

ABSTRACT

Title of Document: SCHIZOPHRENIA-SPECTRUM BEHAVIOR
AND PEER RESPONSES TO INDIVIDUALS
WITH SOCIAL ANHEDONIA

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Individuals with social anhedonia experience difficulties in several domains including social interaction, cognition, psychophysiological abnormalities, and poor long-term functional outcomes. These individuals also exhibit high levels of behaviors of schizoidia and schizotypy in comparison to healthy controls. This study aimed to examine behavior related to schizoidia and schizotypy, their longitudinal stability and whether these behaviors are related to social functioning. For the first time, this research moves beyond self-report data and evaluates how peers respond to individuals with social anhedonia in a brief time frame. The current study utilized a psychometric high-risk sample of individuals with social anhedonia and healthy controls that participated in a three year longitudinal study and examined the stability of the sample's schizoid and schizotypal behaviors. Further, this study investigated peer reactions to these individuals as well as the relationship between peer reactions and schizoid and schizotypal behaviors. Individuals with social anhedonia

demonstrated higher levels of both schizoid and schizotypal behavior at the baseline period, as expected. These differences persisted into the follow-up assessment for schizoid behavior, but not for schizotypal behavior. Peers reported that they were less willing to interact with individuals with social anhedonia and that these individuals were less likable, less friendly and more odd than healthy controls at both the baseline and three-year follow-up period. Further, in regression analyses several patterns emerged to suggest that schizoid behaviors explain a significant amount of variance in these peer responses. This study is the first study to examine the relationship between schizophrenia-spectrum behaviors and peer responses in individuals with social anhedonia and healthy controls.

SCHIZOPHRENIA-SPECTRUM BEHAVIOR AND PEER RESPONSES TO
INDIVIDUALS WITH SOCIAL ANHEDONIA

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Dedication

This dissertation is dedicated to my parents, Robert Baker and Marian Baker, who have always encouraged me to pursue higher education. Thank you for supporting me from preschool through my Ph.D. It is also dedicated to Kyle DeBeer who supported me daily through this process. I appreciate your patience, understanding and humor.

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Chapter 1: Introduction

Psychometric high-risk paradigms have proven useful in studying the development of schizophrenia-spectrum disorders (Blanchard, Collins, Aghevli, Leung, & Cohen, 2011; Kwapil, 1998). Specifically, individual differences associated with the prediction of psychosis are assessed using self-report questionnaires. Individuals who evidence high scores on these measures are identified as a psychometrically high-risk group (Blanchard, et al., 2011; Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Gooding, Tallent, & Matts, 2005; Kwapil, 1998). The psychometric high-risk paradigm has roots in Meehl's theory of schizotypy. In this conceptualization, schizotaxia is a genetic model for the etiology of schizophrenia, and specifically refers to a deficit in neural integration that arises from a genetic abnormality (Meehl, 1962). Meehl postulated that through social learning, all individuals with schizotaxia would develop schizotypy, a personality structure that reflects the latent vulnerability for developing schizophrenia. Meehl (1962) hypothesized that approximately 10% of those with schizotypy would eventually develop schizophrenia in contrast to 1% of the general population (Jablensky, 2000). Meehl theorized that there are four behavioral signs of schizotypy: cognitive slippage, ambivalence, interpersonal aversiveness, and anhedonia (Meehl, 1962).

The term anhedonia describes a broad deficit in pleasure that can be either social or physical (Meehl, 1962). Within the context of transdiagnostic research, anhedonia is a characteristic that cuts across several disorders such as depression, schizophrenia and social anxiety (Brown, Silvia, Myin-Germeys & Kwapil, 2007). However, this characteristic tends to manifest differently among these disorders. Within depression, anhedonia is a state that remits when the depressive episode is treated (Blanchard, Horan

& Brown, 2001). While individuals with social anxiety may experience a lack of pleasure, it is restricted to social situations, and it is due to their fear of rejection, not because they do not desire a relationship (Brown et al., 2007). However, individuals with schizophrenia experience anhedonia as a persistent temperamental trait that does not remit after treatment (Blanchard et al., 2001). Anhedonia is also considered to be one of the negative symptoms of schizophrenia, along with avolition, alogia, asociality and blunted affect, and this symptom constellation is defined by a loss of functioning (Andreasen, 1982). Thus, within schizophrenia spectrum disorders, social anhedonia has good discriminant validity amongst clinical disorders. Due to its prominence in Meehl's model of schizotypy, social anhedonia has frequently been studied in psychometric high-risk paradigms. Building from Meehl's theory, Chapman and colleagues developed scales to assess psychometric high risk (Chapman, Chapman, & Raulin, 1976). A significant body of literature suggests that social anhedonia is a reliable indicator of schizotypy. This literature will be reviewed below.

Social anhedonia is defined as a lessened ability to experience pleasure in social situations (Blanchard et al., 2001; Meehl, 1962). Social anhedonia appears to be a valid indicator of schizotypy, as individuals with elevated social anhedonia display cognitive deficits, psychophysiological abnormalities, poor long-term outcomes, and elevated schizophrenia-spectrum symptoms that are similar to individuals with schizophrenia (Blanchard et al., 2009; Gooding, Kwapil, & Tallent, 1999; Gooding, Miller, & Kwapil, 2000; Gooding & Tallent, 2003; Mishlove & Chapman, 1985; Tallent & Gooding, 1999). These similarities provide validity for the theory that social anhedonia is a potential risk factor for the development of schizophrenia (Blanchard et al., 2011; Gooding et al., 1999;

Gooding et al., 2000; Gooding & Tallent, 2003; Mishlove & Chapman, 1985; Tallent & Gooding, 1999).

Social anhedonia has also been associated with higher levels of schizophrenia spectrum behaviors in comparison to healthy controls (Collins, Blanchard & Biondo, 2005; Emmerson, Miller & Blanchard, 2009). Specifically, individuals with social anhedonia display schizotypic and schizoid behaviors such as constricted facial affect, a lack of non-verbal expression, a lack of verbal expression, physical anergia and odd speech (Collins et al., 2005; Emmerson et al., 2009). Furthermore, these behavioral signs predicted group status (i.e., social anhedonia or healthy control) above and beyond symptom ratings (Collins et al., 2005). Thus, overt behavioral signs of schizoidia and schizotypy provide a unique set of information that is not captured in clinical interviews in this population (Collins et al., 2005). Additionally, in an examination of first-degree relatives of these individuals, mothers of individuals with social anhedonia displayed higher rates of schizotypal behaviors than mothers of healthy controls (Emmerson et al., 2009); however, mothers of individuals with social anhedonia and controls did not differ on clinical ratings of dimensional clinician rated schizophrenia-spectrum symptoms (Emmerson et al., 2009). This finding is in line with Kendler and colleague's research that indicated that behavioral signs are stronger markers of schizotypy than clinical symptoms in the first-degree relatives of those diagnosed with schizophrenia (Kendler, McGuire, Gruenberg, & Walsh, 1995). While there are clearly elevated rates of schizophrenia-spectrum behaviors in individuals with social anhedonia and their first-degree relatives, the stability of these behaviors over time remains unclear.

Although there have been a few long-term outcome studies of individuals with social anhedonia, these studies have primarily focused on the subsequent development of schizophrenia-spectrum disorders and have not investigated the longitudinal stability of schizoid and schizotypal behaviors (Gooding et al., 2005; Kwapil, 1998). However, research on schizotypal personality disorder may provide some support for the notion that these behaviors may stay stable over time. Results from a 2-year longitudinal study of personality disorders suggests that individuals with personality disorders, including schizotypal personality disorder, have enduring maladaptive personality trait patterns (Grilo, Sanislow, Gunderson, Pagano, Yen, Zanarini et al., 2004). Thus, if maladaptive personality trait patterns appear to be stable over time in schizotypal personality disorder, behaviors associated with these personality trait patterns, such as schizotypal behavior, may also persist over time. However, this study also noted that while these trait patterns remain stable, their severity may change over time. It remains unclear whether behaviors associated with schizoidia and schizotypy remain stable in a sample of individuals with social anhedonia.

In summary, individuals high in social anhedonia experience a significant number of cognitive difficulties, psychophysiological aberrations, poor long-term outcomes, increases in schizoid and schizotypal behavior, clinical characteristics, and symptom elevations. However, the stability of certain behaviors associated with social anhedonia, such as schizoid and schizotypal behavior, remains unclear. Further, since these behaviors are unusual (e.g., odd speech), they could potentially negatively impact social interactions of individuals with social anhedonia. This area of study is important because dysfunction and social withdrawal are risk factors for the development of schizophrenia

(Velthorst, Nieman, Becker, van de Fliert, Digemans, Klaassen et al., 2009). Further, these behaviors may elicit negative responses from others, which may increase expressed emotion (Butzlaff & Hooley, 1998). A meta-analytic review of expressed emotion revealed that this factor has a significant impact on relapse in individuals with schizophrenia (Butzlaff & Hooley, 1998). Literature regarding social functioning in individuals with social anhedonia is reviewed below.

Social Functioning in Individuals with Social Anhedonia

In addition to the previously mentioned difficulties that individuals with social anhedonia experience, they also display deficits in social functioning (Blanchard et al., 2011; Kwapil, 1998; Mishlove & Chapman, 1985). Given that these individuals report a lack of pleasure from social experiences and because this is a risk factor for the development of schizophrenia (Velthorst et al., 2009), the social functioning of individuals with elevated rates of social anhedonia is important to investigate. However, the nature of social functioning difficulties in individuals with social anhedonia remains unclear. Individuals with social anhedonia report having fewer social supports, and less perceived social support than healthy controls (Blanchard et al., 2011). Further, research suggests that these individuals report that they have fewer friends, are more reserved with their friends, engage in fewer social interactions and have less interest in dating than healthy controls (Mishlove & Chapman, 1985). In a 10-year longitudinal study, individuals who endorsed elevated rates of social anhedonia were significantly less likely to have been married or have dated in the previous two months than healthy controls (Kwapil, 1998). Further, these individuals also reported having significantly lower quality intimate relationships than healthy controls (Kwapil, 1998). Thus, research

suggests that individuals with social anhedonia are less likely to have quality social support than healthy peers.

Research regarding social functioning in individuals with social anhedonia has also established a link between social support and both schizophrenia-spectrum dimensional symptoms and functioning (Blanchard et al., 2011). Specifically, in a sample of individuals with social anhedonia, the number of social supports and perceptions of social support negatively correlated with schizoid and paranoid personality disorder symptoms such that greater number of social supports and greater perceived social support was related to less severe personality disorder symptoms (Blanchard et al., 2011). Within this sample, greater perceived social support was related to less severe ratings of schizoid, schizotypal, paranoid dimensional personality disorder symptoms. Further, lower global functioning was related to fewer social supports (Blanchard et al., 2011). Schizotypal traits in an undergraduate sample have been related to poor social functioning, decreased empathy and increased negative affect (Henry, Bailey & Rendell, 2008). In another undergraduate sample, increased schizotypal traits were related to poor functioning in several domains including relationships with peers, family and poor scholastic performance (Aguirre, Sergi & Levy, 2008). Although these studies are correlational and a causal direction is indeterminable, this research suggests that lower social functioning is related to increased clinical symptoms and decreases in current functioning; however, the reasons for this relationship currently remain unclear. It is possible that clinical symptoms impact social relationships to bring about this finding.

In order to study social difficulties in this population more closely, two studies (Brown et al., 2007; Kwapil, Silva, Myin-Germeys, Anderson, Coates & Brown, 2009)

used a week long experience-sampling method to collect momentary data regarding social behaviors of those with social anhedonia and healthy controls (Brown et al., 2007; Kwapil et al., 2009). The results of these studies demonstrated that those high on social anhedonia were more frequently alone, less social and less likely to endorse preferring to be with other people than individuals with low social anhedonia (Brown et al., 2007; Kwapil et al., 2009). However, those with high social anhedonia also reported that they enjoyed being alone and that they were not alone because of rejection from other people (Brown et al., 2007; Kwapil et al., 2009). Further, this research revealed that in social situations individuals with high social anhedonia experience less positive affect as well as less engagement and more distance in social situations (Brown et al., 2007). Of note, when those with high social anhedonia were alone, they reported higher positive affect and lower negative affect than individuals low in social anhedonia (Kwapil et al., 2009). Thus, the results of this research suggest that solitude is not distressing to individuals with high social anhedonia (Brown et al., 2007; Kwapil et al., 2009). When those with high social anhedonia did engage with others socially, they reported that they did so in large groups of people that frequently did not include a significant other (Kwapil et al., 2009). This finding is consistent with Kwapil's (1998) aforementioned research in which those with high social anhedonia were less likely to engage in intimate partner relationships.

The research outlined above represents a substantial step forward in understanding social difficulties that individuals with social anhedonia experience. Further, research suggesting that individuals with social anhedonia experience difficulties in social functioning is encouraging because it validates the construct of social

anhedonia. However, this research has several limitations. First, this research relies primarily on self-report measures (Brown et al., 2007; Kwapil, 1998; Kwapil et al., 2009). While self-report measures are frequently used in psychology research, they have significant limitations and they only provide the participant's perspective (Klonsky, Oltmanns, & Turkheimer, 2002). Additionally, self-report measures are not highly correlated with informant reports (Klonsky et al., 2002; Thomas, Turkheimer, & Oltmanns, 2003). Thus, research based solely on self-report measures provides one perspective and may not accurately reflect the interpersonal nature of constructs of interest. Furthermore, this form of measurement fails to consider behaviors exhibited by individuals with social anhedonia. Specifically, individuals with social anhedonia engage in schizotypic behaviors that are not measured by self-report (Collins et al., 2005; Emmerson et al., 2009). These behaviors, such as a lack of expression or odd speech could potentially be related to peer rejection, however, they are not assessed by self-report measurement. Thus, while this research has provided a greater understanding of social functioning in individuals with social anhedonia, it also has significant limitations.

Another critical issue that is not addressed by current literature is the delineation between social anhedonia and schizoid withdrawal. Schizoid withdrawal refers to indifference to social interactions because of a lack of pleasure (Mishlove & Chapman, 1985). Researchers have postulated that schizoid withdrawal results from social anhedonia (Mishlove & Chapman, 1985). However, an alternative hypothesis is that individuals with social anhedonia do retain the capacity for pleasure, but have difficulty creating pleasurable social environments for themselves because they behave in ways that lead to rejection from peers. This suggests an alternative viewpoint to the schizoid

withdrawal hypothesis. Further, if these individuals are not creating a pleasurable social environment for themselves, this can be targeted through clinical interventions, such as social skills training. In order to elucidate the nature of this issue, it would be helpful to understand how others view and respond to individuals with social anhedonia. Currently, research on social anhedonia does not address this issue.

In summary, those who report elevated social anhedonia evidence deficits in social functioning such as social withdrawal and fewer quality relationships (Blanchard et al., 2011; Kwapil, 1998; Kwapil et al., 2009; Mishlove & Chapman, 1985). This research has significant limitations including relying exclusively on self-report measures, a lack of collateral report regarding the study participant's behavior, and a lack of assessment of behaviors exhibited by individuals with social anhedonia. Enhancing our understanding of social functioning deficits in social anhedonia would provide a potential benefit for identifying targets of treatment. Currently, it is unknown how others interact with individuals with social anhedonia. It is possible that individuals with social anhedonia evoke negative reactions from others, which contributes to deficits in social functioning. This model is well established in the depression literature (Coyne, 1976; Joiner, 1999), and has potential implications for the current study. The following section reviews several literatures relevant to interpersonal behavior.

Chapter 2: Interpersonal Behavior

As mentioned previously, research has demonstrated that individuals with social anhedonia behave differently than their peer groups (Collins et al., 2005; Emmerson et al., 2009). Specifically, individuals with social anhedonia demonstrate behaviors associated with schizotypy and schizoidia such as constricted facial affect, a lack of non-verbal expression, a lack of verbal expression, and physical anergia (Collins et al., 2005; Emmerson et al., 2009). Diverse lines of literature suggest that psychopathology and disruptions in emotion, such as diminished expression, negatively impact social relationships (Butler, Egloff, Wilhelm, Smith, Erickson & Gross, 2003; Richards & Gross, 1999). This research indicates that emotionally expressive behavior is important in developing and maintaining social relationships. As noted previously, individuals with social anhedonia experience difficulties in expressing affect both verbally and facially (Collins et al., 2005; Emmerson et al., 2009). Literature regarding expressive suppression, and research regarding psychopathology and peer rejection is reviewed below.

Expressive Suppression

Expressive suppression provides an example of the relationship between diminished emotional expression and subsequent social consequences. Expressive suppression is the act of purposefully limiting emotional expressions while experiencing emotional arousal, which results in reduced emotionally expressive behavior (Butler, et al., 2003; Richards & Gross, 1999). While it is not established that individuals with social anhedonia engage in expressive suppression, they do display constricted facial affect, a lack of variability in affect/expression over time, a lack of non-verbal expression,

physical anergia, and a lack of verbal expression (Collins et al., 2005; Emmerson et al., 2009). Thus, these behaviors mimic the behaviors of individuals actively engaging in suppression, suggesting others' reactions to suppression are informative for social anhedonia. In an experimental study examining the effects of expressive suppression on interpersonal interactions in healthy individuals, emotional suppression had a profoundly negative effect on the interaction (Butler et al., 2003). Specifically, when individuals engaged in expressive suppression during an interaction, it obstructed communication, reduced rapport, inhibited relationship formation, negatively impacted the emotional experience of the participant who was engaging in suppression, and significantly raised the blood pressure of both the participant and their partner (Butler et al., 2003). Therefore, diminished emotional expression evoked a variety of negative social outcomes in healthy participants.

