagnostic interviews and that we're interested in coding require extensive training and time for administration. Ultimately, even though the data that is derived for this study was derived from a larger grant sample and consists of post-hoc coding, we feel as though the detailed examination of these interviews will yield meaningful scientific conclusions that might not otherwise be explored.

It has been shown that the affective structure of language differs between individuals (Feldman-Barrett, 2004). Studies of speech have found that some individuals only use two distinct emotional categories, positive or negative, when describing affective experiences, as compared to other individuals who differentiate specific emotional responses within these two broad categories. For example someone may describe experiences within the "negative" category with words like angry, disgusted, sad, and fear. This individual difference could potentially confound our results if there are some individuals within the social anhedonic group who use fewer emotionally descriptive words not because of an emotional deficit, but rather because there are individual differences in how people use words to represent their emotions. Unfortunately, we will not have a baseline pattern of speech for each participant with which to compare responses from our items of interest. However, we believe the risk that this potential confound may dramatically affect data interpretation is small and argue that

the proposed analyses will, in fact, provide an accurate and unique representation of how individuals experience their emotions.

Prior research has indicated that social anhedonia is present in a transient form in the experience of depressive symptoms (Blanchard, et al., 2001; Berenbaum & Oltmanns, 1992; Katsansis, et al., 1990). Therefore, in the current study, we will control for those subjects currently experiencing a major depressive episode by completely removing them from subsequent analyses. This will allow for optimal precision and further discrimination in defining the precise relationship of social anhedonia with our dependent variables of content analysis and facial expression ratings.

CHAPTER 4. RESULTS

OVERVIEW

This study sought to examine the social and positive emotion words used to describe positive experiences and social relationships, respectively, among socially anhedonic individuals and control participants. In addition, it aimed to identify whether these descriptions were accompanied by positively valenced facial expressions. First, group demographics will be described. Statistical procedures that address concerns regarding variability in subject response durations and missing data will then be outlined. Next, the findings on content analysis will be explored. These results will include descriptive statistics, group differences between social anhedonics and controls, effects for gender, correlations with symptom ratings, and the impact of vocabulary on speech responses. Subsequently, findings on facial expressions will be presented. This section will include results on the inter-rater reliability of FACES, intercorrelations of FACES variables, composition of a new variable to control for varied response durations, descriptive statistics, group differences, and correlations with symptom ratings. Finally, correlations between the dependent measures of expressivity (verbal and facial) will be examined and analyses used to test primary hypotheses will be repeated after removing those subjects who met DSM-IV criteria for current major depressive disorder (MDD).

ANALYSES

Group Demographics

Group differences (social anhedonic vs. control) in gender, race, and education were assessed using Chi square analyses. No significant differences between the social anhedonic and control groups were found for gender ($\chi^2 [1, N = 175] = .164, p = .40$) or

race ($\chi^2 [1, N = 175] = 1.527, p = .822$). However, level of education was significantly different between the two groups ($\chi^2 [1, N = 175] = 10.078, p = .006$) (see Table 1), such that more controls went on to complete some college than anhedonics.

Given group differences in education, univariate analyses of variance (ANOVAs) were used to determine whether language (LIWC content codes) or facial expressions (FACES ratings) differed across education level (i.e., enrolled in or dropped out of high school, high school graduate, or completed part college). Neither language nor facial expressions differed based on education status.

Addressing Variability in Response Time Duration

Because of the nature of the semi-structured interview, the amount of time in which participants responded to interviewer probes varied across participants and across conditions. This variation makes direct comparisons between individuals and between conditions problematic since, at times, there may be differences between participants in the amount of interaction coded. This variability could be due to the lengthy nature of participant's responses or to follow-up questions from the interviewer. In either case, increased amounts of time allowed for responding could serve to artificially inflate content analysis and facial expressions. Descriptive statistics are reported in detail in Figure 1. An independent sample t test was used to determine whether there were any group differences between response durations. Social anhedonics took significantly more time to respond than controls in the social ($t [122] = -4.304, p < .001$) and positive ($t [171] = -3.145, p < .01$) conditions. These differences have the potential to introduce unequal opportunities for the elicitation of positive affect or social language; therefore statistical controls will need to be implemented that can provide some standardization for

response time duration. In analyses described below, details for addressing duration are provided for both the language (LIWC) and facial (FACES) data.

Missing Data

As shown in Table 2, the sample size for each group (proposed sample size: anhedonics = 86, controls = 89) fluctuated somewhat between anhedonics and controls in the social and positive conditions. For LIWC data, these differences resulted from some interviewers omitting the questions that comprised either of these conditions; thus, no speech was available for these items. For FACES data, these differences resulted from either the omission of certain test items or from the participant's face being obscured on the video tape so that FACES ratings could not be completed. No data replacement strategies were employed to account for these sample size differences since the current study is exploratory and these differences are negligible.

Gender

Gender differences are considered in the following analyses since there is considerable evidence to suggest that females are more expressive, facially (e.g., Kring & Gordon, 1998) and verbally (Fischer, 1995), than males across a variety of experimental conditions. Analyses including ethnicity were not included in this study since there is no evidence to suggest that ethnicity has a significant impact on affective language in speech or on facial expressivity.

Verbal Expressivity – LIWC

Descriptive Statistics and Group Differences

The LIWC program provides output for a variety of word categories. For the present study, analyses only include the categories for positive emotion words and social

words. Descriptive statistics for social words used in the positive condition and positive words used in the social condition are listed in Table 2. As noted above, duration of responding differed across groups and must be considered in the analyses. In the case of content analysis of language, the LIWC generates scores based on the proportion of words that can be characterized as social or positive emotions. Thus, the LIWC summary scores can be used without concern for duration of speech as they do not reflect a total word count but the proportion of words that occur in the studied categories.

