

2009

# Affective reactivity of speech disturbances in schizotypy

Kyle Stuart Minor

Louisiana State University and Agricultural and Mechanical College, kminor4@tigers.lsu.edu

Follow this and additional works at: [https://digitalcommons.lsu.edu/gradschool\\_theses](https://digitalcommons.lsu.edu/gradschool_theses)



Part of the [Psychology Commons](#)

---

## Recommended Citation

Minor, Kyle Stuart, "Affective reactivity of speech disturbances in schizotypy" (2009). *LSU Master's Theses*. 2206.  
[https://digitalcommons.lsu.edu/gradschool\\_theses/2206](https://digitalcommons.lsu.edu/gradschool_theses/2206)

This Thesis is brought to you for free and open access by the Graduate School at LSU Digital Commons. It has been accepted for inclusion in LSU Master's Theses by an authorized graduate school editor of LSU Digital Commons. For more information, please contact [gradetd@lsu.edu](mailto:gradetd@lsu.edu).

AFFECTIVE REACTIVITY OF SPEECH DISTURBANCES IN SCHIZOTYPY

A Thesis

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Master of Arts

in

The Department of Psychology

by

Kyle Stuart Minor

B.A., Northern Kentucky University, 2004

May, 2009

## TABLE OF CONTENTS

Abstract.....	iii
Introduction.....	1
Review of Literature.....	2
Schizophrenia.....	2
Overview of Schizotypy.....	3
Assessment of Schizotypy.....	4
Heterogeneity of Schizotypy.....	10
Speech Disturbances.....	11
Measures For Assessing Speech Disturbances.....	13
Emotion/Arousal and Speech Disturbances.....	15
Purpose.....	17
Implications of the Proposed Project.....	18
Method.....	19
Participant Selection.....	19
Measures.....	20
Procedure.....	23
Analyses.....	24
Results.....	27
Group Comparisons.....	27
Discussion.....	33
Conclusion.....	40
References.....	41
Appendix A: Abbreviations Used.....	52
Appendix B: The Schizotypal Personality Questionnaire.....	53
Appendix C: Communication Disturbances Index Modified Manual.....	55
Appendix D: Sample Photographs from the International Affective Picture Systems.....	65
Appendix E: Lehman’s Quality of Life-Brief Interview.....	67
Vita.....	68

## **Abstract**

Speech disturbances (SD) are a stable, pernicious symptom of schizophrenia that increase when negative emotion and/or arousal are elicited. While considerable research has examined SD in patients with schizophrenia, much less is known about individuals at risk for the disorder, who demonstrate schizophrenia-like, or schizotypic, traits. The present study examined SD and speech reactivity to stress, termed affective reactivity (AR), produced during a laboratory procedure in separate groups of controls and individuals with psychometrically identified schizotypy. This project had two primary aims: 1) to examine SD severity across schizotypy symptoms and 2) to examine how SD varies as a function of emotion/stress. We hypothesized that heightened schizotypic traits would be associated with more instances of SD and increased reactivity to emotionally evocative stimuli. In total, 105 participants (schizotypy= 83, control= 22) were examined here. We observed several interesting findings regarding SD and AR when comparing the schizotypy and control groups. On average, participants in the schizotypy group produced a trend level increase in SD across the pleasant and stressful conditions. When examining specific schizotypal symptoms in the stressful condition, disorganized symptoms were positively correlated with SD and negative schizotypy was inversely correlated with SD and AR. These findings indicate that negative and disorganized schizotypy symptoms may be correlated with SD; however, these correlations were only apparent when stress was induced. This study highlights the role of stress reactivity across the schizophrenia-spectrum. Moreover, the incongruous relationships between disorganized and negative symptoms and SD underscore the marked heterogeneity in disease process across schizotypy.

## **Introduction**

Schizophrenia is a debilitating disorder characterized by a wide range of symptoms such as delusions, disorganized speech, and cognitive deficits (Freedman, 2003; McGlashan, 1999; Sawa & Snyder, 2002). Speech disturbances (SD) are a particularly pernicious symptom of the disorder (Andreasen, 1979a; Docherty, 2005), in part because this symptom is highly reactive to the phenomenological state of the individual. That is, SD further increases when negative emotion and/or arousal are elicited (Burbridge & Barch, 2002; Docherty, Evans, Sledge, Seibyl, & Krystal, 1994; Docherty & Hebert, 1997). While there has been considerable empirical attention to understanding these symptoms in individuals with the full-blown illness, much less is known about them in individuals who show signs of the disorder but fail to manifest the full phenotypic expression. In particular, a paucity of research exists investigating SD in these “schizotypic” individuals. This project will redress this issue by employing highly sensitive laboratory procedures to examine speech disturbances in individuals with schizotypic traits.