In order to longitudinally examine social outcomes related to expressive suppression, researchers followed individuals who reported emotional suppression during their transition to college (Srivastava, Tamir, McGonigal, John & Gross, 2009). Engaging in expressive suppression was associated with poor social functioning ten weeks into the transition to college (Srivastava et al., 2009). It was hypothesized that suppression does not allow communication of emotional states, which in turn leads to missed opportunities for support and social bonding (Srivastava et al., 2009). Thus, expressive suppression has multiple significant negative effects on interpersonal behavior, as well as on social functioning outcomes. One caveat is that the negative effects described in these studies may be due to emotional suppression, which is typically considered maladaptive and may not reflect the results of reduced expressivity. While it remains unclear whether

individuals with social anhedonia engage in expressive suppression, this research establishes a relationship between disruptions in emotionally expressive behavior and subsequent negative social outcomes. The relationship between expressive behaviors and peer reactions is further supported in research investigating interpersonal models of depression and schizophrenia.

Interpersonal Models of Depression and Schizophrenia

Coyne hypothesized that individuals with depression evoke negative reactions from others through specific interactive tendencies such as dysphoric facial affect, and monotonous speech (Coyne, 1976). Multiple studies have confirmed this hypothesis and have found that depressed individuals induce negative affect and rejection in others (Boswell & Murray, 1981; Coyne, 1976; Hammen & Peters, 1978). Thus, these results provide further support for the link between expressive behavior and others' perceptions within clinical populations.

Coyne's model has been extended to individuals with schizophrenia. In an experimental study, undergraduate students listened to the tapes of either healthy control participants or participants diagnosed with depression or schizophrenia. They then made ratings about the individuals in domains such as rejection, interpersonal behavior and the rater's own mood (Boswell & Murray, 1981). Results demonstrated that male individuals diagnosed with schizophrenia were just as likely as male depressed individuals to arouse dysphoria and rejection in participants who listened to their interviews (Boswell & Murray, 1981). However, this finding was not supported within the sample of target females (Boswell & Murray, 1981).

Research to date supports a promising link between observable behaviors, particularly expressivity, and peer responses. As mentioned previously, research has demonstrated that individuals with social anhedonia report that they prefer to be alone (Kwapil et al., 2009). However, factors that drive this preference for solitude remain unclear. One possible explanation is that these individuals do not take pleasure in social interactions. As suggested by interpersonal models of depression and schizophrenia, another possible reason for preferring solitude could be that individuals with social anhedonia evoke negative reactions from others in social situations, which, in turn, affects how others interact with these individuals. This can create a negative social environment for individuals with social anhedonia, which may cause them to withdraw socially or experience less pleasure while engaging with others. One way individuals may evoke negative reactions from others is personality disorder traits. Prior research has investigated the role of related personality disorder traits and peer reactions. This research is reviewed below.

Peer Reactions to Individuals with Personality Disorder Traits

In one line of research, individuals with personality disorder traits were rated on likability and personality traits by both peers who knew them well and by people who had interacted with them a few times (South, Oltmanns, & Turkheimer, 2005; Thomas et al., 2003). Participants who were rated by their peers as having a “detached” personality style, which was highly correlated with schizoid personality disorder traits, were rated by their peers as embodying several negative attributes including disagreeableness, neuroticism, unattractiveness, introversion, and being poorly adjusted. Importantly, peer ratings remained stable through the follow-up period (South et al., 2005). Furthermore,

there was a high correspondence in all domains of peer response ratings (i.e., personality disorder symptoms, likability, and personality traits) between peers who knew the individuals well and acquaintances. Thus, separate groups of individuals who were naïve to personality disorder assessment rated those with features of cluster A personality disorders (i.e., schizoid personality disorder, schizotypal personality disorder and paranoid personality disorder) similarly (South et al., 2005). Individuals with schizoid personality disorder traits appear to display several negative characteristics such as disagreeableness and introversion that may negatively impact their social interactions.

Peer Reactions to Individuals at Psychometric High-Risk for Schizophrenia

Initial research on likability in individuals with elevated schizotypal traits suggests that these individuals induce negative affect in others (Shean & Wais, 2000; Zborowski & Garske, 1993). Individuals who evidence elevated scores on both the Perceptual Aberrations and Magical Ideation Chapman Scales participated in a diagnostic interview with a clinician (Shean & Wais, 2000; Zborowski & Garske, 1993). After the interview, the clinicians reported feeling increased anxiety, anger, and less curiosity (Shean & Wais, 2000; Zborowski & Garske, 1993). Thus, individuals with schizotypal traits had an overall negative effect on the interviewers. While this research is a first step in determining if individuals with schizotypal traits behave in a manner that leads to less likability from others, the study did not utilize ratings from an equivalent peer group. Such ratings would represent a more ecologically valid design. Further, these ratings were made by clinicians who have knowledge of schizophrenia-spectrum symptoms, while naïve peers do not.

In summary, diverse lines of literature suggest that there is a relationship between psychopathology, reduced expression, and negative interpersonal interactions. Research on diminished emotional expression indicates that this behavior results in negative social outcomes. Interpersonal models of depression and schizophrenia suggested that people with these disorders evoke negative reactions from others, likely due to reduced or altered expressive behaviors. Peers have been found to rate individuals with schizoid personality traits as being less likable, thus, affecting their social relationships (South et al., 2005; Thomas et al., 2003). Additionally, individuals with schizotypal traits induce negative reactions from interviewers. This body of research is the first step in establishing the relationship between evocative behavior and negative impressions from others in individuals with social anhedonia. However, it remains unclear whether individuals with social anhedonia evoke negative reactions from others, which then impact their social relationships. To date, no research has tied schizophrenia-spectrum behaviors to peer responses; thus, it is unclear if these behaviors lead to peer rejection. This information would help elucidate why individuals with social anhedonia engage in self-isolation. As mentioned previously, their social isolation may not be due to schizoid withdrawal, but rather from evoking negative reactions from others. Literature regarding measuring peer responses is reviewed below.

Measuring Evocative Interpersonal Behavior

A novel way to investigate whether individuals with social anhedonia evoke negative or rejecting attitudes from others is to examine initial impressions of these individuals by their peers. In interpersonal situations, first impressions are often formed from limited information (Ambady, Bernieri, & Richeson, 2000). Recent research has

suggested that these first impressions are often very predictive of future behavior in the observed individual and are resistant to change even after gathering new, contradictory information (Ambady et al., 2000). First impression research utilizes a methodology termed “thin slice ratings of behavior” in which naïve raters judge video clips that are five seconds to five minutes in length on a variety of indices to determine if their first impressions of someone are predictive of future behavior. This technique has been predictive of a wide variety of outcomes ranging from the future behavior of the observed individual (e.g., teaching effectiveness, job performance) to reactions that others will have to the individual after prolonged contact (e.g., relationship quality; Ambady et al., 2000).

Thin slice ratings have also been investigated in personality disorders to determine if naïve raters can detect pathology from short video clips, which simulate initial impression formation. There has been some initial work on thin slice ratings and schizophrenia spectrum disorders (Friedman, Oltmanns & Turkheimer, 2007; Oltmanns, Friedman, Fiedler & Turkheimer, 2004). These studies are the closest approximation of studying peer responses to individuals with social anhedonia. This research suggests that individuals do form strong initial impressions based on their evaluation of the behavior observed in a brief video clip that are meaningfully related to independent ratings of personality disorders (Friedman et al., 2007; Oltmanns et al., 2004). In these studies, participants viewed 30-second clips of individuals with personality disorder traits discussing what they enjoy doing and rated them on a variety of dimensions including likability, attractiveness, and Big Five personality traits (Friedman et al., 2007; Oltmanns et al., 2004).

In one of these studies, 30-second thin slice reactions to those with personality disorder traits were examined (Oltmanns et al., 2004). Dimensional ratings of schizoid and schizotypal personality disorder pathology in the target individual negatively correlated with independent peer ratings of likability and attractiveness such that greater personality disorder traits were related to less likability and attractiveness (Oltmanns et al., 2004). Further, increases in schizotypal and schizoid personality disorder traits were associated with less extroversion, less agreeableness, less conscientiousness, and less openness, as rated by observers. Higher levels of schizotypal and schizoid personality disorder traits were also associated with increased peer ratings of neuroticism in the target individual (Oltmanns et al., 2004). Within the literature on Big Five personality traits, traits of less extroversion, less agreeableness, less conscientiousness, less openness, and increased neuroticism correspond to traits such as unfriendliness, shyness, carelessness, cautiousness, and nervousness, respectively. Thus, individuals with schizotypal and schizoid personality disorder traits were perceived by their peers as being less likable, unattractive, unfriendly, shy, careless, cautious, and nervous. Additionally, increases in paranoid personality disorder pathology were related to decreased conscientiousness and decreased openness as rated by observers, while there was no relationship between this disorder and either likability or attractiveness. In summary, naïve thin-slice raters report that target individuals with dimensional schizotypal or schizoid personality traits are perceived as less likable and less attractive. Thus, these findings suggest that maladaptive personality disorder traits may negatively impact social relationships.

Friedman et al., (2007) replicated the above findings and added an additional component in which thin slice raters also rated schizoid, histrionic, narcissistic, and avoidant personality traits (Friedman et al., 2007). Specifically, thin slice raters judged participants on schizotypal traits such as having no friends and being alone (Friedman et al., 2007). Thin slice ratings of these traits correlated positively with self-reported schizoid and schizotypal personality disorder, but not paranoid personality disorder (Friedman et al., 2007). While the research team used traits that were characteristic of schizoid personality disorder, the two particular traits they examined, having no friends and being alone, are also characteristic of schizotypal personality disorder. Thus, naïve thin slice raters were able to accurately ascertain features of schizotypal and schizoid personality disorder from a short sampling of behavior (Friedman et al., 2007). While it is clear that naïve raters can identify traits associated with personality disorders, what remains unclear is whether these thin-slice ratings remain stable over time.

In summary, individuals with social anhedonia engage in schizophrenia spectrum behaviors, which may impact social functioning. Diverse lines of literature reviewed reveals that individuals who suppress their emotional expression evoke poor social responses from others. Further, there is an established relationship between symptoms of mental illness, such as depression, schizophrenia and personality disorder traits and negative peer responses. However, the relationship between schizophrenia-spectrum behaviors and peer responses has not been investigated. Peer responses can be measured through thin-slice ratings, which are short video clips. Initial studies utilizing this method with individuals with personality disorder traits demonstrate that naïve peers rate

these individuals as being less likeable than individuals without personality disorder traits.

Chapter 3: Rationale

As reviewed previously, individuals with social anhedonia self-report social impairment and social isolation. However, what remains unclear is how these individuals behave when they interact with others and how these behaviors are evaluated by peers. Furthermore, this body of work suffers from a number of limitations including relying on self-report measures, not obtaining informant reports, and failing to examine specific behaviors that these individuals engage in. Current literature in this topic has not gone beyond experience sampling measures.

Behavioral aberrations, such as odd speech and physical anergia, are common in individuals with social anhedonia (Collins et al., 2004; Emmerson et al., 2009). Furthermore, these behaviors distinguish individuals with social anhedonia from healthy individuals (Collins et al., 2004; Emmerson et al., 2009). These behavioral indicators also differentiate the parents of individuals with social anhedonia from parents of healthy individuals (Emmerson et al., 2009). However, it is not clear if these behaviors stay stable over time. Thus, the current study aims to examine the longitudinal stability of these behaviors. Further, it is unknown whether these behaviors evoke negative reactions in peers. In the current study peer reactions to these individuals were measured using a thin-slice technique. This peer report provides an idea of how others respond to individuals with social anhedonia and healthy controls. Additionally, the relationship between schizophrenia-spectrum behaviors and peer responses was explored. These data on behavior and peer responses could provide information regarding the origins of poor social functioning in individuals with social anhedonia. Currently, the literature on social anhedonia does not provide any information regarding these issues.

The current study was designed to address methodological limitations within the literature. Thus, this study had two main aims. First, it examined whether schizophrenia-spectrum behaviors remained stable over a three-year period. Secondly, it investigated the relationship between schizophrenia spectrum behaviors and peer responses. The current study utilized data collected from the Maryland Longitudinal Study of Schizotypy (MLSS; Blanchard et al., 2011). The MLSS is a longitudinal study assessing 175 individuals within the community that examined whether individuals with elevated rates of social anhedonia developed schizophrenia-spectrum disorders over a three-year period in comparison to a normally-hedonic comparison group (see Blanchard et al., 2011). This research was conducted using a community sample of individuals in the area surrounding the University of Maryland, College Park (UMD). The current investigation is an extension of a study conducted by Collins et al. (2005), in which diagnostic interviews with individuals who participated in the MLSS study were used for behavioral codings of schizoidia and schizotypy. The research revealed that individuals with social anhedonia displayed significantly more behavior that was associated with schizoidia and schizotypy than did healthy controls. Further, these findings were repeated within the MLSS sample in a study conducted by Emmerson et al. (2009). Importantly, Collins et al. (2005) and Emmerson et al. (2009) only assessed baseline behavior and did not consider peer responses.

The current research extended Collins et al.'s (2005) work by recoding data from baseline and adding new codings from the a three-year follow-up on behaviors of schizoidia and schizotypy. Furthermore, these videotapes were also coded for peer responses to individuals' behavior on likability and attraction. Peers were individuals

who are within the same age range as participants (i.e., 18-22) and they lived in the same community (i.e., College Park, MD) as the participants. Then, the relationship between behaviors of schizotypy and schizoidia and peer responses was analyzed. These data allowed examination of the following hypotheses:

1. Behavioral ratings of schizotypy and schizoidia would be higher in individuals with high social anhedonia in comparison to healthy controls. Furthermore, it is posited that these differences that are evident at baseline would continue to be present at the three-year follow-up assessment. Thus, these behaviors would remain stable over time.
2. Peers would rate individuals with elevated social anhedonia as less likable and less attractive in comparison to healthy controls at both baseline and the three-year follow-up assessment.
3. There would be a relationship between individual behavioral ratings of schizotypy and schizoidia and peer responding, such that higher behavioral ratings would correspond to decreased likability. Furthermore, it was expected that this pattern would be reliable across assessment points.
4. It is expected that behavioral ratings of schizotypy and schizoidia would demonstrate significant negative correlations with clinical ratings of current functioning, perceived social support, and number of social supports in the social anhedonia group at the three year follow-up. Additionally, it was expected that there would be negative correlations between peer ratings of likability and clinical ratings of current functioning, perceived social support and number of social supports in the social anhedonia group.

Chapter 4: Method

A major limitation of previous studies employing psychometric high-risk paradigms in samples of individuals with social anhedonia is the frequent use of convenience samples of college students. In comparison to community samples, samples of college students have a number of limiting factors such as including individuals with high economic status, less ethnic diversity, high levels of education and lower rates of psychopathology and comorbidity that create a homogeneous sample (Newman, Moffitt, Caspi & Silva, 1998; Sher & Trull, 1996). In order to address such limitations, the current study was conducted using data from the Maryland Longitudinal Study of Schizotypy (MLSS; Blanchard et al., 2011). The MLSS utilized a community sample from the surrounding areas of the University of Maryland, College Park (UMD). This study provided a sample that is similar to the general population, and thus, eliminates the problems of college samples outlined above.

MLSS Recruitment

In order to recruit a diverse community sample, we contracted with the University of Maryland Survey Research Center (SRC) for the initial screening process. The SRC retrieved phone numbers within a 15-mile radius of the University of Maryland, College Park campus. Then, participants were recruited by random digit dialing. SRC representatives ascertained whether there was a member of the household who was 18 years old and if so, invited them to complete a mailed questionnaire for \$15.00. If the person agreed to participate, the SRC representative collected information regarding preferred methods of contact, gender, ethnicity, socioeconomic status, education level, mailing address, and phone numbers. Recruitment for participation in the study was

independent of educational status or socioeconomic status. Those who agreed to participate (N = 3,494) were mailed a consent form and a screening measure, specifically, the Revised Social Anhedonia Scale (RSAS; Eckblad et al., 1982). The RSAS assesses for the presence of social anhedonia.

Participants

There was a 71% rate of return for the questionnaires. Returned questionnaires (N = 2,483) were used to ascertain group status (i.e., social anhedonia group or control group). In order to determine group status, individuals who scored 1.9 standard deviations above the mean were assigned to the social anhedonia group (N = 86). Individuals who scored lower than .5 standard deviations above the mean on the RSAS, the Perceptual Aberrations Scale and the Magical Ideation Scale were designated as the control group (see *Measures* for further information). These cut-off scores have been established in multiple research studies on social anhedonia and effectively identify a social anhedonia group and a control group (Blanchard, Muser, & Bellack, 1998; Blanchard et al., 2001). Within the RSAS, the Infrequency Scale is meant to categorize those who respond randomly to the questionnaire in order to identify and eliminate invalid responses (Chapman et al., 1976). Subjects were excluded if they endorsed more than 3 items on the Infrequency Scale (Chapman et al., 1976). This exclusionary methodology is typical protocol for the RSAS (Chapman et al., 1994; Kwapil et al., 1998).