In order to test the hypothesis that social anhedonics use fewer positive emotion words to describe social relationships than controls, a 2 (group: social anhedonics vs. control) x 2 (gender: male x female) univariate ANOVA was conducted with positive words in the social condition as the dependent variable. Results indicate a significant main effect for group ($F [1, 173] = 8.778, p < .01$), with social anhedonics using fewer positive emotion words in descriptions of social relationships. There were no significant main effects for gender ($F [1, 173] = .028, p = .867$) or the group by gender interaction ($F [1, 173] = .976, p = .325$). These data indicate that social anhedonics used significantly fewer positive emotion words to describe social relationships and fewer social words to describe positive experiences than controls, and that gender had no impact on these group differences.

In order to test the hypothesis that social anhedonics use fewer social words in descriptions of positive experiences than controls, a 2 (group: social anhedonic vs. control) x 2 (gender: male x female) univariate ANOVA was conducted with social words used in the positive condition as the dependent variable. Results indicated a significant main effect for group ($F [1, 172] = 5.681, p < .05$), with social anhedonics

using fewer social words to describe positive experiences than control participants.

There was a non-significant trend for gender effects in this condition ($F [1, 172] = 2.998$, $p = .085$), but no significant group by gender interaction ($F [1, 172] = .068$, $p = .795$).

Correlation with Symptom Ratings

Bivariate correlations were used to conduct a within groups analysis of the relationship between social anhedonics' use of positive words in the social condition and IPDE dimensional scores of schizophrenia-spectrum psychopathology (see Table 3). These results indicated that higher IPDE Paranoid dimensional scores were significantly related to the use of fewer positive emotion words in the social condition ($r = -.29$, $p < .01$). Bivariate correlations were also performed to examine the relationship between social anhedonic's use of social words to describe positive experiences and IPDE dimensional scores; however, no significant correlations emerged. Additionally, correlations were used to determine whether social words in the positive condition and positive words in the social condition were related to summary scores on the SDS. Significant correlations were found such that more social words in the positive condition were related to lower SDS scores on Poverty of Speech ($r = -.24$, $p < .05$) and lower scores on Diminished Social Drive ($r = -.22$, $p < .05$) Therefore, these results indicate that there was some relationship between LIWC categories and symptom ratings in the interview (see Table 3).

The Impact of Vocabulary

A measure of verbal intelligence, the Vocabulary subtest of the Wechsler Adult Intelligence Scale – III (Wechsler, 1997), was obtained during experimental sessions. Because participants' verbal abilities has the potential to impact how effectively one

expresses him/herself through speech, the relationship between vocabulary and the use of social or positive words within the conditions under investigation was examined.

Bivariate correlations between the LIWC variables (i.e., social words in the positive condition and positive emotion words in the social condition) and Vocabulary subtest scores were performed separately by group. No significant correlations were obtained.

Therefore, vocabulary did not significantly impact participants' tendencies to use positive emotion and social words in their verbal descriptions of social relationships and positive experiences.

Facial Expressivity - FACES

Interrater agreement

Interrater agreement for FACES ratings was calculated using an intra-class correlation following the recommendations of Shrout and Fleiss (ICC; 1979). Using this random-effects model, raters are considered to be selected from a random sample of raters and each target is rated by a different set of k judges. Due to the large sample size, all coders were not able to rate all participants; however, raters were divided into three coder pairs and each member of the pair was assigned to independently rate ten participant tapes in order to examine agreement between all possible rater pair combinations. ICCs between rater pairs were calculated across participants for each of the three separate components (frequency, duration, and intensity) for both positive and negative emotions (see Table 4). ICC for Pair 1 ranged from .85 to .95 indicating excellent agreement between raters. However, the ICCs for Pair 2 ranged from .57 to .86, indicating acceptable reliability. Finally, the ICC for Pair 3 ranged from .33 to .73. Further examination of the ICCs for this pair indicates that two-thirds of the ICCs were

above .50, which indicates adequate reliability. In addition, the lowest ICC ratings, .36 and .33, were observed for the duration of positive and negative expressions, a variable that was not examined during the present study. The ICC's for this pair for frequencies of positive and negative expressions are .71 and .55, respectively, values that are indicative of adequate inter-rater reliability

Intercorrelations among FACES Variables

Correlations between the individual FACES variables of frequency, duration, and intensity were computed separately for controls and anhedonics (see Table 5). Correlations ranged from .87 to .99 and all of the individual FACES variables for positive and negative expressions were highly interrelated at the level $p < .01$. These highly significant intercorrelations are consistent with prior studies of FACES (e.g., Kring, et al., 1993) and other studies of facial components (e.g., Kelter, Moffitt, Stouthamer-Loeber, 1995). In order to reduce the number of dependent variables, and as described in previous reports using FACES (Kring & Gordon, 1998), frequency of facial expressions was chosen as the dependent variable for use in analyses in the current study.

New Variable Controlling for Response Duration

A major limitation for using frequency counts of facial expressions is that response times to probe questions during the interview varied across groups. Length of time for responding will have an impact on coding of facial expressions (with longer response times providing more opportunity for a greater number of expressions). Therefore, a new variable was calculated by dividing the total number of facial expressions (positive or negative) by the response duration, in minutes, for each condition. This new variable provides the number of facial expressions displayed per

minute in each condition and provides a metric that can be used to describe expressivity in participants that is relatively independent of the influence of response duration. This variable will be used in all the FACES analyses described below.

Descriptive Statistics and Group Differences

Descriptive statistics for the positive and negative FACES frequency scores for the positive and social conditions are presented in Table 2. In order to test the hypothesis that social anhedonics display fewer positive valenced facial expressions in their descriptions of social relationships than controls, a 2 (group: social anhedonic vs. control) x 2 (gender: male vs. female) univariate ANOVA was conducted with the new variable of positive expressions per minute in the social condition as the dependent variable. Results indicate a significant main effect for gender ($F [1, 171] = 11.247, p < .001$) with females in both groups displaying more positive facial expressions than males in the social condition. There were no significant effects for group ($F [1, 171] = 3.096, p = .080$) or the group by gender interaction ($F [1, 171] = 1.492, p < .224$).