In order to provide appropriate context for the present study, a review of several literatures is required. First, some background information will be provided on schizophrenia. Second, a detailed overview of schizotypy research will be presented. Third, a literature review concerning speech disturbances in patients with schizophrenia and those at risk for the disorder will be conducted. Finally, our study investigating the association between emotion/arousal and SD in schizotypy will be presented.

## **Review of Literature**

### Schizophrenia

Schizophrenia is a complex disease that affects over two million Americans annually and approximately 1% of the world's population (Green, 2001). In young adults living in developed nations, schizophrenia is more disabling than heart disease, drug use, and HIV/AIDS (Murray & Lopez, 1996). While onset can occur throughout the lifespan, the peak age of onset is between ages 18-25 in males and 25-35 in females. (Green, 2001). The exact mechanisms that trigger schizophrenia are unknown and case-specific; however, there is compelling evidence to suggest that interactions between environmental stressors and a genetic predisposition to the disorder have a significant role in the development of schizophrenia (Meehl, 1962; Myin-Germeys, van Os, Schwartz, Stone, & Delespaul, 2001; Norman & Malla, 1993; Zubin & Spring, 1977).

A significant hurdle in understanding the disorder is its heterogeneity. There is no metabolic, genetic, neuroanatomical, neuropsychological deficit or symptom that is present in all, or even most cases of the disorder (Cohen & Docherty, 2005; Menezes, Arenovich, & Zipursky, 2006). One way of reducing heterogeneity is to classify patients according to shared symptomology. Considerable debate has been generated regarding the parceling of symptom categories; currently, the most agreed upon model separates symptoms into three clusters (Andreasen, Arndt, Alliger, Miller, & Flaum, 1995; Bergman, Silverman, Harvey, Smith, & Siever, 2000; Johnstone & Firth, 1996; Malla, Ross, Norman, Cortese, & Diaz, 1993; Phillips et al., 1991; Sarai & Matsunaga, 1993; Thompson & Metzler, 1993). The acceptance of a three factor model of schizophrenia can be traced to a factor analysis by Liddle (1987a), in which three weakly correlated factors emerged: (1) reality distortion (positive), (2) psychomotor poverty (negative), and (3) disorganized subtypes.

## Overview of Schizotypy

Although there is a clear genetic component to schizophrenia, the vast majority of individuals with the schizotypic genotype will never show the manifest illness. These individuals will typically experience a number of subclinical “schizophrenia-like” maladies. Schizotypy, previously referred to as “latent schizophrenia”, was characterized by Bleuler as the most commonly occurring form of schizophrenia. He stated that individuals with ‘latent schizophrenia’ experienced catatonic and paranoid symptoms below the surface, which only became apparent later in life (Bleuler, 1911). The term ‘schizotypal’ was coined in 1953 by Rado to describe a person’s underlying risk for the disorder prior to onset (Rado, 1953). Schizotypal traits are multidimensional and resemble diminished forms of psychotic symptoms (L. J. Chapman, J. P. Chapman, Raulin, & Edell, 1978; Horan, Blanchard, Gangstead, & Kwapil, 2004; Raine, 1991). Understanding the underlying factors of schizotypy may provide a more complete picture of schizophrenia.

It has been estimated that 10% of the population experience some schizotypal traits, while 10% of these individuals eventually develop schizophrenia (Gottesman, 1991). Taxometric studies have supported the view that a distinct group of individuals, on the order of 10%, tend to have schizotypic traits (Horan et al., 2004). What differentiates these at-risk individuals who progress to schizophrenia from those who do not is a question that has spanned several decades. According to Meehl (1962), an individual who inherits a deficiency in brain functioning and encounters particular life stressors that furthers predisposition will develop schizophrenia. Zubin & Spring (1977) expanded on Meehl’s work to describe the diathesis-stress model of schizophrenia, which further clarified the relationship between underlying vulnerability and stress in the onset of schizophrenia. While this model is not universally accepted by researchers, most are in agreement that some combination of environmental and genetic factors is responsible for the transition from schizotypy to schizophrenia. Specifically, research has suggested that increases in stress and negative emotion

are critical factors in the progression toward full-blown disorder (Myin-Germeys et al., 2001; Norman & Malla, 1993; Ventura, Nuechterlein, Lukoff, & Hardesty, 1989). In this section, we have given a brief overview of schizotypy. Next, we will address four different methods of assessing schizotypic traits: Familial Identification, Ultra High Risk, Schizotypal Personality Disorder, and Psychometric Identification.