During the recruitment processing, participants were informed that the study would last approximately 3-5 hours and they would be compensated \$100 for their time. Subjects were instructed to abstain from alcohol or drug use 24 hours prior to their

scheduled appointment. All participants provided informed consent. During the informed consent process, all participants were told that their diagnostic interviews would be videotaped.

MLSS Baseline Procedure

Participants (Social Anhedonics, $n = 86$, Healthy Controls, $n = 89$) were administered a battery of diagnostic interviews to assess psychopathology, symptoms ratings, and family ratings. This battery included the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Gibbon, Spitzer & Williams, 1996), International Personality Disorders Examination (IPDE; Loranger, Andreoli, Berger, Buchheim, Channabasavanna, Coid, Dahl et al., 1995), and the Schedule for the Deficit Syndrome (SDS; Kirkpatrick, Buchanan, McKenney, Alphas & Carpenter, 1989). This battery was administered by advanced doctoral level students in clinical psychology who were blind to group status. These clinicians were trained by a Ph.D. level clinician with extensive experience in the administration of these measures. Then, participants were administered several questionnaires including the Brief Social Support Questionnaire (Sarason, Sarason, Shearin, & Pierce, 1987) and the Interpersonal Support Evaluation List (Cohen & Hoberman, 1983).

Debriefing

After participants were finished with the study they were debriefed by the advanced doctoral student who had completed their assessment interview. During the debriefing session, the aims of the study were described to the participants. Specifically, they were told that the study was examining the relationship between psychological traits

and an individual's social and psychological functioning. Participants were told that they were chosen to participate based on the initial screening questionnaire they filled out. The interviewer disclosed that they did not know how the participant filled out the initial screening questionnaire. Because we utilized a high-risk sample, if the participant's answers during the SCID-I corresponded to a possible Axis I diagnosis, they were informed of this during the debriefing and were told that it was a provisional diagnosis that required further evaluation. If a participant was diagnosed with psychosis and was not receiving psychiatric treatment, the interviewer contacted the principal investigator who participated in relaying the information of the diagnosis and referral recommendations with the participant. Specifically, the interviewer and the primary investigator discussed with the participant the description of the diagnosis, the symptoms associated with it, and specific treatment referrals. Those who were experiencing distress or impairment in functioning due to their symptoms were given treatment referrals. It is unclear how many people followed-up on treatment recommendations. At the baseline assessment within the sample utilized within the current study (social anhedonia: $n = 43$, healthy controls: $n = 56$), 9.3% of social anhedonics had utilized outpatient treatment and 4.7% inpatient treatment, while 3.6% of controls reported outpatient treatment and 0% reported inpatient treatment. At the follow-up period, 25.6% of social anhedonics reported outpatient treatment and 4.7% reported inpatient treatment, while 16.1% of healthy controls reported outpatient treatment and 0% reported inpatient treatment. One healthy control was missing from both the baseline and follow-up analyses, thus, $n = 56$, for treatment data regarding healthy controls.

MLSS Follow-up Assessment

Three years after the baseline assessment, participants were invited to the lab for a follow-up assessment. There was a 90% participant retention rate (Social Anhedonics, n = 79; Healthy Controls, n = 79). During this assessment, the same clinician-rated measures and self-report measures were administered again. Further, the same debriefing procedure was followed.

Exclusion of Tapes for Coding

Tapes were excluded from the study if they could not be coded or if video was not available for either the baseline or follow-up assessments. If a data point at baseline or follow-up was excluded because it could not be reliability coded, the participant was excluded from all analyses, due to a lack of data. Within the baseline data, 15 tapes were excluded because the target question for coding likability was not asked. An additional twenty tapes were excluded from baseline because the videotape was not clear enough to code or because there was no audio recording. In the follow-up period, 31 tapes were excluded because their baseline data was excluded. Five follow-up tapes were excluded because the target question for coding likability was not asked. Eighteen tapes were excluded because the videotape was not clear enough to code or because there was no sound. Forty tapes were excluded because the participants did not have follow-up data. This left a final sample of 100 participants (Social Anhedonics, n = 43, Controls, n = 57).

Procedures and Measures

Screening Measures

Revised Social Anhedonia Scale (RSAS; Mishlove & Chapman, 1985): The RSAS is a self-report questionnaire that contains 40 true-false items designed to measure a

decrease in the experience of pleasure that is derived from interpersonal or social interactions. The purpose of this measure is to identify and group participants into social anhedonia and control groups. The RSAS was administered as part of the initial screening questionnaire that was completed by all participants. The RSAS contains items such 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). Empirical evidence demonstrates that the RSAS is a valid measure of social anhedonia (Mishlove & Chapman, 1985). Specifically, high scorers on the RSAS also displayed social withdrawal and social isolation, but not loneliness, based on interviewer reports (Mishlove & Chapman, 1985). Further, these individuals reported less enjoyment from and need for social contact (Mishlove & Chapman, 1985). Elevated levels of social anhedonia have been found in multiple groups along the schizophrenia spectrum including schizophrenia patients (Blanchard et al., 1998; Chapman et al., 1976), relatives of those with schizophrenia (Katsanis, Iacono, & Beiser, 1990), and cross-sectional studies showing elevated schizophrenia-spectrum disorders in individual with high social anhedonia (Kwapil, 1998). Thus, this research supports the validity of the RSAS as a measure of social anhedonia.

Perceptual Aberrations Scale (Chapman, Chapman & Raulin, 1978) and the Magical Ideation Scale (Eckblad & Chapman, 1983): These two scales are also a part of the Chapman measures and they were used in the MLSS study for screening purposes. The Perceptual Aberrations Scale is comprised of 35 true-false items that assess perceptual distortions including unusual sensory experiences and bodily discontinuities (e.g., “I have felt that something outside my body was a part of my body”). The Magical

Ideation Scale consists of 30 true-false items that measure magical thinking, or erroneous beliefs (e.g., “I have occasionally had the silly feeling that a TV or radio broadcaster knew I was listening to him”). Elevated scores on these measures have been linked to increases in psychotic-like experiences, elevated schizotypal dimensional scores and increases in the rates of psychotic relatives (Chapman et al., 1994). These scales have predictive validity in identifying psychosis-proneness, but not schizophrenia (Chapman et al., 1994). These scales have demonstrated good convergent and discriminant validity (Bailey, West, Widiger & Freiman, 1993).

Clinical Symptom Measures

Axis I Disorders

Structured Clinical Interview for DSM-IV Axis I Disorders, Patient Edition – Research Version (SCID-I; First et al., 1996): The SCID is a clinician administered, semi-structured interview that assesses the presence of Axis I disorders. This interview provides a comprehensive history of psychiatric disorders, as well as information regarding current psychiatric diagnoses. The *DSM-IV* has frequently been employed in studies of individuals at risk for developing psychosis (Gooding & Tallent, 2003; Gooding et al., 2005). Further, it contains an assessment of functioning (i.e., Global Assessment of Functioning, GAF) in which clinicians use a 0 to 100 point scale to assess an individual’s functioning in the domains of social functioning, occupational functioning and psychological health in the past month. The SCID has excellent inter-rater reliability, with kappas higher than .60 (Williams, Gibbon, First, Spitzer, Davies, Borus et al., 1992).

Schizophrenia-Spectrum Symptom Ratings

International Personality Disorder Examination (IPDE; Loranger et al., 1995):

In order to assess for schizophrenia-spectrum disorders the schizotypal, schizoid, and paranoid sections of the International Personality Disorder Examination were administered (Loranger et al., 1995). The IPDE is a semi-structured clinician administered interview that was modified from the Personality Disorders Examination (PDE) and it assesses personality disorders in both DSM-IV and International Classification of Disease-10 (ICD-10). The IPDE measures symptoms associated with schizophrenia spectrum personality disorders including 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. The IPDE provides a wealth of data regarding these personality disorders including dimensional scores of personality disorders as well as DSM-IV categorical diagnoses. The IPDE has demonstrated good psychometric properties including good inter-rater reliability (Loranger, Santorius, Andreoli, Berger, Buchheim, Channabasavanna, Coid et al., 1994). The IPDE has been successfully used in several studies of schizophrenia-spectrum disorders in putatively psychosis-prone subjects (e.g., Blanchard et al., 2011; Chapman et al., 1994) and socially anhedonic individuals have been shown to exhibit higher IPDE dimensional symptoms of cluster A personality disorders (e.g., schizoid personality disorder, schizotypal personality disorder, and paranoid personality disorder) than non-anhedonic individuals at baseline and follow-up assessments (Blanchard et al., 2011; Kwapil, 1998).

Schedule for the Deficit Syndrome (SDS; Kirkpatrick et al., 1989): The SDS is a clinician administered measure that assesses negative symptom characteristics. Specifically, deficit symptoms rated by this scale include: restricted affect, diminished emotional range, poverty of speech, curbing of interests, diminished sense of purpose, and diminished social drive. These characteristics are assessed on a five-point scale that ranges from zero (“absent/normal”) to four (“severe”). Clinicians utilize standardized probe questions to rate each domain. In the MLSS study, SDS ratings were completed at the end of the entire diagnostic interview. This allowed raters to make their assessment based on several diagnostic measures (i.e., SCID, IPDE and SDS). The SDS has demonstrated adequate internal consistency and inter-rater reliability (Kirkpatrick et al., 1989).

Social and Occupational Functioning Measures

Brief Social Support Questionnaire (SSQ-N; Sarason et al., 1987; Sarason, Levine, Basham, & Sarason, 1983): The SSQ-N is a brief self-report measure that assesses the participant’s perceived number of social supports. The questionnaire contains six items that ask participants to list people they can count on for social support. Examples of these items include “Whom can you really count on to distract you from your worries when you feel under stress”? and “Who accepts you totally, including both your worse and your best points”? The composite score of the SSQ-N is made up of the number of people that the participant lists across the 6 items. The SSQ-N also measures satisfaction with their social support, and is measured with the Satisfaction subscale. The SSQ-N has demonstrated good convergent validity and reliability (Sarason et al., 1983; Sarason, Shearin, Pierce & Sarason, 1987). The SSQ-N also has good convergent validity

among other measures of social support (Sarason et al., 1987). Furthermore, the SSQ-N has demonstrated both high internal-consistency and high test-retest reliability (O'Reilly, 1995; Sarason et al., 1987).

Interpersonal Support Evaluation List (ISEL; Cohen, & Hoberman, 1983): The ISEL is a self-report questionnaire that measures perceived social support. This measure consists of four subscales which contain ten, true-false items. The four subscales include: Appraisal, Belonging, Tangible, and Self-esteem. The appraisal subscale measures perceived availability of another individual to talk to about problems (e.g., “There is really no one who can give me objective feedback about how I am handling my problems,” keyed false). The belonging subscale measures the perceived availability of others with whom the participant can engage with in social events (e.g., there are several different people with whom I enjoy spending my time,” keyed true). The Tangible subscale measures the perceived availability of help (e.g., “If I were sick and needed someone to drive me to the doctor, I would have trouble finding someone,” keyed false). Finally, the Self-esteem subscale assesses the perceived availability of praise from others when making comparisons to peers (e.g., I have someone who takes pride in my accomplishments,” keyed true). This scale has demonstrated good test-retest reliability, as well as good internal consistency (Cohen & Hoberman, 1983).

Social and Occupational Functioning Assessment Scale (SOFAS; Goldman, Skodal & Lave, 1992): The SOFAS is a clinician-rated measure, similar to the GAF, that utilizes a 0 to 100 point scale (“0” correlates to “Inadequate information”; “100” corresponds to “Superior functioning in a wide range of activities”) to assess an individual’s social and occupational functioning in the past month. Unlike the GAF,

ratings are made independently from the individual's psychiatric symptoms. The SOFAS has been found to have good inter-rater reliability (Hilsenroth, Ackerman, Blagys, Baumann, Baity, Smith, et al., 2000).

Behavioral Coding

Interpersonal Measure of Schizoidia and Schizotypy (IM-SS; Kosson, Byrnes & Park, 1999): The IM-SS is a behavioral coding system that was developed to assess behaviors associated with schizoid and schizotypal personality disorder in an interpersonal situation. The developers theorized that refining the measurement of behaviors associated with these disorders can increase the accuracy of diagnosis (Kosson & Byrnes, 1999). Two separate scales represent the two disorders, the schizoidia scale and the schizotypy scale. The schizoidia scale contains items such as “constricted facial affect” and “detachment.” The schizotypal scale contains items such as “repetitive behavior” and “odd speech volume rate or tone.” While there is not a scale that corresponds to paranoid personality disorder, characteristics of this scale are included in the two subscales, such as “guardedness” and “suspiciousness/paranoid behavior.” Ratings are made on a four-point ordinal scale that ranges from zero (“not at all”) to three (“perfectly or highly”).

Since its original development, the measure has been revised. In 2008, Kosson et al. published a revised version of the IM-SS (IM-SZ; Kosson, Blackburn, Byrnes, Park, Logan & Donnelly, 2008). In the revised version of the scale, the schizotypy scale was dropped, and the measure only consisted of the schizoidia scale. Since we believe the schizotypy scale provides valuable behavioral ratings, we used a modified version of the IM-SS that was used in Collins et al. (2005) and Emmerson et al. (2009).

Three studies have examined the validity of the IM-SS. In individuals who endorsed elevated rates of social anhedonia and healthy controls, the IM-SS demonstrated good internal consistency and good inter-rater reliability (Collins et al., 2005). In another study that investigated whether first-degree relatives of individuals with social anhedonia also displayed schizoid and schizotypal behaviors, good inter-rater reliability was found for the schizoidia scale. The schizotypy scale demonstrated moderate inter-rater reliability (Emmerson et al., 2009). In terms of the internal consistency of the scale in this study, patterns remained similar to the inter-rater reliability findings (Emmerson et al., 2009). Specifically, the schizoidia scale demonstrated good internal consistency, while the schizotypy scale evidenced moderate internal consistency (Emmerson et al., 2009). In these studies, behavioral ratings of schizoid and schizotypal personality disorder contributed to the determination of putative schizotypes beyond clinical symptom ratings (Collins et al., 2005; Emmerson et al., 2009). In a sample of incarcerated individuals and inmates with psychopathology, the IM-SS was reliable and correlated with measures of schizoid personality disorder (Kosson et al., 2008). These studies support the validity of the IM-SS and its ability to identify putative schizotypes.

The version of the IM-SS that was utilized in this study is a modified version of the original scale and it consists of both the schizoidia subscale and the schizotypy subscale. Consistent with the methods utilized in Collins et al. (2005) and Emmerson et al. (2009), raters coded the following behaviors on the schizoidia scale: constricted facial affect, lack of non-verbal expression, detachment (lack of engagement), lack of verbal expression, indifference (lack of interest), guardedness, lack of variability in affect/expression over time, poor rapport, absence of spontaneity in speech, lack of verbal

responsiveness to interviewer's remarks, and physical anergia. Following the methods of Collins et al. (2005) and Emmerson et al. (2009), the following items were not assessed in this subscale: lack of interpersonal synchrony, poor personal hygiene, and social isolation. The interpersonal synchrony item was not included because the videotapes only revealed the participant, not the participant and the interviewer, thus, interpersonal synchrony could not be assessed. Further, since the interaction interview was videotaped from approximately the chest up it was difficult to assess poor personal hygiene. Since ratings were conducted on a diagnostic interview and not a social interaction, the social isolation item, which evaluates whether the individual chooses to withdraw and isolate in a social interaction, could not be assessed. Additionally, several items from the schizotypy scale were also dropped, which, again is consistent with Collins et al. (2005) and Emmerson et al. (2009). Specifically, the following items were dropped from coding: "displays signs of experiencing auditory hallucinations or illusions," "displays signs of experiencing visual hallucinations or illusions," "spontaneously expresses referential ideation," "spontaneously expresses ideation about thought transmission - other than via decoding non-verbal cues or via persuasion," "spontaneously expresses ideation about being controlled or controlling others – other than via thoughts or via persuasion or via other plausible channels," and "spontaneously expresses paranoid/persecutory ideation." In this study, these items overlap with IPDE symptom ratings and, thus, they were conceptually inconsistent with use of the IM-SS in this study. In summary, the IM-SS yields two dependent variables, one for the schizoidia scale and one for the schizotypy scale.

IM-SS ratings of schizoidia and schizotypal behaviors were conducted based on the first 30 minutes of the SCID (See Appendix A for coding sheet). This practice is consistent with prior studies utilizing the IM-SS (e.g., Collins et al., 2005; Emmerson et al., 2009). During the first portion of the SCID, participants discussed basic demographic information, such as education, race, etc., their current living situation, and prior psychiatric diagnoses and treatment. Additionally, this method followed recommendations by Kosson and Byrnes (1999) who assert that IM-SS codings should be completed on interviews that utilize standardized measures. Previous studies employing this measure have also used approximately a half hour of interviewing and have found this is an adequate time period to code (Collins et al., 2005; Emmerson et al., 2009). Ratings were conducted with the sound on. This methodology is consistent with Collins et al. (2005) and Emmerson et al. (2009). Collins et al., (2005) conducted analyses to determine whether having the sound on biased ratings. The same tapes were coded with either the sound on or the sound off. In subsequent analyses, there was a high correlation between sound on and sound off ratings (Collins et al., 2005). Thus, prior research demonstrates that having the sound on does not bias the IM-SS ratings.