The hypothesis that social anhedonics would display fewer positive facial expressions in their descriptions of positive experiences than controls was tested with another univariate ANOVA. This analysis revealed a significant effect for gender ($F [1, 169] = 13.535, p < .001$), with females exhibiting increased rates of positive expressions in the positive condition than males. There were no significant effects for group ($F [1, 169] = 1.507, p = .221$); or the group by gender interaction ($F [1] = 3.334, p = .07$). These results indicate that social anhedonics did not display significantly fewer positive facial expressions during descriptions of their social relationships or positive emotional experiences than controls.

Although there were no a priori hypotheses regarding negative expressions, the data were readily available and believed to be informative for an exploratory study. Gender and group effects on the elicitation of negative expressions in both the social and positive conditions were explored with univariate ANOVAs. For negative expressions in the social condition, group ($F [1, 171] = 2.635, p = .106$), gender ($F [1, 171] = 3.524, p = .062$), and the gender by group interaction ($F [1, 171] = 1.476, p = .226$) were not significant.

For negative expressions in the positive condition, group ($F [1, 169] = 3.006, p = .085$), gender ($F [1, 169] = .324, p = .324$), and the gender by group interaction ($F [1, 169] = .208, p = .649$) were not significant. These findings indicate that there were no significant differences between anhedonics and controls or between males and females on the expression of negative facial displays in the social or positive conditions.

Correlations with Symptoms Ratings

Bivariate correlations were used to examine the relationship between the average number of social anhedonic's facial displays per minute (positive and negative) for the social and positive conditions and IPDE dimensional scores of schizophrenia-spectrum psychopathology (see Table 6). The only significant correlation to emerge was between negative expressions in the positive condition and IPDE Schizotypal scores ($r = -.16, p < .05$), such that more negative expressions that occurred in the positive condition, the lower the IPDE Schizotypal Score. In addition, bivariate correlations were run to determine whether FACES ratings were related to summary scores on the SDS. Scores on Restricted Affect were significantly related to positive expressions in the social condition ($r = -.21, p < .05$) and positive expressions in the positive condition ($r = -.22, p$

< .05), such that the more positive expressions in the social and positive conditions, the lower the score on Restricted Affect. Another significant correlation emerged to indicate that more negative expressions in the positive condition were related to lower scores on Curbing of Interests ($r = -.15, p < .05$). More positive expressions in the social and positive conditions were related to lower scores on the SDS, but only for Restricted Affect. In addition, the finding that negative expressions in the positive condition are negatively related to IPDE Schizotypal scores and SDS scores on Curbing of Interests is an unexpected finding. However, the finding that fewer positive expressions are related to increases in some SDS scores provides partial support for the hypothesis that fewer positive expressions would be related to higher symptom ratings during the interview.

Correlations between Word Counts and Facial Displays

Bivariate correlations were used to examine whether positive and social descriptions in speech were related to positive and negative facial displays in these same conditions (positive and social). Correlations were run separately by group (see Table 7). No significant relationships were observed between the LIWC variables under investigation (social words used in the positive conditions and positive words used in the social condition) and the average FACES composite scores in the social and positive condition. Therefore, it can be concluded that although these measures both provide estimates of emotional expression, the constructs being measured are independent.

Controlling for Depression

Analyses to test the primary between-groups hypotheses were repeated after removing those participants who met DSM-IV criteria for current Major Depressive Disorder (N = 4). Removing those with current MDD did not change any of the

previously reported results; therefore, these results cannot be better accounted for by the presence of depression. Rather, they reflect traits inherent in those participants identified as anhedonic.

CHAPTER 5. DISCUSSION

This study sought to examine the expression of emotion in individuals believed to be at heightened risk for developing schizophrenia-spectrum disorders (social anhedonics). The study design allowed for the evaluation of naturalistic displays of emotion in response to questions about social and emotional experiences. Specifically, we utilized content analysis of language and facial affect coding to quantify differences between social anhedonics and controls. It was hypothesized that, compared to controls, social anhedonics would less often use positive emotional words in describing social relationships and that they would less often use social words in describing positive emotional events. With regard to facial expression, it was hypothesized that anhedonics would display fewer positive facial expression than controls.

Significant group differences in language use were observed. Social anhedonics used fewer positive emotion words in speech sampled from the social condition than controls. Similarly, significant group effects were found to indicate that social anhedonics used fewer social words in speech derived from the positive condition.

Given the findings of group differences in language, we sought to examine how language might relate to clinical symptom ratings within social anhedonics including schizophrenia-spectrum symptoms and ratings of negative or deficit symptoms. Correlational analyses of language and IPDE ratings revealed significant relationships between positive words in the social condition and IPDE Paranoid scores and between social words in the positive condition and SDS Diminished Social Drive and Poverty of Speech. Specifically, within anhedonics greater paranoia was related to less frequent use

of more positive emotion words. In addition, greater diminished social drive and poverty of speech were related to less frequent use of socially relevant words.

This is the first study to investigate linguistic characteristics as an indicator of emotional expression among individuals elevated in social anhedonia. The present findings of reduced positive emotional expression in anhedonics are consistent with content analysis findings showing reduced emotional expression in the speech of individuals with schizophrenia (Leichsenring & Sachsse, 2002; Taylor et al., 1994). Although, assumptions regarding the positive or negative emotional experience of social relationships among anhedonics are precluded, what can be surmised from this study is that when social anhedonics communicate information about their social relationships, the words used are less likely to communicate that a positive emotional experience is associated with such relationships. Alternatively, when asked to describe positive experiences, the language that is used less often indicates that other individuals are involved in or associated with such experiences.

Although participants are describing and expressing emotions associated with the *experience* of social relationships and positive events, no firm conclusions can be made regarding these internal experiences since experience was not directly assessed. In addition, the nature of the social relationships of participants is unknown. Perhaps the social encounters of anhedonics are more superficial and less meaningful than those of controls. Perhaps it is not that the social experiences of anhedonics are less rewarding, rather these experiences have simply been more limited. Therefore, although the present results are promising and provide unique information regarding the emotional expression of social events in anhedonics, the results must be interpreted cautiously and should not

be inferred to represent the experience of emotional states or as indicative of differences in types of relationships.