### Assessment of Schizotypy

#### A. Familial Identification Methods

Investigating family members of patients with schizophrenia is perhaps the most common method for identifying “at-risk” individuals. Support has come from a large body of literature in which relatives of patients with schizophrenia have demonstrated an increased incidence of schizophrenia, as well as subclinical symptoms of the disease, when compared to healthy controls (Baron et al., 1985; Erlenmeyer-Kimling & Cornblatt, 1987; Fish, 1987; Mednick, Parnas, & Schulsinger, 1987; Thaker, Adami, Moran, Lahti, & Cassady, 1993). In 1911, Bleuler was the first to propose a higher likelihood of schizotypy among family members (Bleuler, 1911). This supposition was bolstered by several early schizophrenia researchers (Deutsch, 1942; Kallman, 1938; Kretschmer, 1925). More recently, the Danish-American adoption studies (Kety, Rosenthal, Wender, & Schulsinger, 1968; Kety, Rosenthal, Wender, Schulsinger, & Jacobsen, 1975; Kety et al., 1994) and the Norwegian twin study (Torgersen, 1984) provided further evidence in support of a genetic component in schizophrenia and schizotypy. In the Danish-American adoption studies, the families of adopted patients with schizophrenia displayed a higher incidence of both schizophrenia and schizotypy (5.0, 10.8%) in comparison to the families of adopted controls (0.4, 1.7%) (Kety et al. 1968; Kety et al., 1975; Kety et al., 1994). In the Norwegian twin studies, researchers observed some evidence of schizotypy (e.g., high rates of paranoid ideas of reference and social anxiety) in nonschizophrenic twins; in addition, relatives of twins with schizophrenia had a higher incidence of



schizotypal personality disorder and higher levels of odd speech, inappropriate affect, odd behavior, and social anxiety when compared to base rates (Torgersen, 1984).

Genetic studies were one of the first ways of examining schizotypy and continue to offer a satisfactory method for identifying individuals at risk of developing schizophrenia. These studies have provided evidence of an increased risk of both schizophrenia and schizotypy in relatives of patients with schizophrenia and relatives also exhibit increased SD when compared to control participants (Ingraham, 1995). An important limitation of these types of studies, however, is that only family members of patients with schizophrenia are identified, leaving a significant proportion of those at risk unaccounted for. Using subsequent methods of assessment, L. J. Chapman, J. P. Chapman, & Kwapil (1994) noted that 40-45% of individuals who displayed subclinical symptomology did not have a family history of psychosis.

#### B. Ultra High Risk

A more recent method of assessing schizotypy was developed to examine patients in the prodromal phase of schizophrenia. These patients, termed 'ultra high risk', are already experiencing psychotic symptoms and are having moderate to severe difficulties in social functioning yet do not meet criteria for schizophrenia (Simon et al., 2006). Several studies have three primary methods of determining ultra high risk status: 1) Attenuated psychotic symptoms- patients with symptoms that are comparable to frank psychotic symptoms, but of lesser intensity, 2) Brief, intermittent psychotic symptoms- patients that experience symptoms that meet criteria of psychotic intensity, however, they have not persisted for six months, 3) Trait and state factors- patients who have some combination of risk factors that increases the likelihood of schizophrenia diagnosis (i.e., lowered mood in combination with Schizotypal Personality Disorder) (Yung et al., 2003).

While researchers using ultra high risk approaches have found that participants in the prodromal phase are more likely to develop schizophrenia, there are significant limitations to this

method. (McGorry et al., 2002; Morrison et al., 2004). One limitation is that it is an inefficient method for determining subclinical levels of schizotypy since ultra high risk studies only include patients who are experiencing moderate to severe difficulties in functioning. A second limitation is that a significant portion of individuals with schizotypic traits are not identified with this method, as most at risk individuals do not present symptoms severe enough to require treatment in a clinical setting.

### C. Schizotypal Personality Disorder

Another method of identifying schizotypy is using a diagnosis of Schizotypal Personality Disorder (SPD) as criteria. SPD is a personality disorder characterized by patterns of deficits in social and interpersonal functioning. According to the *The Diagnostic and Statistical Manual of Mental Disorders-IV-TR* (DSM-IV-TR) (American Psychological Association, APA, 2000), criteria for SPD include cognitive or perceptual distortions such as ideas of reference, paranoid ideation, and odd thinking and speech. SPD is considered to be a schizophrenia-spectrum disorder; however, some researchers have found that SPD diagnosis has poor discriminant validity. In addition to being linked to schizophrenia, SPD diagnosis has high comorbidity with borderline personality disorder, depression, atypical psychosis, and bipolar disorder (McGlashan et al., 2000; Silverman et al., 1993; Yeung, Lyons, Waternaux, Faraone, & Tsuang, 1993). In the study by Yeung et al. (1993), fewer relatives of patients with schizophrenia (6.0%) met criteria for SPD than relatives of patients with bipolar (9.1%), depressed (8.3%), or atypical psychosis (12.5%).