Videotapes were coded by raters who were naïve to the group status of participants. Because potential IM-SS ratings could be biased by thin slice ratings, IM-SS raters did not code thin slice ratings. In order to prevent rater effects from occurring in one assessment, coders rated individuals at baseline and at follow-up. However, they never rated the same individual twice, as ratings from one time period could influence ratings at another time period.

Four coders rated the videotapes. The investigator trained raters on the IM-SS coding system. First, raters learned about schizophrenia-spectrum disorders, including behaviors associated with these disorders. Then, raters were familiarized with the study procedures and the IM-SS. Raters then participated in a training period in which they coded videotapes of individuals who did not participate in the study. During training, the investigator taught raters how to code the videotapes by utilizing examples from the training tapes. These ratings were discussed until adequate inter-rater reliability was met (i.e., r of .8). The tapes were rated independently; however, weekly reliability checks were conducted.

Inter-rater agreement for the IM-SS ratings was calculated using intra-class correlation coefficients (ICC; Shrout & Fleiss, 1979). Using this random effects model, raters are treated as if selected from a random sample of raters and each target is rated by a different set of k judges. This is consistent with methods employed in Collins et al. (2005) and Emmerson et al., (2009). Four raters overlapped on 39 videotapes and this data was used to calculate the ICCs. ICCs between rater pairs were calculated across participants. ICCs are outlined in Table 1.

Cicchetti (1994) defined reliability coefficients of .75 and above as excellent, those falling between .60 and .74 as good, those falling between .40 and .59 as fair and those falling under .40 as poor. Based on these guidelines, the majority of the ICCs are classified as having excellent agreement. A few of the coder pairs (pair 2 and 3; pair 3 and 4) are classified within the good range on the schizoidia subscale of the IM-SS. On the schizotypy subscale only one coder pair, coders 2 and 3, fell within the good range. Overall, there was sufficient agreement between coders. For the participants which four

coders rated, the IM-SS was averaged across the raters for each item and summed to calculate the final variable.

Thin Slice Ratings – Willingness to Interact Scale (WIS; Coyne, 1976): Peers coded thin-slice ratings on participants. Peers are defined as individuals from the same age group and the same community. Thus, coders were individuals from the same age group (i.e., 18-22) and from the area surrounding the University of Maryland. Peers watched 30 second video clips of individuals with social anhedonia or healthy controls during a clinical diagnostic interview and rated these individuals on variables of likability and attractiveness. Raters were naïve to group status and symptom ratings. They were not informed of study hypotheses to avoid biasing ratings. Because potential knowledge of the IM-SS could potentially influence likability ratings, coders did not make IM-SS ratings. Additionally, because rating a target person at baseline could possibly affect ratings of the same target person at the follow-up period, coders did not rate the same person twice.

The 30-second length of coding is consistent with prior studies utilizing this method to examine individuals with personality disorder pathology (Friedman et al., 2007; Oltmanns et al., 2004). Coding focused on responses from participants when answering the questions “What do you really enjoy in life?” and “Tell me about something that happened to make you happy – what did that feel like?” during the Schedule for the Deficit Syndrome interview. This section of the interview was chosen because these questions are consistent with ones asked in previous research on thin slices of behavior in individuals with personality disorder pathology (Friedman et al., 2007;

Oltmanns et al., 2004). Then, the coders rated the individual's likability and attractiveness using the WIS.

Clips were presented on DVD. Coders watched a 30 second clip, then stopped and made ratings and then watched the next participant clip. Coders viewed six clips in a sitting and then took a break. Coders made ratings separately. Within the sequence of six clips, equal numbers of social anhedonics and controls were included. Video clips were viewed with the sound on, which is consistent with prior thin slice research (Friedman et al., 2007; Oltmanns et al., 2004). In order to prevent rater effects from occurring in one assessment, coders rated individuals at baseline and at follow-up. However, they never rated the same individual twice, as ratings from one time period could influence ratings at another time period. Four coders rated each person at baseline or follow-up. Thin slice studies often use as few as eight raters or as many as several hundred raters who make ratings in exchange for research credit for their introduction to psychology course (Ambady et al., 2000). Due to the clinical nature of this project, it is necessary to maintain the confidentiality of participants, thus, polling hundreds of raters was not feasible. However, prior research has demonstrated high intra-class correlations in likability ratings of individuals with personality disorders (Friedman et al., 2007; Oltmanns et al., 2004). Thus, we felt that four target raters were sufficient. Further, because these research assistants put in a greater effort than individuals participating in credit for introduction to psychology, we expected greater fidelity in ratings. Each target was rated by two males and two females in order to avoid a gender bias. Ratings were averaged across the four coders, which is consistent with prior research (Friedman et al., 2007; Oltmanns et al., 2004).

For the thin-slice ratings of likability, raters naïve to group status watched 30 seconds of the diagnostic interview and then rated the target person using the Willingness to Interact Scale (Coyne, 1976). The WIS consists of six items that measure willingness to interact further with a target person. Domains assessed by this measure include asking this person for advice, inviting him or her to the rater's house, and admitting him or her to the respondent's circle of friends. For example, a sample item from this scale is “Would you like to meet this person?” Respondents rate these items on a five-point scale ranging from one (“definitely no”) to five (“definitely yes”). These items were summed to create a total score for the measure. This scale has demonstrated good reliability (Boswell & Murray, 1991; Winer, Bonner, Blaney & Murray, 1981). Additionally, this measure has shown both good internal consistency and inter-rater reliability (Voncken, Alden, Bogels, & Roelofs, 2008). Coding training is not required for this measure.

Additional items were added to the WIS ratings, although they were not calculated into the total scale score because they are separate dependent variables. Specifically, an item was added so the participants can rate how much they like an individual. This is consistent with prior research on thin-slice ratings of individuals with personality disorder traits (Friedman et al., 2007; Oltmanns et al., 2004). Further, individuals’ attractiveness was also rated. This practice is consistent with previous research utilizing thin-slice ratings to study personality pathology (Friedman et al., 2007; Oltmanns et al., 2004). Further, following the methods of Friedman et al. (2007) and Oltmanns et al. (2004), two questions related to schizotypy and schizoidia were added. These questions are, “How friendly do you think this person is?” and “How odd do you think this person is?” These questions were rated on a five-point scale from one (“not

friendly at all) to five (“very friendly”) and one (“not odd at all”) to five (“very odd”), respectively (See Appendix B for coding sheet).

Chapter 5: Results

Sample Characteristics

This study sought to replicate prior findings which indicated that individuals with social anhedonia experience elevated rates of schizophrenia-spectrum behaviors in comparison to healthy controls (Collins et al., 2005; Emmerson et al., 2009) and also aimed to determine if these differences persist longitudinally. Further, this study examined peer responses to individuals with social anhedonia in comparison to healthy controls and whether these differences were maintained over time. Finally, this study sought to determine the precise nature of the relationship between peer responses and schizophrenia-spectrum behaviors.

Because the current study was part of a larger longitudinal study, first, analyses regarding differences between included and excluded participants were examined. Next, demographic variables related to the first study are presented. Then, clinical data collected from the parent study is discussed in order to clinically characterize the sample. Data regarding the primary variables from the current study, specifically the schizoid and schizotypal behavior and the peer responses are outlined. Finally, analyses related to the four main hypotheses are addressed.

The final sample consisted of 100 participants available at both the baseline and the three year follow-up period (social anhedonics: $n = 43$, healthy controls: $n = 57$). In order to compare the baseline analyses against the follow-up analyses, only participants with follow-up data were included (see Methods section). To determine whether there

was a significant difference between the excluded participants and the final sample, analyses were run on demographic variables and peer ratings obtained for the baseline assessment. Within the social anhedonic group, there was no difference between included and excluded participants in terms of gender ($n = 86$), $\chi^2 = .05$, $df = 1$, $p = .83$, race ($n = 86$), $\chi^2 = 4.51$, $df = 4$, $p = .34$, baseline *willingness to interact* score, ($n = 67$) $F(1, 66) = 2.66$, $p = .11$, the baseline “*like*” question¹, $F(1, 66) = 1.85$, $p = .18$, the baseline “*attractiveness*” question, $F(1, 66) = .29$, $p = .59$, the baseline “*friendliness*” question, $F(1, 66) = 2.79$, $p = .10$, the baseline “*oddness*” question, $F(1, 66) = .13$, $p = .72$, baseline schizoidia score, $F(1, 66) = 2.77$, $p = .10$, and baseline schizotypy score, $F(1, 66) = 2.28$, $p = .14$. In the healthy control group, there was no difference between included and excluded participants for gender ($n = 89$), $\chi^2 = .11$, $df = 1$, $p = .74$, race ($n = 89$), $\chi^2 = 2.76$, $df = 4$, $p = .60$, baseline *willingness to interact* score ($n = 72$), $F(1, 71) = 1.22$, $p = .27$, baseline “*attractiveness*” scores, $F(1, 71) = 2.77$, $p = .10$, baseline “*friendliness scores*,” $F(1, 71) = .17$, $p = .68$, baseline “*oddness*” scores, $F(1, 71) = .46$, $p = .50$, baseline schizoidia scores, $F(1, 71) = .42$, $p = .52$ or baseline schizotypy scores, $F(1, 71) = .023$, $p = .88$. However, there was a significant difference between the healthy controls who were excluded and those available at both assessments on the baseline “*like*” question, $F(1, 71) = 4.23$, $p < .05$, such that individuals who were included had a higher mean score than individuals who were excluded (included $M = 3.31$; excluded $M = 3.06$).

¹ Moving forward, abbreviations will be used for the questions added to the Willingness to Interact Scale. Question 7, “How much do you like this individual?” will be referred to as “Like.” Question 8 “How attractive do you think this person is?” will be referred to as “Attractiveness.” Question 9 “How friendly do you think this person is?” will be referred to as “Friendliness.” Question 10 “How odd do you think this person is?” will be referred to as “Oddness.”

All participants were either 18 or 19 at the first assessment and 21 or 22 at the time of the follow-up assessment (follow-up mean age: $21.48 \pm .50$). See Table 2 for race, gender and education demographic information at the baseline and follow-up assessments. As outlined in the methods section, analyses were only conducted on participants who had data for both baseline and follow-up. One participant from the healthy control sample was missing education data in the follow-up period; thus, $n = 56$ for healthy controls in the follow-up period. Within the sample of included participants chi-squared analyses revealed there were no significant differences between the social anhedonic group and the control group on demographic variables of race, $\chi^2 = 1.89$, $df = 4$, $p = .76$, or sex, $\chi^2 = .10$, $df = 1$, $p = .75$.

Clinical Characteristics of the Sample

Table 3 outlines the clinical characteristics of the baseline sample and the follow-up period. Data was missing for one healthy control for the follow-up deficit syndrome rating, and the baseline and follow-up Axis II dimensional score. For these scores $n = 56$ for healthy controls. In order to replicate findings from the larger MLSS study, repeated measures ANOVAs were conducted on the IPDE clinician ratings of the dimensional schizoid, schizotypal and paranoid scores (Couture, Blanchard & Cohen, under review). As in the larger study, for the IPDE clinician-rated schizoid dimensional scores there was a significant effect for group, $F(1, 98) = 27.07$, $p < .001$ (see Table 4). Further, there was a significant effect for time, $F(1, 98) = 7.59$, $p < .01$ and the interaction, $F(1, 98) = 4.79$, $p < .05$. Because the interaction was significant, one-way ANOVAs were conducted on the baseline and follow-up samples. There was a significant difference between individuals with social anhedonia and healthy controls in both the baseline and follow-up

periods (baseline: $F(1, 98) = 23.88, p < .001$; follow-up: $F(1, 98) = 17.87, p < .001$). Individuals with social anhedonia had higher rates of dimensional schizoid symptoms than healthy controls at both the baseline and follow-up period. Additionally the time effect indicates that clinician rated dimensional schizoid personality disorder scores decreased over time. The interaction effect indicates that while scores for healthy controls remained stable over time, scores for individuals with social anhedonia decreased over time.

In terms of the schizotypal dimensional personality disorder scores, there was a significant effect for group $F(1, 98) = 53.96, p < .05$ (see Table 4). Further, there was a significant effect for time, $F(1, 98) = 7.77, p < .01$ and the interaction, $F(1, 98) = 4.18, p < .05$. In order to follow-up on the interaction effect, one-way ANOVAs were conducted for both the baseline and follow-up periods. There were significant effects for both the baseline, $F(1, 98) = 27.92, p < .001$, and follow-up periods, $F(1, 98) = 8.32, p < .01$. Thus, there was a significant difference between the social anhedonia and healthy control groups on dimensional scores of schizotypal personality disorder, such that individuals with social anhedonia had more symptoms than healthy controls. Further, the time effect suggests that clinician rated dimensional schizotypal personality disorder scores decreased over time. The interaction effect suggests that, similarly to schizoid symptoms, while healthy controls' scores remained relatively stable over time, scores decreased individuals with social anhedonia.

A repeated measures ANOVA revealed a significant difference between the social anhedonia group and the healthy control group on clinician rated IPDE paranoid personality disorder symptoms (see Table 4). There was a significant effect for group,

$F(1, 98) = 18.49, p < .001$ and a significant effect for time, $F(1, 98) = 6.54, p < .05$, however, the interaction effect was not significant, $F(1, 98) = .45, p > .05$. Thus, dimensional paranoid personality disorder scores were again significantly different between the two groups, such that individuals with social anhedonia had elevated scores on paranoid personality disorder symptoms in comparison to healthy controls. Further, the time effect revealed that these scores decreased over time. In summation, these results are consistent with the larger study. Thus, while some participants were excluded from the current study, the symptoms profiles of the participants included in the current study are similar to those in the larger study.

Primary Variables - Interpersonal Measure of Schizotypy and Schizoidia Measure (IM-SS)

The IM-SS yields two subscales reflecting behavioral ratings of schizoidia and schizotypy. One of the questions on the schizotypy scale measures the “negative reaction of the interviewer to the individual.” Because this item was similar to likability and could therefore drive findings of a relationship between the IM-SS and WIS, it was dropped from the analyses. Means and standard deviations for these two subscales within the social anhedonic group and the healthy control group are presented in Table 5.

Primary Variables – Willingness to Interact Scale (WIS)

In order to calculate the *willingness to interact* variable, first, the individual items were recoded so that higher scores corresponded to more positive reactions by the peer rater. Then, a mean score over the 4 coders was calculated for each individual question at each time point. Questions 1-6 were summed to create a total score for the scale.

Questions 7-10 are separate dependent variables (i.e., *like*, *attractiveness*, *friendliness* and *oddness*). For questions 7-10 a mean over all 4 coders was calculated for each question at each time point. Means and standard deviations for the WIS scale and added questions are outlined in Table 6.

Hypothesis 1: Schizoid and Schizotypy Behaviors

The first hypothesis aimed to determine if there was a significant difference in the healthy control group and the social anhedonic group IM-SS ratings of schizoid and schizotypic behaviors at the baseline and follow-up assessment. For the IM-SS schizoidia subscale, a repeated measures ANOVA determined that there was a main effect for group ($F(1, 98) = 12.37, p < .05$), but not for time ($F(1, 98) = 2.22, p > .05$) or the interaction ($F(1, 98) = 1.47, p > .05$), as hypothesized. Thus, in comparison to healthy controls, individuals with social anhedonia had higher rates of IM-SS schizoid behavior at both baseline and follow-up.

For the IM-SS schizotypy subscale, a repeated measures ANOVA found that there was a main effect for group, $F(1, 98) = 4.10, p < .05$, time, $F(1, 98) = 7.77, p < .01$, and the interaction, $F(1, 98) = 4.18, p < .05$. In terms of the time effect, as seen in Table 5 scores on the IM-SS schizotypy subscale decreased from the baseline period to the follow-up. In order to further investigate the interaction effect, one-way ANOVAs were conducted.

For the baseline IM-SS schizotypy data, the one-way ANOVA was significant, $F(1, 98) = 7.00, p < .05$. However, the follow-up was not significant. Thus, in regards to the main effect for group, individuals with social anhedonia had higher rates of schizotypic behavior than controls at baseline, but not at follow-up.

Test-retest correlations were also conducted. It was expected that there would be high test-retest correlations for IM-SS ratings within each group. Within the social anhedonia group, there were significant correlations for both subscales between the baseline period and the follow-up (schizoidia: $r = .52, p < .001$; schizotypy: $r = .74, p < .001$). Test-retest correlations followed the same pattern for the healthy control group (schizoidia: $r = .35, p < .01$; schizotypy: $r = .31, p < .05$). These correlations indicate that these behavioral ratings remained somewhat stable within each group over time.

The two IM-SS subscales were also correlated to determine whether the subscales of schizophrenia-spectrum behavior were related to each other. Within the social anhedonia sample, the two IM-SS subscales were correlated at the baseline period, $r = .34, p < .05$. However, they were not correlated at follow-up, $r = -.04, p = .39$. Within the healthy control sample, the two IM-SS subscales were not correlated at baseline, $r = .10, p = .24$. However, they were correlated at follow-up, $r = .41, p < .05$. These results suggest that the IM-SS schizoid and schizotypal behaviors were only modestly related (sharing no more than 16% variance) and that this relationship was not consistent over time.