A lack of facial expressivity in individuals with schizophrenia has been a consistently noted since early clinical observations by Bleuler (1950) and in recent investigations (Berenbaum & Oltmanns, 1992; Kring, et al., 1993; Kring & Neale, 1996). Affective flattening, which refers to an immobile and unresponsive face, poor eye contact, and reduced body language, is one of the negative symptoms that are diagnostic characteristics of schizophrenia (DSM-IV; American Psychiatric Association, 1994). These reports in the literature led to the current hypothesis that if social anhedonia is a true trait marker for the development of schizophrenia or related psychotic illnesses, then it would be expected that some flattened facial expressivity, as compared with non-social anhedonics, would be observed. However, there were no differences between social anhedonic and control participant's positive (or negative) facial expressions during the social or positive conditions. The results of this study were able to replicate an effect for gender that has been observed throughout the literature on emotional expressivity (e.g., Kring & Gordon, 1996); females, in both groups, displayed more positive expressions than males, across the social and positive conditions.

Although unexpected, these results are consistent with a previous study that examined facial expression responses to affect-eliciting film clips in a sample of non-ill participants with elevated scores on the Physical Anhedonia Scale and control participants (Berenbaum, Snowwhite, & Oltmanns, 1987). This investigation reported no differences between anhedonics and controls on self-report measures of experienced emotion or on coded facial expressions. However, a gender difference was observed,

with females reporting the experience of more emotion and displaying significantly more facial expressivity (Berenbaum, et al., 1987).

While consistent with this prior work, the results of the current study are inconsistent with an earlier study that reported on the same sample of social anhedonics during the same diagnostic interview procedure utilized herein (Collins, et al., 2004). Collins and colleagues (2004) examined global ratings of coder's overall impressions of facial expressivity indexed by the categories of constricted facial affect and lack of non-verbal expression. These were the only two variables that reflected facial displays of affect and were averaged with other categories such as lack of verbal expression and lack of verbal responsiveness to create a summary score for signs associated with schizoidia. In addition, the portions of the interview that were analyzed in the two studies only overlapped somewhat; both included IPDE items, but other portions differed. Using the schizoidia behavioral coding variable from Collins et al. (2004), it was found that social anhedonics were significantly less expressive than controls. In sum, the previous investigation used global ratings of facial expressivity while the current study sought to detect specific occurrences of any facial expression with a positive or negative valence, even those with low levels of intensity or duration (a 1 second minimum of duration was required before an expression was coded). Additionally, the previous investigation measured portions of videotape that contained less structured social interactions (i.e., the Overview section of the SCID) than segments of the interview analyzed in the current study. Thus, differences in ratings of expressivity between these two studies could have been due to differences in measurement or to differences in the interview segments chosen for analysis.

It was also hypothesized that in the social anhedonic group, fewer positive facial expressions would be associated with greater IPDE and SDS ratings of psychopathology. Correlational analyses for these variables were exploratory and also included negative facial expressions. It was found that more negative expressions in the positive condition were significantly related to lower IPDE Schizotypal scores. This is an unexpected finding and is difficult to interpret. More negative expressions in the positive condition were also related to lower scores on the SDS Curbing of Interests. Currently, it is unclear why the presence of negative expressions would be related to decreased scores on the IPDE Schizotypal dimension. It may be the case that too few negative expressions were elicited during the overall interview, which introduces a restricted range of behavior that could potentially bias results. Significant relationships were also observed between positive expressions in the social condition and SDS Restricted Affect, such that fewer positive expressions were associated with greater SDS scores in this category. In addition, fewer positive expressions in the positive condition were also related higher SDS Restricted Affect scores. These findings do provide support for the hypothesis that fewer positive expressions would be related to greater symptom ratings. However, since significant correlations were only found for one symptom variable, and since the findings on negative expressions conflict with expectations, the hypothesis regarding deficits in positive expressions and symptom correlates can only be partially supported.

Current results indicate that although social anhedonics use fewer affectively valenced words in social descriptions and fewer social words in positive experience descriptions, they did not use fewer positively-valenced facial expressions than controls. Perhaps it is the case that anhedonics appear less expressive than controls when rated on

global, summary scores of facial expressivity. Or perhaps anhedonics are less facially expressive than controls during less-structured social interactions than the formal, question-answer sections of the interview analyzed in this study. Further work is needed to elucidate these matters.

Content analysis scores and FACES ratings were not significantly correlated with each other, indicating that the usage of positive and social words was not significantly related to the expression of positive facial displays during the social or positive conditions. These results indicate that measures of content of speech were independent of nonverbal facial expressions. Some analyses were utilized to examine the contribution of other factors that might influence language and facial expression. First, the relation between vocabulary (as measured with the WAIS-III) and language codes was examined. No significant correlations were found. Based on this analysis, it appears that vocabulary ability did not significantly impact social anhedonic or control participant's verbal responses to social relationship or positive experience interview probes as determined by correlational analyses.

Second, because anhedonia is a clinical feature of major depression and the occurrence of transient social anhedonia has been documented in major depression (Blanchard, et al., 2001), the present results were re-computed after removing participants who met full DSM-IV criteria for MDD. Specifically analyses were computed that examined group differences between anhedonics and controls on 1) amount of positive emotion words in the social condition, 2) amount of social words in the positive conditions, and 3) average number of positive and negative facial expressions in the social and positive conditions. The removal of these participants did not alter any

of the significant findings reported above. However, only four participants met criteria for MDD and were removed during these analyses and because of the small number of participants who met criteria for current MDD, it cannot be firmly established that the transient anhedonia of a depressive episode versus the trait-like anhedonia that is a risk marker for schizophrenia would not have significantly altered these results. Thus, although the removal of depressed participants did not alter the results of the major hypotheses, it remains unclear exactly how the content analysis and facial expression ratings would differ between those individuals who endorse anhedonia as a result of depression or individuals elevated in anhedonia that is indicative of risk for the development of psychosis.