The tenuous link between SPD and schizophrenia is one reason why some schizophrenia researchers are resistant to using SPD as criteria in studies examining subclinical symptomology of the disorder. Another limitation is the length of time compared to other methods; participants must be individually evaluated to receive a diagnosis of SPD. Researchers are less likely to embrace a method that requires individual diagnostic interviews to assess SPD when other methods exist that

effectively screen large groups of participants, especially when it has not been shown to be more effective.

#### D. Psychometric Identification Methods

Several brief, standardized measures, such as questionnaires and personality profiles, have been created to assess schizotypy. This method is ideal for screening large populations since questionnaires can be administered to many participants simultaneously. Most of these methods allow a wider range of those at risk to be identified and are less time consuming than diagnostic interviews (L. J. Chapman et al., 1994). These techniques are commonly used to screen for schizotypy symptoms in undergraduate and community samples (L. J. Chapman et al., 1994; Raine, 1991), are good indicators of future development of psychosis, and identify participants that would not be recruited in genetic high risk studies (Gooding, Tallent, & Matts, 2005).

The Eysenck Psychoticism Scale (1975) was one of the first validated measures to be developed and was used to measure psychoticism, based on findings that sociopathy and illegal activity are more likely to occur in the families of patients with schizophrenia (Heston, 1966; Kallmann, 1938; Planansky, 1972). On this scale, schizotypy was described as an extreme aspect of normal personality and placed on a continuum with criminality, psychopathy, sociopathy, manic-depressive disorder, and schizophrenia (J. P. Chapman, L. J. Chapman, & Kwapil, 1994). Many researchers have criticized the scale by pointing out that it lacks external validity and does not accurately measure the attribute for which it is named (Bishop, 1977; Block, 1974; Zuckerman, 1991).

In contrast with the Eysenck Psychoticism Scale, the Chapman scales conceptualize schizotypy as a discrete category and sought to identify deviant scorers on five scales: Impulsive Nonconformity, Magical Ideation, Perceptual Aberration, Physical Anhedonia, and Social Anhedonia (L. J. Chapman et al., 1994). These scales have shown promise in identifying schizotypy

in college undergraduates. L. J. Chapman et al. (1994) conducted one of the first and best known examples of a psychometric risk study. First, the Chapman scales were administered to 7,800 undergraduates and 534 individuals were identified as being at risk for schizophrenia. Deviant scorers- 1.96 above or 0.50 Standard Deviations below the mean- on the Magical Ideation (unusual thinking and/or ideas) and high scorers on the Social Anhedonia scale were more likely to be diagnosed with schizophrenia, Psychosis NOS, and/or Bipolar disorder at 10-year follow-up. Individuals who scored high on both the Magical Ideation and Social Anhedonia subscales were at a further increased risk (Kwapil, Miller, Zinser, J. P. Chapman, & L. J. Chapman, 1997). In a follow up using the same sample, Kwapil (1998) found that high scores on a revised Social Anhedonia scale were associated with a diagnosis of schizophrenia 10 years later.

In a more recent replication of the Chapman and Kwapil studies, Gooding et al. (2005) have examined a new sample of psychometrically identified participants with schizotypic traits. Participants were divided into three groups and assessed longitudinally. The three groups consisted of: deviant scorers on the 1) Social Anhedonia and 2) Magical Ideation scales and 3) controls. The three groups did not differ in terms of family history of schizophrenia-spectrum disorders. At the five-year follow up assessments, college students in the Social Anhedonia group had significantly more schizophrenia-spectrum disorders five years later (15.6%) than those in the Magical Ideation (5.1%) or control (0%) groups. While Magical Ideation was not a predictor of schizophrenia spectrum disorder at 5 year follow up, it should be noted that the average age of participants is 23 and they have not yet passed through the peak age of onset. Based on the results of L. J. Chapman et al. (1994), it should be expected that additional participants will develop schizophrenia-spectrum disorders at 10 year follow up.

Although the Chapman scales have displayed high coefficient alphas and test-retest reliabilities (L. J. Chapman & J. P. Chapman, 1985; Mishlove & L. J. Chapman, 1985), there are

some notable limitations. One, the Chapman scales identify pathology that is common to many types of disorders, such as depression, schizophrenia, bipolar disorder, and psychosis NOS. Another disadvantage is that some scales are not associated with a future diagnosis of schizophrenia. Finally, completing the Chapman scales is time-consuming compared to other screening measures, limiting the efficiency with which a large scale study can be conducted.