Correlational analyses were conducted to examine the relationship between schizophrenia-spectrum behavior and clinician rated symptomatology. In the baseline period within the social anhedonia sample, the IM-SS correlated with Axis II Cluster A Personality Disorder dimensional scores. Specifically, the IM-SS behavioral ratings of schizotypy correlated with the IPDE clinician interview dimensional schizotypal scale, $r = .38, p < .01$, and the IPDE clinician interview paranoid dimensional scale, $r = .30, p < .05$. However, behavioral rating of schizotypy did not correlate with clinician rated

schizoid personality disorder dimensional symptoms. The IM-SS schizoid subscale was correlated with the dimensional deficit syndrome scale, $r = .76, p < .001$, however it was not correlated with clinician rated cluster A personality disorder dimensional symptoms. In the follow-up social anhedonia sample, the IM-SS schizotypy behavioral subscale remained significantly correlated with both the schizotypal personality disorder dimensional subscale, $r = .59, p < .001$ and the paranoid personality dimensional subscale, $r = .39, p < .01$ and again was not correlated with clinician rated schizoid personality disorder dimensional symptoms. The IM-SS schizoid subscale also continued to correlate with the deficit symptom dimensional subscale, $r = .54, p < .001$ and again the scale was not correlated with clinician rated cluster A personality disorder dimensional symptoms. Thus, over both the baseline and the follow-up period, the behavioral IM-SS ratings of schizotypy were moderately correlated with clinician IPDE ratings of schizotypal and paranoid personality disorder, and behavioral IM-SS ratings of schizoidia were correlated with the deficit syndrome scale. These findings indicate that behavioral ratings of schizotypy are related to clinician ratings of schizotypy, while they do not completely overlap. Surprisingly, schizoid behaviors were not correlated with clinician ratings of schizoid personality disorder. However, they were correlated with the deficit syndrome scale, which measures negative symptoms. This is to be expected because the construct of schizoidia and negative symptoms overlap on items such as blunted affect and alogia.

Hypothesis 2: Peer Responses

The second aim sought to determine whether peer responses (i.e., ratings of *willingness to interact, liking, attractiveness, friendliness* and *oddness*) to the social

anhedonia group were significantly different than peer responses to the healthy control group at both baseline and the three-year follow-up assessment. For the *willingness to interact score*, a repeated measures ANOVA revealed main effects for both group and time (group: $F(1, 98) = 4.10, p < .05$; time: $F(1, 98) = 42.80, p < .001$, see Table 6). The interaction effect was not significant, as expected, $F(1, 98) = .86, p > .05$. The main effect for group indicates that when raters only viewed a thin-slice of an interview, they expressed a greater willingness to interact further with the healthy controls compared to social anhedonics. The main effect for time was not anticipated. Scores for both groups increased over time, which reflects peer ratings of greater willingness to interact during the follow-up period.

A repeated measures ANOVA was also conducted on the *likability* question. There was a significant main effect for group and for time (group: $F(1, 98) = 5.53, p < .05$; time: $F(1, 98) = 23.77, p < .001$), but not for the interaction effect, $F(1, 98) = .68, p > .05$. Again, the main effect of group was significant. Therefore, raters liked the healthy controls more than the social anhedonics. The main effect for time was not expected. Scores for both groups increased over time, which corresponds to greater likability at the follow-up (see Table 6).

For the *attractiveness* question, the main effect for group was not significant, $F(1, 98) = .30, p > .05$, nor was the interaction, $F(1, 98) = .29, p > .05$, but there was a significant main effect for time, which was not expected, $F(1, 98) = 9.84, p < .01$. Therefore, ratings of attractiveness for both groups increased over time, but there was no significant difference in attractiveness between the groups.

A repeated measures ANOVA conducted on the *friendliness* question revealed main effects for both group, $F(1, 98) = 11.46, p < .01$, and time $F(1, 98) = 40.41, p < .001$, but not for the interaction, $F(1, 98) = .01, p > .05$. This main effect indicates that healthy controls were viewed as more friendly than social anhedonics. The unexpected main effect for indicates that *friendliness* ratings increased over time.

For the *oddness* question, a repeated measures ANOVA revealed a significant main effect for group, $F(1, 98) = 7.09, p < .01$, and for time, $F(1, 98) = 22.17, p < .001$, but not for the interaction effect, $F(1, 98) = .51, p > .05$. This main effect indicates that healthy controls were rated as being less odd than social anhedonics at both baseline and follow-up. The main effect of time was not expected. Oddness scores increased for both groups, which corresponds to decreased oddness over time.

Hypothesis 3: The Relationship Between Peer Responses and Schizophrenia-Spectrum Behaviors

The third aim of this study sought to determine whether behaviors of schizoidia and schizotypy would predict peer responses in the social anhedonia group. Specifically it was predicted that greater schizoid and schizotypal behavior would be associated with peer ratings indicating less willingness to interact, likability, friendliness and greater oddness. Because attractiveness is tied to physical appearance, it was not predicted that behaviors related to schizoidia or schizotypy would predict attractiveness. Further, there were no group differences between healthy controls and individuals with social anhedonia on peer ratings of attractiveness. Thus, regression analyses were not conducted on this variable.

First, correlations between the IM-SS behavioral ratings of schizotypy and schizoidia and the peer rated *willingness to interact* score and associated questions were run for both the baseline and follow-up period (see Table 7). There were significant correlations between the behavioral ratings of schizoidia and the WIS scale and added questions (i.e., *like*, *friendliness*, and *oddness*) in both the baseline and the follow-up periods (baseline: WIS total, $r = -.47, p < .01$; likability, $r = -.47, p < .01$; friendliness, $r = -.58, p < .001$; oddness, $r = -.37, p < .01$; follow-up: WIS total, $r = -.40, p < .01$; likability, $r = -.48, p < .01$; friendliness, $r = -.55, p < .001$; oddness, $r = -.47, p < .01$). Thus, greater ratings of schizoid behavior were associated with lower peer ratings in both the baseline and follow-up period. When behavioral ratings of schizotypy were examined, there were significant correlations between this subscale and all peer rating variables in the baseline period (WIS total, $r = -.27, p < .05$; likability, $r = -.33, p < .05$; friendliness, $r = -.29, p < .05$; oddness, $r = -.26, p < .01$). However, correlations between schizotypy and WIS total, likability and friendliness were not significant in the follow-up period (WIS total, $r = -.19, p > .05$; likability, $r = -.12, p > .05$; friendliness, $r = -.03, p > .05$). The oddness question was correlated with behavioral ratings of schizotypy in the follow-up period (oddness, $r = -.41, p < .01$). Thus, there were only correlations between behavioral ratings of schizotypal behavior and peer ratings in the follow-up period.

In order to determine the combined and unique contributions of schizoidia and schizotypy to peer ratings, regression equations were conducted on the *willingness to interact* score and each added question (i.e., *like*, *friendliness* and *oddness*) for both the baseline and follow-up when both schizoidia and schizotypy correlated with the peer

response variable.² Specifically, analyses were conducted on all peer responses variables in the baseline period and only the oddness peer response variable in the follow-up period. The goal of these analyses was to determine what combined variance they account for and whether each variable uniquely explains variance in peer responses.

For all peer variables, the two IM-SS subscales were entered into a regression equation in order to determine their effects on peer ratings. For the WIS total score, the overall model was significant, $R^2 = .23$, $F(2, 40) = 6.01$, $p < .01$, and schizoidia was a significant predictor in the model, $\beta = -.43$, $t(40) = -2.89$, $sr^2 = -.40$, $p < .01$ (See Table 8). For the *like* question, both IM-SS subscales significantly correlated with it (see Table 8). These variables were entered simultaneously into a regression equation. The overall model was significant, $R^2 = .23$, $F(2, 40) = 5.95$, $p < .01$. The schizoidia subscale was a significant predictor in the model, $\beta = -.37$, $t(40) = -2.52$, $sr^2 = -.35$, $p < .05$ (see Table 8). For *friendliness* the overall model was significant, $R^2 = .59$, $F(2, 40) = 10.76$, $p < .001$, and schizoidia was a significant predictor in the model, $\beta = -.08$, $t(40) = -4.05$, $sr^2 = -.52$, $p < .001$, schizotypy was not a significant predictor in the model (see Table 8). For the baseline *oddness* variable overall model was significant, $R^2 = .16$, $F(2, 40) = 3.73$, $p < .05$. Schizoidia was a significant predictor in the model, $\beta = -.32$, $t(40) = -2.09$, $sr^2 = -.30$, $p < .05$; however, schizotypy was not (see Table 8). In all of the baseline analyses, schizoidia was a significant predictor in the model, but schizotypy was not.

In terms of the follow-up period analyses both the schizoidia and schizotypy subscales significantly correlated with the oddness question. Multiple regression was

² The contribution of other variables that could affect the relationship between behaviors on the schizophrenia spectrum and peer responses was also investigated. These ancillary analyses are included in Appendix C.

conducted in order to determine if these subscales predicted the variance in the oddness question. These IM-SS subscales were put into the regression model simultaneously. The overall model was significant $R^2 = .40$, $F(2, 40) = 13.35$, $p < .001$ (see Table 8). Both the schizoidia and the schizotypy subscale were significant predictors in the model (schizoidia: $\beta = -.48$, $t(40) = -3.95$, $sr^2 = -.48$ $p < .001$; schizotypy: $\beta = -.43$, $t(40) = -3.50$, $sr^2 = -.43$ $p < .01$).

Hypothesis 4: Correlates of Peer Responses and Schizophrenia-Spectrum Behaviors

The fourth aim sought to determine the relationship between both peer responses and schizophrenia-spectrum behaviors, and number of social supports, perceived social support and current functioning within the social anhedonia group (see Table 9).

In terms of the baseline peer ratings of *willingness to interact*, *like*, *friendliness* and *oddness*, there were no significant correlations with any of the peer support and social functioning measures. In contrast, for the follow-up period peer ratings were associated with peer support and social functioning. There were significant correlations between the clinician rated Global Assessment of Functioning and *willingness to interact* total, $r = .67$, $p < .001$, the *like* question, $r = .65$, $p < .001$, the *attractiveness* question, $r = .30$, $p < .05$, the *friendliness* question, $r = .53$, $p < .001$, and the *oddness* question, $r = .53$, $p < .001$. Therefore, greater likability, attractiveness, friendliness and decreased oddness were all associated with higher clinician-rated global functioning. These correlations suggest that peer observed behavior from brief viewing appears to be relevant for broader global functioning as rated within a clinical interview, at least during the follow-up period. There were significant correlations between the SOFAS and the *willingness to interact* score, $r = .68$, $p < .001$, the *like* question, $r = .63$, $p < .001$, the *friendliness*

question, $r = .47, p < .01$, and the *oddness* question $r = .45, p < .01$. Of note, the SOFAS was only employed at follow-up and not baseline; thus, data for baseline is unavailable. These correlations reveal that higher clinician-rated social and occupational functioning were associated with greater willingness to interact with this person, likability, friendliness, and decreases in oddness. The SOFAS variable does not include a rating of clinical symptoms, thus it only measures social and occupational functioning. There were also significant correlations between the ISEL Tangible subscale and both the *willingness to interact* total, $r = .33, p < .05$, the *like* question, $r = .33, p < .05$ and the *friendliness* question, $r = .44, p < .01$. Therefore, increases in perceived availability of help were correlated with increases in overall *willingness to interact, likability* and *friendliness* by individuals rating them.

In terms of the baseline IM-SS, only two correlations were significant in the predicted direction: the schizotypy subscale and the ISEL Tangible subscale, $r = -.34, p < .05$; and the schizotypy subscale and the global assessment of functioning, $r = -.31, p < .05$ (see Table 9). Thus, increases in schizotypic behaviors were associated with decreases in clinician rated global functioning. Also, increases in schizotypic behavior were associated with decreases in the perceived availability of social support in the form of material help (i.e., ISEL Tangible subscale). There was one correlation that was in the opposite direction than what was predicted: SSQ-N Satisfaction and the schizotypy subscale, $r = .31, p < .05$. Thus, increases in schizotypic behavior were associated with increases in the satisfaction of social support. No other correlations in the baseline period were significant.

In the follow-up data, several correlations reached significance. Correlations were significant between the IM-SS schizotypy subscale and the following scales: the Global Assessment of Functioning, $r = -.43, p < .01$, the Social and Occupational Functioning Assessment Scale, $r = -.33, p < .05$. Thus, increases in IM-SS schizotypic behavior were associated with decreases in functioning. The SSQ-N satisfaction subscale was unexpectedly positively correlated with the IM-SS schizoidia subscale, $r = .30, p < .05$. Thus, increases in schizoid behavior were associated with increases in satisfaction of self-reported social support. No other correlations were significant.

Post-Hoc Analyses

Post-Hoc analyses were conducted to determine whether baseline schizophrenia-spectrum behavior predicted peer responses in the follow-up period, while controlling for baseline peer responses. First, correlations between baseline schizophrenia-spectrum behavior and peer responses were examined. Baseline schizophrenia-spectrum behavior correlated with all baseline peer responses (See appendix Table 11). When correlations in the follow-up were examined, baseline schizoidia correlated with all peer response variables in the follow-up (WIS Total: $r = -.43, p < .01$; like: $r = -.45, p < .01$, friendliness: $r = -.48, p < .01$, oddness: $r = -.30, p < .05$), as did baseline schizotypy (WIS Total: $r = -.37, p < .05$; like: $r = -.32, p < .05$, friendliness: $r = -.31, p < .05$, oddness: $r = -.57, p < .001$).

Thus, hierarchical regression was run for all follow-up peer responses variables. To control for baseline peer responses (i.e., baseline WIS total, like, friendliness and oddness), each of these variables were entered into the first step of the respective models. Then, schizoidia and schizotypy were entered into the second step of the model. For the

WIS total, the first step of the model was significant $R^2 = .18$, $F(1, 41) = 9.96$, $p < .01$, and baseline WIS total was a significant predictor in the model, $\beta = .33$, $t(41) = 3.16$, $sr^2 = .25$, $p < .01$. After the second step, the overall model remained significant, $R^2 = .25$, $F(3, 39) = 5.58$, $p < .01$, however, the change in R^2 was not significant, $R^2\Delta = .11$, $F(2, 39) = 2.93$, $p > .05$. Baseline WIS total did not remain a significant predictor in the model, and no other predictors were significant. Thus, after controlling for baseline willingness to engage, baseline schizoidia and schizotypy did not predict willingness to engage scores in the follow-up period.

For like, the first step of the model was significant $R^2 = .12$, $F(1, 41) = 5.83$, $p < .05$, and baseline like was a significant predictor in the model, $\beta = .41$, $t(41) = 2.41$, $sr^2 = .35$, $p < .05$. After the second step, the overall model remained significant, $R^2 = .25$, $F(3, 39) = 4.36$, $p < .01$ and the change in R^2 was significant, $R^2\Delta = .13$, $F(2, 39) = 3.30$, $p < .05$. Baseline like did not remain a significant predictor in the model, however, schizoidia became a significant predictor in the model, $\beta = -.04$, $t(39) = -2.03$, $sr^2 = .14$, $p < .05$. Therefore, after controlling for baseline peer like ratings, baseline schizoidia behavior predicted follow-up likability, but schizotypy did not.

For friendliness, the first step of the model was significant $R^2 = .15$, $F(1, 41) = 7.20$, $p < .05$, and baseline friendliness was a significant predictor in the model, $\beta = .42$, $t(41) = 2.68$, $sr^2 = .38$, $p < .05$. After the second step, the overall model remained significant, $R^2 = .21$, $F(3, 39) = 4.78$, $p < .01$, however the change in R^2 was trend significant, $R^2\Delta = .12$, $F(2, 39) = 3.19$, $p = .05$. Baseline friendliness did not remain a significant predictor in the model, however, schizoidia became a trend significant predictor in the model, $\beta = -.05$, $t(39) = -2.02$, $sr^2 = -.27$, $p = .05$. Thus, baseline

schizoidia was trend significant in predicting follow-up peer responses, but was not a significant predictor in the model. No other predictors were significant in the second step of the model.

Finally, for oddness the first step of the model was significant $R^2 = .16$, $F(1, 41) = 7.62$, $p < .01$, and baseline oddness was a significant predictor in the model, $\beta = .44$, $t(41) = 2.76$, $sr^2 = .39$, $p < .01$. After the second step, the overall model remained significant, $R^2 = .39$, $F(3, 39) = 8.40$, $p < .001$, and there was a significant change in R^2 , $R^2\Delta = .23$, $F(2, 39) = 7.57$, $p < .01$. Baseline oddness did not remain a significant predictor in the model, however, schizotypy became a significant predictor in the model, $\beta = -.11$, $t(39) = -.34$, $sr^2 = -.34$, $p = .01$. Thus, baseline schizotypy was significant in predicting follow-up oddness. No other predictors were significant in the second step of the model.