LIMITATIONS

Although some major strengths of the current study are the use of a diverse community sample and the application of a novel methodology for measuring affect expression, some limitations are noteworthy. First, because this study is not longitudinal in nature, the validity of the construct of social anhedonia as a marker for the risk of developing schizophrenia-spectrum pathology cannot be addressed. Prior work has provided evidence for the validity and reliability of the construct of social anhedonia in college samples (Chapman, et al., 1994; Kwapil, 1998; Gooding, et al., 2005). However, participants in the current study would need to be followed through the risk period (early to late twenties) before claims can be made regarding the adequacy of social anhedonia as a marker of elevated risk for psychopathology in a community sample. A longitudinal study for this purpose is currently underway.

Second, these data do not reflect the emotional experience of social interactions or relationships, only conclusions regarding the verbal and nonverbal expression of these emotions can be drawn. Therefore, it is unknown how the experience of positive emotional states in social relationships is related to the expression of emotion as described above. Do anhedonics actually experience fewer positive emotions associated with social relationships and interactions? Or do they simply use less positive emotional language to describe these relationships? If that is the case, why do they use less positive descriptions and describe their positive experiences as less influenced by others? Interpretations from the current results are limited to the description of the expressivity, verbal and nonverbal, of social anhedonics during a social interaction that occurs as part of a semi-structured diagnostic interview.

FUTURE DIRECTIONS

It has been previously noted there are limitations associated with the semi-structured interview used in the present study. There are also limitations in generalizability associated with prior studies that have relied on the presentation of film clips or flavored drinks in the laboratory (Kring, et al., 1993, Berenbaum & Oltmanns, 1992). Future studies would benefit by utilizing more naturalistic stimuli in a laboratory or by examining social and emotional behavior in a naturalistic environment. Such methods may allow for more meaningful conclusions regarding behavior that occurs in a “real world” setting.

As socially anhedonic participants in this study age and move through the risk period (early to late twenties) for developing schizophrenia-spectrum illnesses, it will be important to continue to assess how emotions related to social functioning are expressed.

In this way, a longitudinal design could provide invaluable information regarding the social and emotional factors that could serve to speed the development of a debilitating mental illness or protect an individual from decompensation. In addition, studying these constructs in a longitudinal manner will serve to inform the study of the construct of social anhedonia by outlining the specific behavioral characteristics that define the clinical presentation of a socially anhedonic individual.

APPENDIX A

University of Maryland IRB Approval



**IRB APPROVAL NOTIFICATION OF
PROTOCOL REVISION/ADDENDUM REQUEST**

TO: Dr. Jack Blanchard
Department of Psychology

FROM: Dr. Phylis Moser-Veillon, Co-Chairperson
Dr. Marc Rogers, Co-Chairperson
Institutional Review Board

DATE: Monday, July 26, 2004

IRB PROTOCOL NUMBER AND PROJECT TITLE:
00848; "Family Study of Traits and Psychological Functioning"

REMINDER: IRB approval for your research project will expire on **May 31, 2005**. If you wish to collect data from human subjects in connection with this research project after the approval expiration date, please submit a renewal application to the IRB at least 30 days before approval is due to expire.

This is to notify you that the Institutional Review Board (IRB) has approved your request to revise the approved protocol for your project (identified above); a summary of those changes appears below. Please also remember to report any protocol deviations (should they occur) to the IRB. Thank you.

SUMMARY OF APPROVED CHANGES:

- Approval of 30 June 2004 request to add measures to the three-year following that will commence in August 2004.

University of Maryland HSR and IRB Approval



UNIVERSITY OF
MARYLAND

INSTITUTIONAL REVIEW BOARD

2100 Lee Building
College Park, Maryland 20742-5121
301-405-4212 TEL 301-314-1475 FAX

To: Jack Blanchard
Monica Mann
Rachel Thompson
Angela Henneberger
Psychology

From: Roslyn Edson, M.S., CIP *RE*
IRB Manager
University of Maryland, College Park

Re: IRB Application # 05-0089
Title: Verbal and Nonverbal Expressions as Indicators of Social
and Emotional Functioning among Social Anhedonics

Approval Date: March 2, 2005

Expiration Date: March 2, 2006

Type of Application: Initial

Type of Research: Nonexempt

Type of Review: Expedited

10410

The University of Maryland, College Park Institutional Review Board (IRB) approved your IRB application. The research was approved in accordance with the University's IRB policies and procedures and 45 CFR 46, the Federal Policy for the Protection of Human Subjects. Please reference the above-cited IRB application number in any future communications with our office regarding this research.

Recruitment/Consent: For research requiring written informed consent, the IRB-approved and stamped informed consent document is enclosed. The IRB approval expiration date has been stamped on the informed consent document. Please keep copies of the consent forms used for this research for three years after the completion of the research.

Continuing Review: If you want to continue to collect data from human subjects or analyze data from human subjects after the expiration date for this approval, you must submit a renewal application to the IRB Office at least 30 days before the approval expiration date.

APPENDIX B

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 C

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. (-)

APPENDIX D

Selected IPDE and SDS Questions in Each Condition

Social Condition

IPDE

III. Who are the most important people in your life?

In what way are they important?

24. Do you enjoy close relationships or being part of a family?

Tell me about it? Why do you enjoy it?

Positive Condition

IPDE

51. What kinds of activities do you enjoy?

SDS – B. Diminished Emotional Range

What do you really enjoy in life?

Tell me about something that happened to make you happy – what did that feel like?

Negative Condition

SDS – B. Diminished Emotional Range

What upsets you? Tell me about something that happened to make you upset?

What makes you sad?

What makes you angry?