One of the most frequently used measures in schizotypy research is the Schizotypal Personality Questionnaire (SPQ) (Raine, 1991), a 74 question self report scale that combines previous efforts and examines schizotypy by utilizing nine separate subscales based on DSM-III-R criteria (American Psychological Association, 1987). The SPQ has demonstrated high internal reliability (0.91) and high sampling validity across all nine subscales (ranging from 0.71 to 0.78). Test-retest reliability has also been established by Raine et al. (1991) (0.82) and both convergent and discriminant validity have been demonstrated. An aim in creating the SPQ was to have brief subscales that measure schizotypal personality disorder on nine distinct domains. (Raine, 1991). The SPQ was designed to adhere to the three factor model of schizotypy (to be detailed below); a goal supported in a recent factor analysis by Kerns (2006), who observed that measures of the SPQ loaded highly on their designated symptom factors.

In summary, using validated measures to assess schizotypy offers an efficient, reliable method for screening large populations and evidence has demonstrated that identification of schizotypy with these methods is associated with a future diagnosis of schizophrenia at 5-year and 10-year follow up (L. J. Chapman et al., 1994; Gooding et al., 2005; Mason et al., 2004; Tyrka et al., 1995). In comparison to genetic studies, another advantage of these techniques is best exemplified by two previously mentioned studies. In the L. J. Chapman study (1994), 40-45% of individuals who scored high on measures of schizotypy did not have psychotic family members. In the Gooding et al. study (2005), undergraduates did not differ regarding family history of

schizophrenia, however, high scorers on the Social Anhedonia scale were significantly more likely to be diagnosed with schizophrenia five years later. This demonstrates the value of psychometric high risk studies; namely, that some participants identified as at risk for schizophrenia would not be recruited using other methodologies (Gooding et al., 2005).

### Heterogeneity of Schizotypy

Following the introduction of the two-factor model in schizophrenia (Crow, 1980), many researchers adopted an analogous model for at risk individuals (Siever & Gunderson, 1983; Widigier, Frances, Warner, & Bluhm, 1986) that emphasized factors similar to positive and negative symptoms (Allen, L. J. Chapman, J. P. Chapman, Vuchatich, & Frost, 1987; Andreasen & Olson, 1982; Raine & Albutt, 1989). A significant limitation of this model is that it does not emphasize some schizotypal symptoms outlined in the DSM-IV-R (Kendler & Hewitt, 1992). The gradual shift toward the three factor model in schizophrenia that followed Liddle's factor analysis (1987) also signaled movement toward a three factor model in schizotypy (Chen, Hsiao, & Lin, 1997; Fossati, Raine, Carretta, Leonardi, & Maffei, 2003; Raine et al., 1994) and this model has been accepted by most researchers (Battaglia, Cavallini, Macciardi, & Bellodi, 1997; Bentall, Claridge, & Slade, 1989; Bergman et al., 1996; Gruzelier, 1996; Kendler & Hewitt, 1992; Raine et al., 1994; Venables & Bailes, 1994). The three factors in this model are: 1) cognitive perceptual (positive schizotypy), 2) interpersonal deficits (negative schizotypy), and 3) disorganized symptoms (Arndt, Alliger, & Andreasen, 1991; Bilder, Mukherjee, Rieder, & Pandurangi, 1985; Liddle & Barnes, 1990; Reynolds, Raine, Mellinger, Venables, & Mednick, 2000).

A recent factor analysis by Kerns (2006) compared the two and three factor models of schizotypy. The three factor model exhibited a good fit, while the two factor model did not. When directly compared, the three factor model was a significantly better fit than the two factor model.

While the three factor model is accepted by most researchers conducting at risk studies, this factor analysis provided further evidence for its use.

### Speech Disturbances

The previous sections have addressed methods for assessing schizotypy, as well as the number of factors that comprise this construct. Here, we turn our attention to speech disturbance, which is a specific symptom of schizophrenia that has also been shown to play a role in schizotypy. Increased rates of speech disturbances are a stable symptom observed in patients with schizophrenia that is reflective of thought disorder. The loss of goal-directed thought and loose associations often manifest in patients' speech, as patients frequently construct sentences in which two unrelated ideas are associated or reply in a way that has little to do with the topic (McKenna & Oh, 2005). Often, the speaker uses phrases containing ambiguous or unclear references, making it difficult for the listener to determine meaning (Docherty, DeRosa, & Andreasen, 1996). There is an extensive research history examining speech disturbances as a symptom of schizophrenia. Errors in the speech of patients with schizophrenia were first described by Bleuler, who introduced the term 'loosening of associations' to reflect a critical aspect of thought disorder that lead to an interruption in the associative threads that guide thinking (Bleuler, 1911). Bleuler considered 'loosening of associations' a fundamental symptom of schizophrenia; symptoms which he believed to be present in all patients with schizophrenia, although some remained below the surface. Bleuler provided examples of patients who experienced 'loosening of associations' in single threads, whole groups of threads, or in extreme cases, a majority of the associative threads of thinking (Bleuler, 1911). These loose associations often caused the patient to become sidetracked by concepts that had no connection to the initial main idea, leading the patients' speech to stray from their initial purpose (McKenna & Oh, 2005).