Chapter 6: Discussion

This is the first study to examine peer responses and schizophrenia-spectrum behavior longitudinally in a sample of individuals with social anhedonia and healthy controls. While prior research in the MLSS study has determined that schizophrenia-spectrum behaviors are elevated in individuals with social anhedonia in comparison to healthy controls (Collins et al., 2005; Emmerson et al., 2009), the current study sought to determine if these behaviors persisted longitudinally. Also, given that individuals with social anhedonia struggle socially (Blanchard et al., 2011; Brown et al., 2007; Kwapil, 1998; Kwapil et al., 2009; Mishlove & Chapman, 1985), this study examined whether peer responses were less positive towards individuals with social anhedonia when they viewed a thin slice of the target's behavior. Further, this study aimed to determine whether these differences in peer responses persisted over time. This study also investigated the relationship between schizophrenia-spectrum behaviors and peer responses in order to determine if schizophrenia-spectrum behaviors contribute to the variance in peer responses. Finally, correlations between both peer responses and schizophrenia-spectrum behaviors and social and functioning variables were examined. Detailed findings and their relationship to the extant literature are outlined below.

Schizophrenia-Spectrum Behavior

As predicted, there was a significant difference between the social anhedonia group and the healthy control group on behaviors of schizoidia at both the baseline and the follow-up period. There was also a significant difference between healthy controls and individuals with social anhedonia at the baseline period for schizotypy, but this finding did not persist through the follow-up period. These baseline findings repeat the

results found by both Collins et al. (2005) and Emmerson et al. (2009). Further, the results of this study extend the findings longitudinally, such that individuals with social anhedonia have higher rates of schizoid behaviors than healthy controls over time. Additionally, the behavioral ratings of schizoidia were highly correlated with the deficit syndrome scale, a measure of negative symptoms, which suggests that negative symptoms are manifesting in this behavioral domain. However, while behaviors related to schizotypy were higher in the social anhedonia group at baseline, this finding did not persist over time.

Behaviors of schizoidia and schizotypy both decreased over time, but were only significantly lower between the baseline period and the follow-up period for schizoidia. This pattern is also seen in levels of clinician rated Axis II personality disorder symptoms (see Table 4). Personality disorder researchers have noted that personality disorder symptoms decrease over time, particularly during the transition from adolescence to adulthood, which is the age range of participants in the current study (Cohen, Crawford, Johnson & Kasen, 2005). One study examining the point prevalence of personality disorders at ages 14, 16, 22 and 33 determined that the point prevalence of schizotypal personality disorder decreased steadily from ages 14 to 22, and then remained stable from ages 22 to 33 (Johnson, Cohen, Kasen, Skodol & Oldham, 2008). When these symptoms are measured both with self-report measures and clinician rated measures in an adult sample, schizotypal personality disorder symptoms have been shown to decrease over a 3-year period (Samuel, Hopwood, Ansell, Morey, Sainslow, Markowitz, et al., 2011). Thus, findings from the current study, in which behaviors of schizoidia and schizotypy decreased over time are consistent with the literature on personality disorder symptoms.

Despite this decrease, differences in schizoid behavior did persist indicating that individuals with social anhedonia still had significantly higher levels of schizoid behavior at the follow-up period.

Within the data, the schizotypy variable had a restricted range, particularly during the follow-up period. It is possible that behaviors related to schizotypy normalized over time, which resulted in little severity or range in the data. Further, participants were selected on a variable (i.e. social anhedonia) that overlaps most directly with schizoidia, less so with schizotypy. Thus, selection of participants on the social anhedonia variable could have resulted in a more restricted range in schizotypy characteristics compared to schizoid characteristics. This restricted range likely contributed to the null findings for schizotypy.

Peer Ratings

The current study also examined peer ratings in individuals with social anhedonia and healthy controls. As predicted, there was a significant difference between the social anhedonia group and the healthy control group on peer ratings based on thin slices of behavior. Specifically, raters were less willing to engage with individuals with social anhedonia. Further, raters thought individuals in the social anhedonia group were significantly less likable, less friendly and more odd than healthy controls, as expected. While peer ratings became more favorable over the 3-year period for both groups, group differences still persisted over time. Interestingly, there were group differences in all peer rating variables except for attractiveness. Thus, these differences are not explained by the influence of attractiveness.

Several studies have found that individuals with social anhedonia have significant social difficulties (Blanchard et al., 2011; Brown et al., 2007; Kwapil, 1998; Kwapil et al., 2009; Mishlove & Chapman, 1985). However, these studies suffer from several limitations including: self-report measures that only provide the participant's perspective, and a failure to assess observed behaviors (Blanchard et al., 2011; Brown et al., 2007; Kwapil, 1998; Kwapil et al., 2009; Mishlove & Chapman, 1985; Thomas et al., 2003). Further, self-report measurements are not highly correlated with collateral reports (Klonsky et al., 2002). The current study establishes that in addition to self-reported difficulties, peers are also regard individuals with social anhedonia as being less likable, unfriendly and odd, and therefore may be less likely to form significant relationships with these individuals. Although it has been previously documented that individuals with social anhedonia experience social difficulties, this study is the first evidence that peers may be more likely to reject them. Further, negative correlations between peer ratings and clinician rated social functioning suggests that these peer responses may relate to the broader functional impairments rated by clinicians. However, this pattern was only observed during the follow-up period. While clinicians and peers social ratings of individuals with social anhedonia correlated, what explains this pattern of poor social functioning in peer ratings is schizophrenia-spectrum behavior.

The Relationship Between Peer Ratings and Schizophrenia-Spectrum Behavior

The current study also extends the prior findings regarding schizophrenia-spectrum behavior to the social behavior domain. In the baseline period, behavioral ratings of schizoidia were a significant correlate of peer responses in all models. However, behavioral ratings of schizotypy were not a significant predictor in any of the

models. In the follow-up period, regression was only run on the oddness question because it was the only outcome variable that was correlated with both subscales of the IM-SS. In this analysis, both schizoidia and schizotypy were significant. It is important to note that there were no group differences in schizotypy in the follow-up period. Thus, a lack of findings in the baseline regression models for schizotypy may be due to the fact that schizotypy normalized over the three-year period. Furthermore, schizoidia was also more prevalent and persistent in this sample, because social anhedonia was used as the selection criteria for the current study. Social anhedonia overlaps with schizoid behaviors, which may explain why schizoidia was an important factor in all of the analyses.

The findings in the current study are consistent with research from the thin-slice literature. Studies conducted in non-clinical samples suggest that first impressions can be formed within 39 milliseconds based on limited information (Ambady et al., 2000; Bar, Neta & Linz, 2006). The results of the current study are similar to thin-slice research on personality disorders, which has revealed that naïve raters are able to ascertain psychopathology from short video clips (Friedman et al., 2007; Oltmanns et al., 2004). This research has determined that raters view individuals with schizoid and schizotypal traits as being less likable and less attractive (Oltmanns et al., 2004). Further, research on thin slices of facial expression has determined that raters can pick up on the slightest hint of a facial expression (Laeng, Profeti, Saether, Adolfsdottir, Lundervold, Vangberg et al., 2010) and these minor facial expressions are found to evoke emotions in others (Laeng et al., 2010). This research is highly relevant to the current study because the construct of schizoidia includes items such as a constricted facial affect and detachment (i.e., poor eye

contact). The current findings extend this research by demonstrating a link between schizophrenia-spectrum behaviors and resulting negative peer responses.

Additionally, other thin-slice literature has determined that naïve raters can make clinical judgments that correlate with clinician ratings in short amounts of time. For instance, one study that examined thin-slice ratings of psychopaths found that untrained coders' ratings of psychopathy correlated with clinician ratings of psychopathy (Fowler, Lilienfeld & Patrick, 2009). Within the same study, the same pattern of findings emerged for ratings of intelligence and this finding has also been established in a non-clinical sample (Borkenau, Mauer, Riemann, Spinath & Angleitner, 2004; Fowler et al., 2009). Interestingly, in the current study there were significant correlations between clinician rated global assessment of functioning and peer ratings in the follow-up period. Thus, naïve raters responses are related to clinician ratings, indicating that naïve raters are able to ascertain the same lack of functioning, which in turn may affect their desire for further interaction. This pattern was not observed in the baseline period, however, it is unclear why the results were only significant in the follow-up period and should be interpreted with caution.

The findings in the current study suggest that behaviors related to schizoidia, may evoke rejection from peers. As mentioned previously, a defining characteristic of schizophrenia-spectrum disorders is schizoid withdrawal (i.e., individuals with schizophrenia-spectrum disorders do not want to interact with others). Individuals with social anhedonia report that they prefer to be alone, but not because they feel rejected by others (Kwapil et al., 2009). Further, in a recent study individuals with social anhedonia and healthy controls were asked to participate in an affiliative task (Llerena, Park,

Couture, & Blanchard, manuscript submitted). In response to a simulated peer interaction, individuals with elevated social anhedonia were less likely to engage in affiliative behavior, and were less socially skilled than healthy controls. After the interaction, individuals with social anhedonia indicated less change in positive affect, less affiliative feelings, and less willingness to interact in the future with their interaction partner. Data from the current study suggests that individuals with social anhedonia behave in a way that leads others to be less willing to interact with them. However, what remains unclear is what aspect of this process emerges first. Specifically, it is unknown whether behavioral deficits emerge first and cascade into social difficulties that lead to peer rejection and the belief that social interactions are unrewarding. Or, whether affective or motivational deficits are primary and lead to non-affiliative behaviors that peers respond to with rejection. It is likely that these processes are not mutually exclusive, but future research should focus on longitudinal studies to address which aspects of social interaction difficulties (i.e., evoking negative responses from peers though behavior or motivational deficits) start first.

The current findings appear consistent with findings from clinical samples indicating that individuals with schizophrenia are likely to be rejected. In one study, agreeable undergraduates created friendships over a two-week period with individuals with schizophrenia (Nisenson, Berenbaum & Good, 2001). The undergraduates were specifically chosen because of their “pleasant” personalities. After two weeks the undergraduates’ behavior changed significantly, such that it became more negative. In another study, undergraduates viewed a 3-minute role-play between a patient with schizophrenia and a confederate and measured how much the undergraduates wanted to

avoid interaction with the patient (Penn, Kohlmaier & Corrigan, 2000). The best predictor of avoiding the interaction was how “strange” the patient was rated as being. Strangeness was predicted by the patient’s global level of social skills. Further, in another study investigating staff reactions to individuals with treatment-resistant schizophrenia found that staff were more likely to reject patients when they engaged in disorganized behavior and evidenced higher cognitive difficulties (Heresco-Levy, Ermilov, Giltsinsky, Lichtenstein, & Blander, 1999).

These present findings are also in line with literature regarding interpersonal models of depression and schizophrenia (Boswell & Murray, 1981; Coyne, 1976; Hammen & Peters, 1978). Individuals with depression and schizophrenia arouse negative affect in others and are more likely to be rejected (Boswell & Murray, 1981; Coyne, 1976; Hammen & Peters, 1978). Results from the current study reflect similar findings in a population of individuals with social anhedonia.

Findings from the current study are also consistent with literature on inhibiting emotion expression (Butler et al., 2003; Gross & Levenson, 1997; Richards & Gross, 1999). Research has demonstrated that a lack of emotional expression can result in severe social consequences, such as obstructed communication, poor rapport, and overall poor social functioning (Butler et al., 2003; Gross & Levenson, 1997; Richards & Gross, 1999). Within the current study, schizoid behaviors, which are often behaviors that include lack emotional expression (i.e., constricted facial affect and a lack of non-verbal expression), explained the variance in peer responses. Thus, the results of the current study are in line with literature on emotional inhibition.

While there were significant differences between groups in almost all domains of peer responses, there was no difference between the groups on attractiveness in either the baseline or follow-up period. A significant body of literature suggests that attractiveness influences first impressions of others so that individuals who are more attractive are viewed more favorably, and thus, more likable (Eagly, Ashmore, Makhijani, & Longo, 1991; Feingold, 1992; Lorenzo, Biesanz & Human, 2010). However, the finding in the current study suggests that attractiveness, while correlated with likability, does not account for group differences because there were no significant differences between social anhedonics and controls on this variable.

As in the schizophrenia-spectrum behavior analyses, there was also an unexpected time effect in the peer ratings. Over time, peer response scores improved on all indices including willingness to interact, likability, attractiveness, friendliness, and oddness (corresponding to decreased oddness). One way to interpret this finding is that due to the relationship between schizophrenia-spectrum behavior and likability in the regression analyses, which will be discussed further below, as schizophrenia-spectrum behaviors reduce over time, favorable peer responses increase over time. None of the interaction effects were significant, as expected. Thus, despite developmental improvement in schizophrenia-spectrum behavior, group differences still persisted into the follow-up period. However, another possible explanation for this finding is the phenomenon of regression to the mean, which asserts that extreme scores on one assessment tend to move towards the mean on the following assessment (Bland & Altman, 1994). While this is a possibility, schizophrenia-spectrum behavior demonstrated a consistent pattern of decreases over time. Further, peer responses also demonstrated a consistent pattern in

which they increased over time. These patterns argue against the possibility of regression towards the mean.

Post-hoc analyses demonstrated that baseline schizophrenia-spectrum behavior predicted peer responses in the follow-up period. Specifically, baseline schizoidia predicted follow-up likability and baseline schizotypy predicted follow-up oddness. Thus, baseline measurements of schizophrenia-spectrum behavior were predictive of follow-up peer-responses.

There were several significant correlations between schizophrenia-spectrum behaviors and social and functioning variables. Higher behavioral ratings of schizotypy were associated with lower functioning, and this finding persisted from the baseline period to the follow-up period. Further, in the follow-up period, poorer social functioning were associated with elevated schizotypal behaviors. A significant body of literature suggests that schizotypal personality disorder and schizotypal traits are associated with reductions in functioning (Henry et al., 2008; Skodal, Gunderson, McGlashan, Dyck, Stout, Bender et al., 2002). The current research extends this finding by demonstrating that this association persists over time. Further, it extends this research by demonstrating that behaviors of schizotypy, not just clinician rated symptoms, are associated with decreases in functioning.

In the baseline period, increased schizotypic behavior was related to the decreased reported availability of social support. In the follow-up period, elevation in schizotypic behaviors were associated with decreases in the satisfaction of social support. These findings are consistent with findings from the larger MLSS study that established a link between increases in clinician rated cluster A personality disorder symptoms and

decreases in social support (Blanchard et al., 2011). The current research extends these findings by demonstrating a relationship between schizotypic behaviors and decreases in the availability of social support and satisfaction with social support.

While there were associations between schizophrenia-spectrum behavior and self-reported social support, there were also several correlations that were not in the expected direction. In the baseline period, increases in the satisfaction of social support were related to increases in schizotypic behavior and in the follow-up period, increases in the satisfaction of social support were related to increases in schizoid behavior. These correlations were unexpected. While these findings were not predicted, they may be tapping a core form of schizoidia and schizotypy in which these individuals are satisfied with being alone. These findings are in line with research described earlier in which individuals with social anhedonia are less likely to engage with others (Llerena et al., manuscript submitted).

Although some schizophrenia-spectrum behavior correlations were not in the predicted directions, peer response scores demonstrated interesting relationships, specifically between peer responses and clinician rated global functioning. In the follow-up period, clinician rated global functioning correlated with all peer responses scores (i.e., *willingness to interact*, *likability*, *attractiveness*, *friendliness*, and *oddness*). Further, decreases in social functioning were related to less *willingness to interact*, less *likability*, less *friendliness* and increased *oddness*, in the follow-up period (the measure was only employed in the follow-up). While prior research has established that social anhedonics experience social difficulties that are related to functioning (Blanchard et al., 2011), this is the first study to establish that negative peer responses are also related to decreased

functioning in several domains including decreased global functioning, social and occupational functioning in individuals with social anhedonia.

While there were no relationships between peer responses and social support in the baseline period, there were several significant correlations in the follow-up period. Decreases in perceived availability of social support was related to decreases in *willingness to interact*, *likability* and *friendliness*. Thus, peer rejection was related to the individual's perceptions of the availability of their social support.

Limitations

While this study has major strengths, such as an ethnically diverse community sample and a novel investigation of social difficulties in individuals with social anhedonia, it has notable limitations. These limitations include: restricted range of both IM-SS schizotypy scores in the follow-up and IPDE scores, conducting multiple statistical analyses without corrections on a small sample size, the variable utilized to select participants, discussion of prior treatment during the IM-SS ratings, the inability to explore gender differences and difficulty generalizing the current results to a clinical sample.

One limitation of the current study is the restricted range of the schizotypy scale of the IM-SS in the follow-up sample and IPDE dimensional scores. Within the follow-up sample, the mean of the behavioral ratings of schizotypy scores of social anhedonics was low ($M = 1.78$). One reason for this could be the method utilized to recruit participants. Participants were selected because they endorsed high levels of social anhedonia, a form of negative schizotypy that in prior research has a high conversion rate to schizophrenia. Social anhedonia overlaps with schizoid behaviors, but not schizotypal

behaviors, which could have resulted in the restricted range for schizotypal behavior. Thus, this is likely why the sample had higher levels of schizoidia than schizotypy, and also likely why schizotypy normalized while schizoidia remained persistent over time. This restricted range could have affected the null results of the schizotypy scores in the follow-up. While the IPDE scores in the current study were similar to those in the larger MLSS study, the range of these scores was restricted, which could have affected the results. Thus, these results need to be interpreted with caution due to the restricted range of these measures. In order to capture the full range of behavior, participants should be selected for both negative and positive schizotypy in future research.