APPENDIX E

LIWC Categories

II. Psychological Processes

Affective or emotional processes

Positive Emotions

Accept, accepta*, accepted, accepting, accepts, active*, admir*, ador*, advantage*, adventure*, affection*, agree*, alert*, amaz*, amus*, attachment*, attract*, award*, awesome*, beaut*, benefit, benefits, benign, best, better, bless*, bold, brave*, bright*, brillian*, calm*, care, cared, carefree, careful*, cares, caring, casual*, certain*, challeng*, charm*, cheer, cheered, cheerf*, cherish*, chuckl*, clever*, comfort*, commitment*, concentrat*, confidence*, confidently, confront*, considerate, contented*, control*, convinc*, courag*, create*, creating, creative*, cute*, daring, darling, dear, definite*, delicate*, delicious*, delight*, determina*, determined, devot*, digni*, divine*, dynam*, ease*, easy*, ecsta*, efficien*, elegant*, encourag*, energ*, engaging, enjoy*, entertain*, enthus*, excel*, excit*, faith*, fantastic*, favor*, favour*, festiv*, flawless, flirt*, fond, fondly, forgiv*, free*, friendl*, fun, funn*, gentle, gently, giggl*, giving, glad, glorious, glory, good, goodness, gorgeous*, grand, gratef*, grati*, grin, grins, handsom*, happi*, happy, harmony, heaven*, helpful*, hero*, hilarious, honest*, honor*, honour*, hope, hoped, hopef*, hopes, hoping, humor*, humour*, ideal*, impress*, improve*, inspire*, intell*, interest*, jolly, joy, keen*, kindn*, kiss*, laugh*, liked, likes, liking, livel*, love, loved, lovely, loves, loving*, loyal*, lucki*, lucky, magnific*, merr*, neat, nice*, nurtur*, ok, okay, optimi*, original, paradise, partie*, party*, passion*, peace*, perfect, perfection, perfectly, play, played, playing, plays, pleasant, pleased, pleasing, pleasure*, popular*, positive*, prett*, pride, prize*, profit*, promising, proud*, ready, reassure*, relax*, rich*, romanc*, romantic*, satisfy*, secure, secure*, sensitiv*, sentimental, share, shared, shares, sharing, silly, sincer*, smart*, smil*, sociab*, special, strong*, sunn*, super, superior*, support, supported, supporter*, supporting, supportiv*, supports, suprem*, sure*, surpris*, sweet, talent*, tender, terrific*, thank, thanked, thankf*, thanks*, thoughtful*, tolerant*, top, treasure*, triumph*, true*, trust*, truth*, useful*, valu*, vigor*, vigour*, virtue*, vital, warm, warmth, wealth*, welcom*, win, winn*, wins, wisdom, wise, won, wonderf*, worship*, worthwhile, zip.

Social Processes

Acquainta*, admit, admits, admitted, admitting, adult, adults, advice, affair*, anybod*, anyone*, apology*, argu*, army, ask, asked, asking, asks, assembl*, aunt*, babe, babies, baby, band, beg*, blam*, boy*, boyfriend*, boys, brother*, bud, buddies, buddy, buds, call, called, calling, calls, celebrat*, chat*, chick, child, children, colleague*, comment*, communic*, companion, complain*, comrade, confess*, confide, confided, confides, congregat*, consult*, contact*, contradict*, convers*, counsel*,

cousin*, coworker*, critici*, crowd, dad*, daughter*, describe, described, describes, describing, discl*, discuss*, email*, e-mail*, encourag*, everybod*, everyone*, everything*, ex, excuse*, exgirl*, explain, explained, explaining, explains, express, expressed, expresses, expressing, families*, family, father*, fellow*, female*, feud*, fiancé*, fight, fighting, fights, flatter*, folks, forgiv*, fought, friends*, game*, gather*, gave, gentlem*, girl*, girlfriend*, girls, give, given, gives, giving, gossip*, grandchil*, granddad*, graddau*, grandf*, grandm*, grandpa*, grandson*, great-*, group*, grownup*, guest*, guy*, he, hear, heard, hearing, hears, he'd, he'll, hello, help, helped, helpful*, her, hers, herself*, he's, hi, him, himself, his, honey, human, humans, husband*, individual, individuals, infant, infants, inform, informs, insult*, interact*, interrup*, interview*, involv*, kid*, kids, kin, ladies, lady, lets let's listen, listened, listening, listens, lover*, ma'am, male, males, man*, mate, mates, meet, meeting*, meets, men*, mention*, messag*, met, mob, mom, momma*, mommy*, moms mom's, mother*, mum, mummy*, mums, mum's, negotiate*, neighbor*, nephew*, niece*, organization*, organize*, organizing, our, ours, ourselves, pal, pals, parent*, participat*, partie*, partner*, party*, people*, person, persons, persua*, phone*, praise*, question, questioning, questioned, questions, reassur*, refus*, relatives, replie*, reply, request*, respond*, roommate*, roomie*, roommate*, rumor*, rumour*, said, say*, secret, secrets, share, shared, shares, sharing, she, she'd, she'll, she's, sir, sister*, somebod*, someone*, son, sons, son's, speak, speaking, speaks, spoke*, spouse*, step-*, stepfat*, stepmot*, suggest*, sweetheart*, talk, talked, talking, talks, team*, teas*, telephon*, tell, telling, tells, thee, their*, them, themselves, they, they'd, they'll, they're, they've, thine, thou, thoust, thy, told, uncle, uncles, uncle's, us, we, we'd, welcom*, we'll, we're, we've who, who's, wife*, wive*, woman*, women*, ya, ya'll, ye, you, you'd you'll your*, you're, you've

* = any other forms of a given word
 (e.g., bud* = bud, buds, buddy, buddies)

APPENDIX F

FACES Time Sheet
(to be filled out during LIWC coding)

FILE # _____
SUBJECT # _____
LIWC Coder initials: _____

IPDE

III. Interpersonal Relationships

Who are the most important people in your life?

In what way are they important?

Start time: _____ **Stop time:** _____

24. Do you enjoy close relationships or being part of a family?

Tell me about it? Why do you enjoy it?

Start time: _____ **Stop time:** _____

51. What kinds of activities do you enjoy?

Start time: _____ **Stop time:** _____

SDS

B. Diminished Emotional Range

1B. What do you really enjoy in life?

Tell me about something that happened to make you happy – what did that feel like?

Start time: _____ **Stop time:** _____

4B. What upsets you? Tell me about something that happened to make you upset – what did that feel like?

What makes you sad?

What irritates you or makes you angry?