Shortly after Bleuler's description, Emil Kraepelin introduced the term 'incoherence of thought' in patients with schizophrenia. Similar to 'loosening of associations', Kraepelin described a magnified inability for comprehension in patients that differed from other forms of confusion. According to Kraepelin, 'incoherence of thought' could range from increased distractibility in mild cases to a complete loss of association in more severe patients (Kraepelin, 1913). He also introduced the term 'derailment' and differentiated between derailment of thought and derailment of language. Determining markers for derailment of language included confused syntax, substituting a similarly sounding word for another, and/or the usage of unintelligible words called neologisms (Kraepelin, 1913). Approximately 25 years after Bleuler and Kraepelin conducted their research, the first empirical study of schizophrenic speech was conducted using 25 patients with severe cases of schizophrenia and distinct categories of unclear speech began to emerge (Cameron, 1938).

Over the next decades, researchers introduced several new methods to assess schizophrenic speech (Halliday & Hasan, 1976; Harrow & Miller, 1980; Harrow & Prosen, 1979; Harrow & Quinlan, 1985; Reilly, 1975; Rochester & Martin, 1979; Wing, 1961). An emerging debate focused on which underlying factors formed the basis for speech disturbances. One camp believed that psychotic speech is a symptom of thought disorder and represents difficulty abstracting information and defining concepts (Blatt & Ritzler, 1974; Goldstein & Scheerer, 1941; Johnston & Holzman, 1979). Another viewpoint is that speech disturbances reflect linguistic deficits that lead to an impaired knowledge of speech structure (Hoffman, Stopek, & Andreasen, 1986; Rochester & Martin, 1979; Salzinger, 1973). Significant overlap appears to exist between the two viewpoints (Docherty, DeRosa, & Andreasen, 1996). The following section will introduce the major measures developed for evaluating schizophrenia speech.



## Measures For Assessing Speech Disturbances

### A. Thought, Language, and Communication (TLC) Index

Andreasen provided a major overhaul of other measures when she developed the Thought, Language, and Communication (TLC) Index. The TLC Index contained 18 explicit types of communication errors including poverty of speech, loss of goal, incoherence, and self-reference errors (Andreasen, 1979a). The TLC has been utilized in dozens of studies over the past two decades. Findings suggest that the TLC Index is useful for determining thought disorder in patients with schizophrenia and is more predictive of executive dysfunction than language functioning in patients (Stirling, Hellewell, Blakey, & Deakin, 2006).

One limitation of the TLC Index is that, although it is a good marker for communication errors in patients with schizophrenia, it is not a sensitive indicator of errors in individuals with schizotypy. Evidence suggests that the errors observed frequently in individuals with schizotypy are less explicit than those observed in patients and should be characterized by a more subtle measure of speech disturbance (Docherty, Gordinier, Hall, & Cutting, 1999; Docherty & Gottesman, 2000; Shenton, Solovay, Holzman, Coleman, & Gale, 1989; Singer & Wynne, 1965; Wahlberg et al., 1997). The TLC Index was created to detect blatant speech disturbance observed in patients, but is not designed to identify more subtle disturbances commonly seen in those at risk.

### B. Thought Disorder Index

Johnston and Holzman (1979) created the Thought Disorder Index (TDI), with the goal of measuring instances of disordered thinking by utilizing transcribed speech samples in response to the Rorschach test. Each time an instance of thought disorder is demonstrated, a subjective score is given based on severity. Severity is determined by four levels of scoring: 0.25 (minor idiosyncrasies, difficult for an untrained observer to detect), 0.50 (conveys distinct oddness, veering from conversational topic, decreased contact with reality), 0.75 (clear thought disturbances

associated with psychosis, including unstable thinking and perception), and 1.0 (completely disassociated with reality). The TDI has been used in approximately 30 studies since it was developed. In a longitudinal adoption study examining individuals at high genetic risk compared to adoptees with low genetic risk, researchers found TDI scores remained stable over time. However, group status (high risk, low risk) was not associated with psychiatric diagnosis eleven years later (Metsanen et al., 2005).