Similarly, data analyses conducted on the sample represents another limitation. Because of limitations with the videotapes, the dataset was limited to 43 subjects in the social anhedonia group. Multiple statistical analyses were run on this data without corrections. Thus, these results should be interpreted with caution.

Another limitation is the possible influence of IM-SS rating through participants' divulgence of prior psychiatric treatment. Individuals rating the IM-SS watched the first 30 minutes of the Structured Clinical Interview for DSM-IV, during which participants discuss prior psychiatric treatment. Individuals with social anhedonia did have more psychiatric treatment in comparison to healthy controls. While participants did discuss psychiatric treatment, no one had received treatment for a schizophrenia-spectrum condition, thus, raters were still blind to group status.

Another limitation of the current research is that there was not enough power to explore gender differences. Gender differences in course, functioning, and symptomatology of schizophrenia-spectrum disorders are outlined in the literature

(Hafner, 2003; Thorup, Petersen, Jeppesen, Ohlenschlaeger, Christensen et al., 2007). Specifically, females have higher social functioning and markedly better social outcomes (Hafner, 2003; Scholten, Aleman & Kahn, 2007; Thorup et al., 2007). Additionally, recent research suggests that females diagnosed with schizophrenia are superior to males in processing emotional language, which could explain gender differences in social functioning (Scholten et al., 2007). Part of the schizoidia variable is constricted facial affect (Kring & Gordon, 1998). In the larger MLSS study (Blanchard et al., 2011) there were no gender differences. However, it is unclear whether or not the current study would have had different correlates between the two genders.

While research suggests that individuals with social anhedonia are more likely to develop schizophrenia-spectrum disorders than healthy controls, in the current study, none of the participants developed schizophrenia or schizophrenia-spectrum disorders (Couture et al., under review). Thus, it is difficult to discuss the implications of the current study in regards to schizophrenia or schizotypy without reservations. While the results should be interpreted cautiously, the current study suggests that individuals with social anhedonia evidence maladaptive behaviors that elicit negative reactions from others. In terms of the extension of these results to schizophrenia, we must interpret the results with caution; however, it does raise questions about risk for schizophrenia and potential interventions to mitigate this risk. Specifically, behavioral interventions could be developed to target behaviors related to schizoidia and schizotypy.

Future Directions

This study establishes a link between schizophrenia-spectrum behaviors and peer responses in a sample of individuals with social anhedonia. Since individuals with social

anhedonia are at risk to develop schizophrenia and due to the fact that individuals with schizophrenia also experience significant social difficulties (Schuldberg, Quinlan, & Glazer, 1999), the next steps of this research would be to replicate these findings in a sample of individuals with first episode schizophrenia or individuals at clinical high risk for schizophrenia. Social deterioration is an important predictor in the transition to psychosis (Velthorst et al., 2009) Thus, it is important to elucidate the role of interpersonal factors in this process.

This research also points to potential treatment targets for groups of individuals that engage in schizophrenia-spectrum behaviors, such as schizophrenia and cluster A personality disorders. For example, behaviors related to schizoidia are related to rejection from peers. Current social skills treatments focus on increasing skills and do not stress changing schizophrenia-spectrum behaviors, such as constricted facial affect or lack of non-verbal expression (Bellack, Mueser, Gingerich & Agresta, 2004). Thus, once it is established that individuals with schizophrenia engage in schizophrenia-spectrum behavior that is related to peer rejection, future research should determine if modifying these behaviors leads to increases in social functioning.

Table 1

Intra-class Correlations (ICC) for IM-SS Subscales (n = 39)

	Coder 1	Coder 2	Coder 3
Schizoidia Scale			
Coder 2	.85	–	–
Coder 3	.74	.86	–
Coder 4	.84	.76	.66
Schizotypy Scale			
Coder 2	.89	–	–
Coder 3	.79	.82	–
Coder 4	.86	.73	.75

Table 2

Demographic Characteristics (Social Anhedonics: n = 43; Healthy Controls: n = 57)

	Social Anhedonics N (%)	Healthy Controls N (%)
Gender		
Male	24 (55.8%)	30 (52.6%)
Female	19 (44.2%)	27 (47.4%)
Ethnicity		
Caucasian	16 (37.2%)	27 (47.3%)
African American	23 (53.5%)	23 (40.4%)
Asian	1 (2.3%)	2 (3.5%)
Hispanic	2 (4.7%)	4 (7.0%)
Other	1 (2.3%)	1 (1.8%)
Baseline Education		
Some High School	0 (0.0%)	2 (3.6%)
High School Graduate/GED	11 (25.6%)	19 (33.3%)
Some College/Trade School	32 (74.4%)	36 (63.1%)
Trade School Graduate	0 (0.0%)	0 (0.0%)
College Graduate	0 (0.0%)	0 (0.0%)
Some Graduate School	0 (0.0%)	0 (0.0%)
Follow-up Education^a		
Some High School	0 (0.0%)	0 (0.0%)
High School Graduate/GED	2 (4.6%)	5 (8.9%)
Some College/Trade School	26 (60.5%)	39 (69.6%)
Trade School Graduate	1 (2.3%)	3 (5.4%)
College Graduate	10 (23.3%)	8 (14.3%)
Some Graduate School	4 (9.3%)	1 (1.8%)

^a Follow-up Education n = 56 for healthy controls

Table 3

Baseline Clinical Characteristics (Social Anhedonics: n = 43; Healthy Controls: n = 57)

	Social Anhedonics N (%)	Healthy Controls N (%)
<i>Baseline</i>		
Axis I Disorders		
Current Mood Disorder	1 (2.3%)	1 (1.8%)
Lifetime Mood Disorder	10 (23.3%)	5 (8.8)
Current Psychotic Disorder	0 (0.0%)	1 (1.8%)
Lifetime Psychotic Disorder	0 (0.0%)	1 (1.8%)
Current Substance Use Disorder	3 (7.0%)	3 (5.3%)
Lifetime Substance Use Disorder	5 (11.6%)	11 (19.3%)
Deficit Syndrome Diagnosis	0 (0.0%)	0 (0.0%)
Axis II Cluster A Disorders Dimensional Scores ^{a, b}		
Schizotypal Personality Disorder	1.53 (1.65)	.27 (.62)
Schizoid Personality Disorder	1.63 (2.09)	.21 (.49)
Paranoid Personality Disorder	1.16 (1.83)	.29 (.59)
<i>Follow-up</i>		
Axis I Disorders		
Current Mood Disorder	2 (4.7%)	3 (5.3%)
Lifetime Mood Disorder	14 (32.6%)	10 (17.5%)
Current Psychotic Disorder	0 (0.0%)	1 (1.8%)
Lifetime Psychotic Disorder	0 (0.0%)	2 (3.5%)
Current Substance Use Disorder	5 (11.6%)	4 (7.0%)
Lifetime Substance Use Disorder	9 (20.9%)	16 (28.1%)
Axis II Cluster A Disorders Dimensional Scores ^b		
Schizotypal Personality Disorder	.58 (1.05)	.13 (.57)
Schizoid Personality Disorder	1.00 (1.35)	.11 (.56)
Paranoid Personality Disorder	.79 (1.15)	.14 (.62)
Deficit Syndrome Diagnosis ^a	0 (0.0%)	0 (0.0%)

^a For Axis II Dimensional Scores in the baseline period and Deficit Syndrome Diagnosis in the follow-up period, n = 56 for healthy controls ^b For Axis II Dimensional Scores, numbers represent means and standard deviations

Table 4

Means, Standard Deviations and Repeated Measures ANOVAs for IPDE Dimensional Personality Disorder Symptoms at Baseline and Follow-up (Social Anhedonics, n = 43; Healthy Controls, n = 56)

	Baseline		Follow-up		For Group <i>F</i>	For Time <i>F</i>	For Interaction <i>F</i>
	Social Anhedonics Mean (<i>SD</i>)	Healthy Controls Mean (<i>SD</i>)	Social Anhedonics Mean (<i>SD</i>)	Healthy Controls Mean (<i>SD</i>)			
Schizoid Personality Disorder	1.63 (2.09)	.21 (.49)	1.00 (1.35)	.14 (.62)	27.07***	7.59**	4.79*
Schizotypal Personality Disorder	1.53 (1.65)	.27 (.62)	.58 (1.05)	.11 (.56)	53.96*	7.77**	4.18*
Paranoid Personality Disorder	1.16 (1.83)	.29 (.59)	.79 (1.15)	.07 (.32)	18.49***	6.54**	.45

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 5

Means and Standard Deviations for IM-SS Variables (Social Anhedonics, n = 43, Healthy Controls, n = 57)

	Social Anhedonics Mean (SD)	Healthy Controls Mean (SD)
Baseline		
Schizoidia	5.44 (5.43)	2.35 (3.10)
Schizotypy	3.02 (3.72)	1.46 (2.15)
Follow-up		
Schizoidia	4.26 (5.14)	2.23 (3.21)
Schizotypy	1.78 (3.34)	1.26 (2.19)

Table 6

Means, Standard Deviations and Repeated Measures ANOVAs for WIS Variables at Baseline and Follow-up (Social Anhedonics, n = 43; Healthy Controls, n = 57)

	Baseline		Follow-up		Effect Size For Group <i>F</i>	Effect Size For Time <i>F</i>	Effect Size For Interaction <i>F</i>
	Social Anhedonics Mean (<i>SD</i>)	Healthy Controls Mean (<i>SD</i>)	Social Anhedonics Mean (<i>SD</i>)	Healthy Controls Mean (<i>SD</i>)			
WIS Total	15.12 (3.66)	16.89 (3.97)	18.10 (4.35)	19.12 (3.78)	4.10*	42.80***	.86
Like	2.97 (.56)	3.31 (.51)	3.39 (.65)	3.50 (.58)	5.53*	23.77***	3.52
Attractiveness	3.00 (.72)	3.12 (.78)	3.31 (.85)	3.34 (.78)	.29	9.84**	.29
Friendliness	3.16 (.75)	3.55 (.66)	3.67 (.82)	4.04 (.48)	11.46**	40.41***	.01
Oddness ^a	2.77 (.77)	3.19 (.82)	3.22 (.86)	3.53 (.74)	7.09**	22.17***	.51

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, ^aHigher Oddness scores correspond to less oddness, ^ = trend significant, $p < .10$

Table 7

Correlations Between Peer Response Scores and Schizophrenia-Spectrum Behavior Variables in the Social Anhedonia Sample (Social Anhedonics, n = 43)

	Schizoidia <i>r</i>	Schizotypy <i>r</i>
Baseline Peer Responses		
WIS Total	-.47**	-.27*
Like	-.47**	-.33*
Friendliness	-.58***	-.29*
Oddness	-.37**	-.26*
Follow-up Peer Responses		
WIS Total	-.40**	-.19
Like	-.48**	-.12
Friendliness	-.55***	-.03
Oddness	-.47**	-.41**

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 8

Multiple Regression in the Baseline and Follow-up Period in the Social Anhedonia Sample (Social Anhedonics, n = 43)

	Schizoidia <i>b</i>	Schizotypy <i>b</i>	Model <i>R</i> ²	<i>F</i>
Baseline				
WIS Total	-.29**	-.12	.23	6.01**
Like	-.04*	-.03	.23	5.95*
Friendliness	-.08***	-.02	.35	10.76***
Oddness	-.05*	-.03	.16	3.73*
Follow-up				
Oddness	-.08***	-.11**	.40	13.35***

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 9

Bivariate Correlations Between WIS Variables and IM-SS Subscales and Social and Functioning Variables in the Social Anhedonia Sample (n = 43)

	Appraisal <i>r</i>	Perceived Social Support		Self-Esteem <i>r</i>	Number of Social Supports		Current Functioning	
		Belonging <i>r</i>	Tangible <i>r</i>		Number <i>r</i>	Satisfaction <i>r</i>	GAF <i>r</i>	SOFAS <i>r</i>
Baseline Peer Ratings								
WIS Total	-.10	.06	.09	-.14	.02	-.17	.28	-. ^a
Like	-.07	.08	.11	-.09	-.04	-.12	.25	-
Attractiveness	-.21	-.11	.00	-.04	-.09	.03	-.13	-
Friendliness	-.02	.09	.10	.02	-.09	-.22	.23	-
Oddness	-.09	-.01	-.01	.00	-.11	-.09	.27	-
Baseline Behavioral Ratings								
Schizoidia	.10	.14	.07	.02	.04	.22	-.15	-
Schizotypy	.15	-.23	-.34*	-.14	-.11	.31*	-.31*	-
Follow-up Peer Ratings								
WIS Total	.14	.26	.33*	.29	.10	.05	.67***	.68***
Like	.04	.17	.33*	.19	.14	-.04	.65***	.63***
Attractiveness	.15	.24	.21	.17	.24	.15	.30*	.28
Friendliness	.05	.27	.44**	.24	.10	.00	.53***	.47**
Oddness	.05	.15	.14	.28	.25	.14	.53***	.45**
Follow-up Behavioral Ratings								
Schizoidia	.25	.02	-.08	.02	-.15	.30*	-.21	-.14
Schizotypy	-.17	-.23	-.02	-.26	-.05	-.36*	-.43**	-.33*

^a The SOFAS was not measured in the baseline period; * = $p < .05$, ** = $p < .01$, *** = $p < .001$

Appendices

Appendix A: Interpersonal Measure of Schizoidia and Schizotypy Coding Sheet

Appendix B: Willingness to Interact Scale

Appendix C: Ancillary Analyses

Appendix A: Interpersonal Measure of Schizoidia and Schizotypy Coding Sheet

Participant Number: _____ **Rater:** _____ **Circle one:** Interviewer Observer

Instructions: Please rate each construct by circling the word(s) that describes the individual you interviewed. A few examples of each trait are also listed. Please check any of the examples that apply and feel free to note other manifestations of these traits in the blank space. Please note that a construct will frequently describe an individual even if none of the examples are relevant to the individual.

Interpersonal Measure of Schizoidia

- 1) Constricted Facial Affect
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ dull facial expression
_____ infrequent blinking
_____ rarely if ever smiles
_____ flatness

- 2) Lack of Non-Verbal Expression
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ very little head/body movement
_____ frozen posture
_____ few expressive hand/arm gestures

- 3) Detachment (Lack of Engagement)
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ diverts direct eye contact
_____ directs eye gaze down and holds it in one place

- 4) Lack of Verbal Expression
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ little elaboration, one word or short answer
_____ non-dramatic language
_____ lack of inflection in general
_____ lack of animation or enthusiasm in describing any life event or relationship

- 5) Indifference (Lack of Interest)
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
____ displays no curiosity about the purpose of the interview
____ indifference to interviewer's criticism/praise
____ individual may not seem to be attending to interviewer's questions
- 6) Guardedness
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
____ reluctant to express any firm opinions
____ only reveals personal details when directly questioned
____ difficulty answering questions regarding feelings about personally significant events (regardless of the depth or concreteness of his answers)
____ avoids or discourages in-depth exploration of motives or feelings
- 7) Lack of Variability in Affect/Expression Over Time
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
____ from start to finish, individual does not warm up during interview
____ emotional coldness throughout interview
- 8) Poor Rapport
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
____ seems aloof
____ interviewer feels no sense of rapport with individual
____ lack of response to jokes
____ individual does not show signs of enjoying the interaction
- 9) Absence of Spontaneity in Speech
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
____ tolerant of long, silent pauses
____ does not initiate conversation or ask questions

- 10) Lack of Verbal Responsiveness to Interviewer's Remarks
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ lack of "uh, huh," "yeah," "ok," or "umm"
_____ lack of verbal expression of commonality

- 11) Lack of Interpersonal Synchrony
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- _____ lack of convergence with interviewer's actions at close of interview
_____ does not make same head/body movements as interviewer

Interpersonal Measure of Schizotypy

- 1) Inappropriate Affect
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
_____ frequently changing
_____ inappropriate laughter
_____ facial expression or body language grossly contradicts stated feelings
- 2) Suspiciousness/Paranoid Behavior
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
_____ tries to ascertain what interviewer is writing down
_____ signs of objection or resistance to a question being asked (other than to clarify meaning of words)
- 3) Guarded Posture
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
_____ crouches in chair
_____ tries to hide part of face or body from interviewer's view
_____ tries to hide possession or object from interviewer's view
_____ turns away from the interviewer
- 4) Speech Disorganized or Difficult to Understand
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly
- check all that apply:
_____ difficult to distinguish meaning of sentence
_____ difficult to see how answer fits with question
_____ disjointed answers

- 5) Tangential Speech
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- changed answer in middle of explanation
 difficulty staying with the question asked
 difficult to see how consecutive sentences fit together
 rambling or very lengthy responses

- 6) Unusual or Odd Speech (other than disorganized or repetitive speech)
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- use of foreign terms/neologisms
 use of phrases in inappropriate contexts
 overuse / misuse of idioms
 references to self in the third person
 use of verbal brackets before answer (e.g., "For this next one, I'm going to answer honestly")

- 7) Odd speech Volume or Rate or Tone
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- inappropriately soft / loud speech
 pressured or rapid speech
 slow or ponderous speech
 excessive latency before beginning to answer a question
 unusual tone of voice, e.g. aggressive / condescending / mischievous
(other than associated with accent or dialect) / disguised voice / voice of a character

- 8) Excessive Use of Gestures to Accentuate or Qualify Speech
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- excessive use of hands to place quotes around expressions
 excessive waving of hands or arms either to obtain attention or add emphasis

- 9) Repetitive Behavior
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- repetitive motor behavior or gestures
 ritualistic behaviors
 repetitive verbalizations or phrases
 stereotyped mannerisms

- 10) Odd Behavior
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- Unusual posture
 Silly Behavior
 staring at videocamera (if applicable)
 unusual hand or head positions
 moving lips between questions or muttering to self

- 11) Odd or Disorganized Appearance
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- excessive clothing
 leaves coat or sunglasses on for most of interview
 inappropriate dress (e.g., pajamas, clothing inside-out, very little clothing)

- 12) Negative Reaction of Interviewer to Individual
describes this individual (please circle your rating)
not at all ----- somewhat ----- very well ----- perfectly

check all that apply:

- evokes negative responses/rejection
 feeling of discomfort
 feeling that this person is odd
 feeling of helplessness/perceived intimidation
 feeling aggressive/on guard

Appendix B: Willingness to Interact Scale

Willingness to Interact Scale:

Please rate how willing you would be to have further interaction with your partner. "Partner" in the questions below refer to the person you just introduced yourself to.