Start time: _____ **Stop time:** _____

APPENDIX G

FACES Coding Sheet

Valence:

Positive_____

(e.g., happy, delighted, glad, amused, pleased, content, satisfied, clam, serene, excited, astonished, cheerful, surprised, active, content)

Negative_____

(e.g., miserable, distressed, annoyed, jittery, nervous, angry, gloomy, anxious, afraid, tense, alarmed, frustrated, disgusted, depressed, hostile)

Neutral_____

(e.g., engaged, interested, contemplative, a facial expression that is decidedly intense, but does not show either positive or negative valence)

Intensity: low medium high very high
 1 2 3 4

Low: a mild expression, such as a smile where the corners of the mouth are slightly raised but no teeth are shown and very little eye movement.

Medium: a moderate expression, a smile bordering on a laugh, with the eyebrows slightly raised and the lips apart, exposing teeth.

High: an expression that involves most, if not all, of the face, such as laughing with an open mouth and raising the eyebrows and cheeks.

Very High: reserved for very intense expressions, such as laughing with the mouth completely open with the eyebrows and cheeks substantially raised.

*Subject*_____ *Interviewer:* _____ *Rater:* _____

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive_____ Negative_____ Neutral_____

Intensity: low medium high very high
 1 2 3 4

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive_____ Negative_____ Neutral_____

Intensity: low medium high very high
 1 2 3

FACES

Faces Coding Sheet, cont.

Subject _____ *Interviewer:* _____ *Rater:* _____

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive _____ Negative _____ Neutral _____

Intensity: low medium high very high
1 2 3 4

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive _____ Negative _____ Neutral _____

Intensity: low medium high very high
1 2 3 4

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive _____ Negative _____ Neutral _____

Intensity: low medium high very high
1 2 3 4

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive _____ Negative _____ Neutral _____

Intensity: low medium high very high
1 2 3 4

Time start: _____ Time end: _____ Duration: _____ Item # _____

Valence: Positive _____ Negative _____ Neutral _____

Intensity: low medium high very high
1 2 3 4

FACES Summary Sheet

Subject: _____ *Interviewer:* _____ *Rater:* _____

Please rate the degree to which the subject expressed each of the following emotions using the scale below:

Not at all = 1 Slightly = 2 Somewhat = 3 Moderately = 4 Quite a bit = 5 Very Much = 6

Interest _____ Sadness _____ Happiness _____ Anger _____ Fear _____ Amusement _____ Disgust _____

What is the overall level of expressiveness for this person?

Low	Fairly low	Medium	Fairly high	High
1	2	3	4	5

Low: none or few expressions all of which were short and low in intensity.

High: many highly intense and longer expressions

Total number of positive expressions _____

Total number of negative expressions _____

Total number of neutral expression _____

Total duration of positive expressions _____

Total duration of negative expressions _____

Total duration of neutral expressions _____

Mean duration of positive expressions _____

Mean duration of negative expressions _____

Mean duration of neutral expressions _____

(Divide the total duration of expressions by the number of expressions)

Total positive intensity _____

Total negative intensity _____

Total neutral intensity _____

Mean positive intensity _____

Mean negative intensity _____

Mean neutral intensity _____

(Total intensity ratings divided by the number of expressions)

What was the predominant emotion being expressed throughout the interview?

- A. Interest
- B. Sadness
- C. Anger
- D. Surprise
- E. Fear/Disgust
- F. Neutral/Indifferent
- G. Happiness

Table 1

Demographic Characteristics for Social Anhedonic and Control Participants

	Social Anhedonic (N = 86)	Control (N = 89)	p-level
<u>Gender</u>			
Male (%)	37 (43.0%)	41 (46.1%)	ns
Female (%)	49 (57.0%)	48 (53.9%)	
<u>Ethnicity</u>			
Caucasian (%)	38 (44.2%)	40 (44.9%)	ns
African American (%)	40 (46.5%)	37 (41.6%)	
Hispanic (%)	6 (7.0%)	7 (7.9%)	
Other (%)	2 (2.4%)	5 (5.6%)	
<u>Education</u>			
Enrolled in high school (%)	1 (1.2%)	1 (1.1%)	.006
High School Graduate (%)	25 (29.1%)	9 (10.1%)	
Part-college (%)	60 (69.8%)	79 (88.8%)	

Table 2

Descriptive Statistics for LIWC and FACES Variables

	Soc. Anh. Mean (SD)	N	Control Mean (SD)	N
<u>LIWC</u>				
Positive words in the social condition	2.847 (2.05)	86	3.834 (2.43)	87
Social words in the positive condition	5.412 (3.25)	85	6.599 (3.34)	87
<u>FACES</u>				
Positive expressions in the social condition	1.230 (1.18)	85	1.707 (2.16)	86
Negative expressions in the social condition	0.629 (0.91)	85	0.430 (0.80)	86
Positive expressions in the positive condition	1.898 (2.31)	82	2.378 (2.43)	86
Negative expressions in the positive condition	0.606 (0.87)	82	0.411 (0.58)	86

LIWC: Linguistic Inquiry and Word Count

FACES: Facial Expressive Coding System

Table 3

Correlations between LIWC Variables (N = 85), IPDE Dimensional Scores, and SDS Summary Scores – Social Anhedonics

	Social words in positive condition <i>r</i>	Positive words in social condition <i>r</i>
IPDE Schizoid	-.19	-.16
IPDE Schizotypal	-.08	-.07
IPDE Paranoid	.01	-.30*
SDS Restricted Affect	-.04	-.15
SDS Diminished Emotional Range	-.13	-.02
SDS Poverty of Speech	-.24*	-.07
SDS Curbing of Interests	.05	-.08
SDS Diminished Sense of Purpose	-.02	-.12
SDS Diminished Social Drive	-.22*	-.12

* $p < 0.01$

LIWC: Linguistic Inquiry and Word Count

IPDE: International Personality Disorder Examination

SDS: Schedule for the Deficit Syndrome

Table 4

Inter-Rater Reliability of FACES

	ICC Pair 1	ICC Pair 2	ICC Pair 3
Frequency of positive expressions	.95	.66	.71
Frequency of negative expressions	.88	.86	.55
Duration of positive expressions	.90	.74	.36
Duration of negative expressions	.90	.73	.33
Intensity of positive expressions	.87	.57	.73
Intensity of negative expressions	.85	.82	.66