Limitations of the TDI include that it may not be sensitive to differences in education, social class, or ethnicity. For instance, a phrase that is not familiar to the rater, but commonly used as slang in a cultural subgroup, may be incorrectly identified as an instance of thought disorder (Solovay, Shenton, Gasperatti, & Coleman, 1986). A limitation the TDI shares with the TLC Index is that it is designed to identify explicit speech disturbances in patients with schizophrenia and may not be sensitive enough to detect more subtle incidences of disturbance found in individuals with schizotypy. Another limitation is that it relies on the examiner to inquire into all instances of thought disorder in order to clarify meaning behind the participants' phrase. Thus, extensive training may be necessary in order to administer the TDI (Solovay et al., 1986).

### C. Communication Disturbance Index (CDI)

The Communication Disturbance Index (CDI) was created to identify more subtle instances of speech disturbance that the TLC Index and TDI may not detect. Disturbances are separated into six distinct categories and SD is measured according to level and type of disturbance. Due to the difficulty distinguishing between thought and speech disturbances, as both are reflective of cognitive deficits (Docherty et al., 1996), the CDI does not attempt to separate the two. The basis for the CDI was outlined by Rochester and Martin (1979), who examined unclear references that were directly representative of communication failures in the speech of patients with schizophrenia (Docherty et al., 1996).

The CDI has been used frequently in schizophrenia research to measure disorganized speech (Docherty, 2005) and will be utilized in our study. One important reason we selected the CDI is that schizotypy researchers have suggested a need for a subtle measure of speech disturbance (Docherty, Gordinier, et al., 1999; Docherty & Gottesman, 2000; Shenton et al., 1989; Singer & Wynne, 1965; Wahlberg et al., 1997) and the CDI has demonstrated the ability to differentiate between the speech of nonpsychiatric controls and relatives of patients with schizophrenia (Docherty, 1993; Docherty, 1995; Docherty, Gordinier, Hall, & Cutting, 1997; Docherty, Hall, & Gordinier, 1998; Docherty, Hall, Gordinier, & Cutting, 2000; Docherty, Sledge, & Wexler, 1994). Although measures such as the TLC and TDI have shown success at identifying gross disturbances in schizophrenia speech, they are not designed to detect milder disturbances. The CDI is a more sophisticated instrument and yields frequency counts of SD rather than relying on observer ratings. To provide an indication of the CDI's sensitivity, nonpsychiatric subjects (average 0.70 SD per 100 words) have demonstrated some levels of speech disturbance when measured, in addition to patients (2.46 per 100 words) (Docherty, Cohen, Nienow, Dinzeo, & Dangelmaier, 2003).

#### Emotion/Arousal and Speech Disturbances

Stress and expressed emotion play important roles in the progression of schizotypy to schizophrenia (Myin-Germeys et al., 2001; Norman & Malla, 1993; Ventura et al., 1989) and in the exacerbation of symptom severity in affected individuals. Understanding how negative emotion affects symptoms has been a particularly complicated endeavor. This is in large part because there are few measures of schizophrenia symptoms sensitive enough to detect minor changes in severity over time. To date, studies examining the effects of stress on symptoms have been dependent on expensive designs that employ longitudinal "life-events" (e.g., Brown & Birley, 1968) or event-sampling methodologies (e.g., Myin-Germeys et al., 2001). Although extremely informative, these methods can not be applied to laboratory settings, limiting their potential for understanding the

pathophysiological mechanism that underlies symptom reactivity. As yet, there are no measures of delusions or hallucinations sensitive enough to be used in the laboratory, and measures of negative symptoms are still under development (Cohen, Alpert, Nienow, Dinzeo, & Docherty, in press). The advent of the CDI has allowed for the examination of thought disorder under laboratory conditions. A burgeoning line of research has suggested that certain speech errors, detectable only with the CDI, have been shown to increase when patients focus on stressful stimuli; this increase in SD when emotion/arousal is elicited is sometimes referred to as affective reactivity (Docherty et al., 1994; Docherty & Hebert, 1997). This increase in SD has also been observed, to lesser extent, when healthy controls speak about stressful topics compared to pleasant or neutral topics (Burbridge, Larsen, & Barch, 2005). This line of research is extremely important because it could potentially elucidate differences in how individuals with schizotypy and nonpsychiatric controls respond to stress.