1. How willing would you be to go to a movie with this individual?

1	2	3	4	5
definitely willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

2. How willing would you be to ask this individual for advice?

1	2	3	4	5
definitely willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

3. How willing would you be to go on a 3 hour bus trip with this individual?

1	2	3	4	5
definitely Willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

4. How willing would you be to invite this individual to your home?

1	2	3	4	5
definitely Willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

5. How willing would you be to invite this individual to a social event?

1	2	3	4	5
definitely Willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

6. How willing would you be to admit this individual into your circle of friends?

1	2	3	4	5
definitely Willing	somewhat willing	neutral	somewhat unwilling	definitely unwilling

7. How much do you like this individual?

1	2	3	4	5
definitely dislike	somewhat dislike	neutral	somewhat like	definitely like

8. How attractive is this individual?

1	2	3	4	5
definitely not attracted	somewhat not attracted	neutral	somewhat attracted	definitely attracted

9. How friendly do you think this person is?

1	2	3	4	5
definitely unfriendly	somewhat unfriendly	neutral	somewhat friendly	definitely friendly

10. How odd do you think this person is?

1	2	3	4	5
definitely odd	somewhat odd	neutral	somewhat not odd	definitely not odd

Appendix C: Ancillary Analyses

Hypothesis three aimed to determine if schizophrenia-spectrum behavior explained the variance in peer responses. In addition to investigating the relationship between schizophrenia-spectrum behavior and peer response variables, variables that may affect the outcome variables, such as depression, attractiveness and negative affectivity, were examined. To be conservative, lifetime depression was examined. Of note, there were group differences in lifetime depression in the baseline period, $F(1, 98) = 20.12, p < .001$, but not the follow-up period. There were also group differences in negative affectivity in the baseline period, $F(1, 98) = 4.11, p < .05$, although it was not measured in the follow-up period. While there were no significant differences in attractiveness between the two groups at baseline or follow-up, there is a significant amount of literature suggesting that judgments of others are influenced by attractiveness (Eagly et al., 1991; Feingold, 1992; Lorenzo et al., 2007).

In order to investigate the impact of these variables, correlations between these control variables and the main study outcome variables were explored (see Table 10). Of note, trait negative affectivity was only measured in the baseline period, thus, there is no data available for follow-up analyses. There were significant negative correlations between all peer response variables and lifetime depression in the baseline period indicating that individuals who met criteria for lifetime depression, versus those who did not were more likely to be rejected by peers. However, there were no significant correlations between lifetime depression and peer responses in the follow-up period. There were significant correlations between attractiveness and all peer response variables in both the baseline and follow-up period such that greater attractiveness indicated more

positive responses from peers. In the follow-up period, schizotypy was not correlated with any peer response variables except for oddness. Negative affectivity was not measured in the follow-up period.

For the schizoidia and schizotypy variables, there was a significant correlation between schizotypy and lifetime depression in the baseline period. No other control variables correlated with schizoidia and schizotypy in the baseline period. There were no significant correlations between schizoidia and schizotypy and any other control variables.

Next, partial correlations were conducted to determine the contribution of variables that could potentially affect the correlation between behavioral ratings of schizoidia and schizotypy and peer responses including depression, attractiveness, and negative affectivity (see Table 11). In terms of using control variables in the regression equations, a priori decision rules were utilized to determine whether the variables would be used as a covariate. Specifically, if the covariate changed the significant correlation into a non-significant correlation for either schizotypy or schizoidia, it would be used as a covariate.

In the baseline period, results revealed that depression did not affect correlations between schizoidia and peer responses in the baseline period. However, depression did affect correlations between schizotypy and all peer response variables. In the follow-up period, depression did not correlate with any of the peer response variables, and was thus omitted as a covariate in the follow-up period. The covariate attractiveness did not affect schizoidia in the baseline period and did not affect most variables in the follow-up period. However, attractiveness did change the correlation between schizotypy and oddness in

the baseline period. Trait negative affectivity did not affect the relationship between schizoidia and peer responses. However, it did affect the relationship between schizoidia and oddness. In summation, regression equations were run on all peer response variables in the baseline period and on the oddness variable in the in follow-up period order to control for covariates.

For the WIS total, partial correlations were run between the IM-SS subscales and WIS total, controlling for the variables that correlated with the WIS total score (see Table 11). When attractiveness was controlled for all correlations remained significant. When lifetime depression was controlled for, the IM-SS schizotypy subscale was no longer significant. Due to this, a hierarchical multiple regression was conducted to control for the effects of lifetime depression. First, lifetime depression was stepped into the model, then, the IM-SS subscales were put into the second step of the model. After the first step, the overall model was significant, $R^2 = .13$, $F(1, 41) = 5.99$, $p < .001$, and lifetime depression was a significant predictor in the model, $\beta = -.36$, $t(41) = 7.49$, $sr^2 = -.36$, $p < .05$, (see Table 12). Next, the IM-SS subscales, schizoidia and schizotypy, were added into the model in the second step, to see if the IM-SS variables predicted the variance in the model above and beyond lifetime depression. The overall model remained significant, $R^2 = .32$, $F(3, 39) = 7.49$, $p < .001$, and lifetime depression remained a significant predictor in the model, $\beta = -3.39$, $t(39) = -2.87$, $sr^2 = -.37$, $p < .01$. The schizoidia subscale was also a significant predictor in the model, $\beta = -.34$, $t(39) = -3.62$, $sr^2 = -.46$, $p < .01$, while schizotypy was not (see Table 12). There was a significant change in R^2 in the second step of the model, R^2 change = .24, $F(2, 39) = 7.31$, $p < .01$. Thus, the schizoidia subscale predicted the variance in the *willingness to interact* total

above and beyond the variance explained by lifetime depression. Overall, behaviors associated with schizoidia explained a significant amount of the variance in willingness to interact.

In order to investigate the contribution of attractiveness, depression, and other personality variables, these variables were correlated with the *like* question variable. Only lifetime depression and attractiveness were significantly correlated with the like variable (lifetime depression, $r = -.32, p < .05$; attractiveness, $r = .57, p < .001$; see Table 10). Then, partial correlations were run between the like question and the IM-SS subscales to control for these variables. When attractiveness was controlled for both IM-SS subscales remained significantly correlated with the like question (see Table 11). When depression was controlled for, the schizotypy subscale was no longer significant (see Table 11).

Thus, a hierarchical regression was performed to control for lifetime depression. Lifetime depression was entered into the first step of the model. Then, the IM-SS subscales were put into the second step of the model. After the first step of the model, the overall model was significant, $R^2 = .10, F(1, 41) = 4.55, p < .05$. Lifetime depression was a significant predictor in the model, $\beta = -.41, t(41) = -2.13, sr^2 = .32, p < .05$. After the IM-SS variables were stepped into the equation, the overall model remained significant, $R^2 = .31, F(3, 39) = 5.95, p < .01$. Lifetime depression remained a significant predictor in the model, $\beta = -.41, t(41) = -2.13, sr^2 = .32, p < .05$. The schizoidia subscale was also a significant predictor in the model, $\beta = -.41, t(41) = -2.13, sr^2 = .32, p < .05$ (see Table 13). However, schizotypy was not a significant predictor in the model. Additionally, the $R^2\Delta$ was significant for second step of the model, $R^2\Delta = .21, F(2, 39) =$

6.08, $p < .01$. Thus, while depression and schizoidia were both significant predictors in the model, adding the schizoidia subscale to the model predicted a significant amount of variance above and beyond depression. However, schizotypy was not a significant predictor in the model.

In order to investigate the effects of attractiveness, depression and other personality variables, correlations were run between these variables and the friendliness question. There were only significant correlations between the friendliness question and the attractiveness and lifetime depression (attractiveness: $r = .41$, $p < .01$; lifetime depression: $r = -.31$, $p < .05$; see Table 10). Then, partial correlations were run between friendliness question scores and IM-SS items while controlling for these variables.

When lifetime depression was controlled for the relationship between schizotypy and the friendliness question no longer remained significant (see Table 11). When attractiveness was controlled for both correlations remained significant (see Table 11). Because of this, a hierarchical regression was run to control for the effects of lifetime depression in the model. First, lifetime depression was stepped into the model. Then, the IM-SS subscales were put into the second step of the model (see Table 14). After the first step, the overall model was significant, $R^2 = .09$, $F(1, 41) = 4.21$, $p < .05$. Lifetime depression was a significant predictor in the model, $\beta = -.31$, $t(41) = -2.05$, $sr^2 = .31$, $p < .05$. After the IM-SS items were stepped into the model, the overall model remained significant, $R^2 = .46$, $F(3, 39) = 10.86$, $p < .001$. Lifetime depression remained a significant predictor in the model, $\beta = -.35$, $t(41) = -2.75$, $sr^2 = -.33$, $p < .01$. Additionally schizoidia was a significant predictor in the model, $\beta = -.61$, $t(39) = -4.80$, $sr^2 = -.57$, $p < .001$. However, schizotypy was not a significant predictor in the model (see Table 14).

Between the first and second step of the model, there was a significant difference in $R^2\Delta = .37$, $F(2, 39) = 12.96$, $p < .001$. Therefore, schizoidia explained the variance in the model above and beyond lifetime depression. Thus, the variance in friendliness ratings can be explained through behaviors related to schizoidia.

Next, partial correlations were conducted between the baseline oddness question and the IM-SS items while controlling for attractiveness, negative affectivity and lifetime depression. When lifetime depression, attractiveness and negative affectivity were controlled for schizotypy did not remain significant (see Table 11).

Therefore, a hierarchical regression was conducted to control for the effects of lifetime depression, attractiveness and negative affectivity. First, lifetime depression attractiveness and negative affectivity were put into the first step of the model. Then, the IM-SS subscales were stepped into the second step of the model. After the first step, the model was significant, $R^2 = .44$, $F(3, 39) = 10.08$, $p < .001$, and attractiveness was a significant predictor in the model, $\beta = .51$, $t(41) = 3.73$, $sr^2 = .45$, $p < .01$ (see Table 15). After the second step, the model remained significant, $R^2 = .55$, $F(5, 37) = 9.04$, $p < .001$. Attractiveness remained a significant predictor in the model, $\beta = .43$, $t(37) = 3.31$, $sr^2 = .37$, $p < .01$. In the second step of the model, depression became a significant predictor, $\beta = -.53$, $t(37) = -2.18$, $sr^2 = -.24$, $p < .001$. Schizoidia was also a significant predictor in the model, $\beta = -.05$, $t(37) = -2.88$, $sr^2 = -.32$, $p < .01$. The R^2 change between the first and second step was significant, $R^2\Delta = .11$, $F(2, 37) = 4.65$, $p < .05$. Thus, schizoidia explained a significant amount of the variance above and beyond depression, attractiveness and negative affectivity, while schizotypy was not a significant predictor in the model.

In the follow-up period, schizotypy did not correlate with the WIS total score, like or friendliness. Thus, regressions were not run because these analyses would not provide information above and beyond partial correlations. Although the oddness variable did correlate with both schizoidia and schizotypy, depression did not correlate with oddness and negative affectivity was not measured in the follow-up period. Although attractiveness was explored as a covariate, it did not change the correlation between oddness and schizoidia or schizotypy. Thus, regressions controlling for covariates were not conducted for the follow-up analyses.

In summary, in the baseline period, for all peer response variables, *WIS total, like, friendliness, oddness* schizoidia predicted variance above and beyond the added covariates, while schizotypy was not a significant predictor in the models. However, analyses in the follow-up were not conducted because either schizotypy did not correlate with peer response variables or because covariates did not change the correlation between oddness and schizophrenia-spectrum behavior variables.

Table 10

Correlations Between Likability Scores and Control Variables in the Social Anhedonia Sample (Social Anhedonics, n = 43)

	Lifetime Depression	Attractiveness	Trait Negative Affectivity
Baseline Peer Responses			
WIS Total	-.36**	.66***	-.24
Like	-.32*	.60***	-.22
Friendliness	-.31*	.41**	.00
Oddness	-.46**	.58***	-.33*
Baseline Schizophrenia-Spectrum Behavior			
Schizoidia	-.06	-.17	-.14
Schizotypy	.33*	-.09	.19
Follow-up Peer Responses			
WIS Total	.18	.57***	-. ^a
Like	.09	.45**	-
Friendliness	.10	.32*	-
Oddness	.25	.53***	-
Follow-up Schizophrenia-Spectrum Behavior			
Schizoidia	-.16	-.28	-
Schizotypy	-.04	-.10	-

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, ^a Trait Negative Affectivity was not measured in the follow-up period

Table 11

Bivariate and Partial Correlations Between WIS Variables and IM-SS Subscales in the Social Anhedonia Sample (n = 43)

	Schizoidia <i>r</i>	Schizoidia Lifetime Depression <i>pr</i>	Schizoidia Attractiveness <i>pr</i>	Schizoidia Negative Affectivity <i>pr</i>	Schizotypy <i>r</i>	Schizotypy Lifetime Depression <i>pr</i>	Schizotypy Attractiveness <i>pr</i>	Schizotypy Negative Affectivity <i>pr</i>
Baseline								
WIS Total	-.47**	-.52**	-.48**	-.52***	-.27*	-.17	-.27*	-. ^a
Like	-.44**	-.48**	-.43**	-.49***	-.33*	-.25	-.34*	-
Friendliness	-.58***	-.63***	-.57***	-.59***	-.29*	-.21	-.28*	-
Oddness	-.37**	-.45**	-.34**	-.45***	-.26*	-.13	-.25	-.21
Follow-up								
WIS Total	-.40**	- ^b	-.30*	- ^c	-.19	- ^b	- ^d	- ^c
Like	-.48**	-	-.41**	-	-.12	-	-	-
Friendliness	-.55***	-	-.51***	-	-.03	-	-	-
Oddness	-.47**	-	-.38**	-	-.41**	-	-.43**	-

* = $p < .05$, ** = $p < .01$, *** = $p < .001$, ^a there was no correlation between negative affectivity and the WIS total, like or friendliness variables, so it was not controlled for in partial correlations, ^b lifetime depression was not correlated with any peer response variables in the follow-up, ^c negative affectivity was not measured in the follow-up period, ^d schizotypy was not correlated with the WIS total, like or friendliness questions

Table 12

Hierarchical Regression Predicting WIS Scores from IM-SS Items Controlling for Lifetime Depression in the Baseline Social Anhedonia Sample (n = 43)

Variable	WIS Total			
	<i>b</i>	<i>R</i> ²	<i>F</i>	<i>p</i>
Step 1*		.13	5.99	.02
Lifetime Depression*	-3.06			.02
Step 2***		.36	7.31	.00
Schizoidia**	-.34			.00
Schizotypy	.03			.84

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 13

Hierarchical Regression Predicting Like Scores from IM-SS Items Controlling for Lifetime Depression in the Baseline Social Anhedonia Sample (n = 43)

Variable	Like			
	<i>b</i>	<i>R</i> ²	<i>F</i>	<i>p</i>
Step 1*		.10	4.55	.03
Lifetime Depression*	-.41			.04
Step 2**		.31	5.95	.04
Schizoidia**	-.04			.00
Schizotypy	-.01			.59

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 14

Hierarchical Regression Predicting Friendliness Scores from IM-SS Items Controlling for Lifetime Depression in the Baseline Social Anhedonia Sample (n = 43)

Variable	Friendliness			
	<i>b</i>	<i>R</i> ²	<i>F</i>	<i>p</i>
Step 1*		.09	4.21	.04
Lifetime Depression*	-.54			.04
Step 2***		.46	10.86	.00
Schizoidia***	-.09			.00
Schizotypy	.00			.81

Table 15

Hierarchical Regression Predicting Oddness Scores from IM-SS Items Controlling for Attractiveness, Lifetime Depression and Trait Negative Affectivity in the Baseline Social Anhedonia Sample (n = 43)

Variable	Oddness			
	<i>b</i>	<i>R</i> ²	<i>F</i>	<i>p</i>
Step 1***		.44	10.08	.00
Lifetime Depression	-.48			.06
Attractiveness**	.51			.00
Trait Negative Affectivity	-.02			.36
Step 2***		.55	9.04	.00
Schizoidia**	-.05			.00
Schizotypy	.00			.82

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

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