FACES: Facial Expression Coding System

Table 5

Correlations between Individual FACES Variables

	Anhedonics <u>r</u>	Controls <u>r</u>
Positive Expressions in the Social Condition		
Frequency x Duration	.87*	.97*
Frequency x Intensity	.98*	.98*
Duration x Intensity	.90*	.97*
Negative Expressions in the Social Condition		
Frequency x Duration	.99*	.95*
Frequency x Intensity	.99*	.98*
Duration x Intensity	.99*	.95*
Positive Expressions in the Positive Condition		
Frequency x Duration	.94*	.94*
Frequency x Intensity	.96*	.98*
Duration x Intensity	.92*	.93*
Negative Expressions in the Positive Condition		
Frequency x Duration	.90*	.95*
Frequency x Intensity	.99*	.96*
Duration x Intensity	.90*	.93*

* $p < 0.01$

FACES: Facial Expression Coding System

Table 6

Correlations between FACES Variables (N = 82), IPDE Dimensional Scores and SDS Summary Scores – Social Anhedonics

	Pos. exp's soc. cond. <u>r</u>	Neg. exp's soc. cond. <u>r</u>	Pos. exp's pos. cond. <u>r</u>	Neg exp's pos. cond. <u>r</u>
IPDE Schizoid	-.03	.01	-.02	-.08
IPDE Schizotypal	-.02	.02	-.05	-.16*
IPDE Paranoid	-.05	.12	-.09	-.01
SDS Restricted Affect	-.21*	-.03	-.22*	-.05
SDS Dim. EmotionalRange	-.13	.10	-.10	-.05
SDS Poverty of Speech	.01	-.08	-.10	-.10
SDS Curbing of Interests	-.09	-.12	-.12	-.15*
SDS Dim. Sense of Purpose	-.11	-.04	-.12	.03
SDS Dim. Social Drive	-.14	.12	-.13	.03

* $p < 0.05$

FACES: Facial Expression Coding System

IPDE: International Personality Disorder Examination

SDS: Schedule for the Deficit Syndrome

Table 7

Correlations between Measures of Word Count (LIWC) and Facial Displays (FACES)

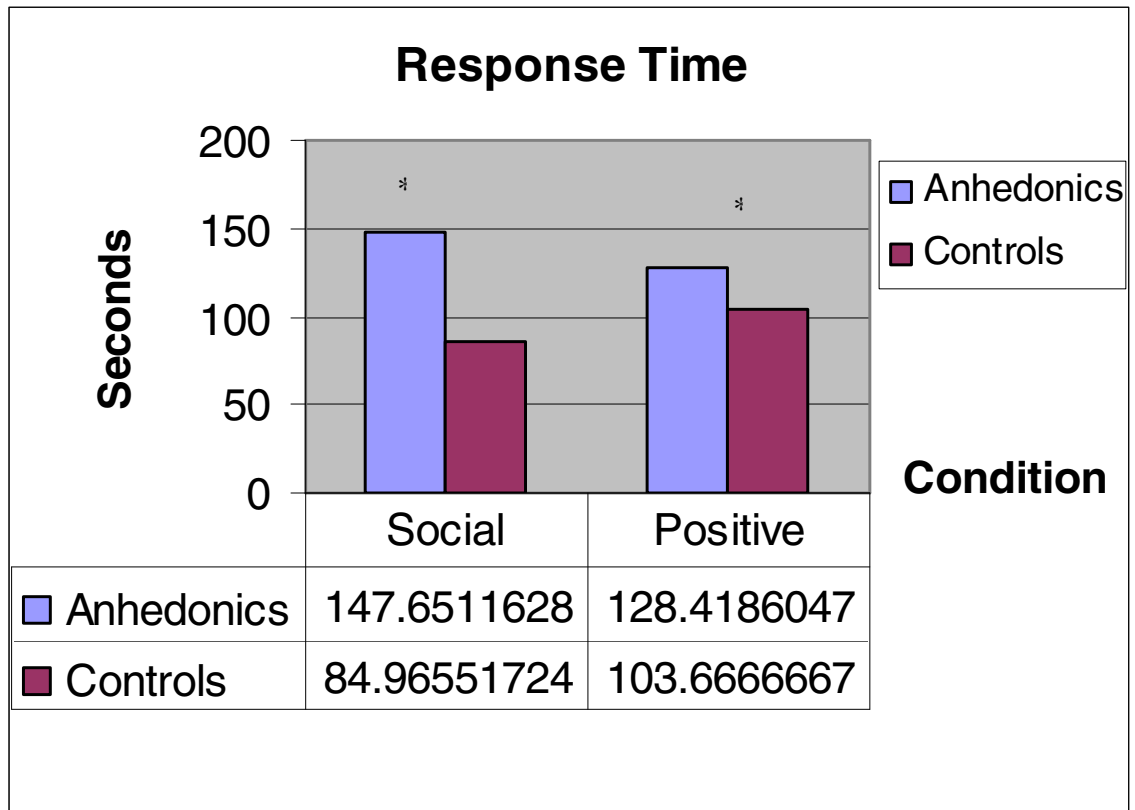
in condition	Social words in positive condition <u>r</u>	Positive words social <u>r</u>
<u>Social Anhedonics</u>		
Positive expressions in social condition	.08	.08
Negative expressions in social condition	-.12	-.05
Positive expressions in positive condition	.07	.16
Negative expressions in positive condition	.02	-.13
<u>Controls</u>		
Positive expressions in social condition	-.06	.09
Negative expressions in social condition	-.04	.06
Positive expressions in positive condition	.09	.14
Negative expressions in positive condition	.10	-.06

LIWC: Linguistic Inquiry and Word Count

FACES: Facial Expression Coding System

Figure 1

Differences in Response Durations



* p < 0.05

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