Within patients with schizophrenia, Docherty and colleagues have proposed that symptom reactivity reflects an individual difference variable that is reflective of a more general physiological and phenomenological reactivity (Docherty et al., 1996; Docherty & Hebert, 1997; Docherty, Rhinewine, Nienow, & Cohen, 2001). Thus, affective reactivity may reflect a marker of disease process that identifies a subtype of schizophrenia that is pathophysiologicaly distinct from that seen in other patients. Studies supporting this theory include two studies utilizing a startle paradigm where participants reactive to the paradigm also displayed a more pronounced reactivity in speech (Docherty et al., 2001; Docherty & Grillon, 1995), while nonreactive patients did not show an increase in SD (Docherty & Grillon, 1995). The study by Docherty et al. (2001) examined how stressful reactive and nonreactive patients with schizophrenia found stressful and pleasant narratives. The authors found that reactive patients rated the stressful narrative as more stressful than the pleasant narrative condition, while nonreactive patients rated them equally stressful.

Studies (Docherty, Evans et al., 1994; Docherty & Hebert, 1997) have also found evidence that individuals with reactive speech tend to also show severe levels of positive symptoms. In contrast, patients with primarily negative symptoms have shown less severe reactive speech than other patients (Cohen & Docherty, 2004).

Although there has been increasing research using laboratory methods to understand the link between symptom exacerbation and negative affect in patients with schizophrenia, individuals at putative risk for developing the disorder have largely been ignored. This is a particularly important line of inquiry given that many of these individuals will experience social and occupational dysfunction as a result of their subclinical symptoms, and some of these individuals will probably develop the full-blown illness. At present, no studies have examined the association between SD and affective reactivity across the broad range of putative schizotypy. The current study examined speech disorder reactivity in positive, negative, and disorganized schizotypy compared to controls.

#### Purpose

This study has two primary aims: 1) to examine SD severity across various manifestations of schizotypy and 2) to examine how SD varies as a function of emotion/stress. As part of this examination, several hypotheses were evaluated. Our first hypothesis is that individuals with schizotypy have an increased rate of SD compared to controls. A correlation analysis was conducted in order to examine SD across symptoms of schizotypy. Our expectation was that elevations in positive and disorganized schizotypal symptoms would be associated with increases in SD, while negative symptoms will not be associated with SD.

The second hypothesis was that participants with schizotypal traits would display significant increases in reactivity when comparing reactivity scores with controls. Reactivity scores were computed for all individuals by using regression to analyze SD frequency in the stressful versus pleasant condition. When examining schizotypal subtypes, positive and disorganized schizotypal

symptoms were expected to be correlated with increased reactivity scores, while negative symptoms were not expected to be related to AR.

Finally, it is important to understand the degree to which speech disorder affect functioning in the real world. To investigate this issue, we examined the relationship between affective reactivity of speech and impoverishment in quality of life (QOL) in regard to social situations. In other words, we wanted to investigate whether subjects exhibiting increased rates of reactivity would have a significantly lower social QOL rating compared to participants who are less reactive. When compared with control participants, we hypothesized that those in the schizotypy group would have lower social QOL. We also expected that as all three types of schizotypy symptoms increase, social QOL would worsen.

#### Implications of the Proposed Project

This project may have several important implications. One, examining SD may provide a basis for helping to detect individuals at risk for schizophrenia. Developing measures of risk markers that improve upon current psychometric methodologies could be tremendously helpful for early identification efforts. Two, studying different subtypes of schizotypy might increase our understanding of the heterogeneity of the disorder. Due to the heterogeneity across patients with schizophrenia, the possible identification of subtypes before diagnosis could have important ramifications in assessing the future disease course of individuals displaying schizotypal traits (Kwapil et al., 1997). Third, stress and expressed emotion play an important role in the onset of schizophrenia and in symptom exacerbation (Myin-Germeys et al, 2001; Norman & Malla, 1993; Ventura et al., 1989). By studying reactivity in individuals at risk we may be able to better clarify the role stress plays in individuals without the full disorder.

## **Method**

### Participant Selection

Participants were recruited from the freshman and sophomore population at Louisiana State University. College students are a good source from which to draw participants as they are in the peak age range of first episode schizophrenia (L. J. Chapman et al., 1994). Students completed the Schizotypal Personality Questionnaire (SPQ) online in exchange for a chance to win one of 10 \$25 prizes. In total, 1,775 undergraduates completed the SPQ.

Next, individuals exhibiting schizotypal traits were identified by research assistants using the standards outlined in Raine (1991). Z-scores were computed separately for gender and ethnicity for all participants in order to identify individuals with schizotypy and controls. Participants were identified based on elevated scores on at least one of three symptom subscales: positive, negative, or disorganized (Raine et al., 1994). Control participants, who scored  $< 1$  StDev from the mean on all schizotypy scales, were randomly selected from the initial questionnaire. Then, selected participants were contacted by email to undergo an “in-person” testing session in our laboratory on campus at Louisiana State University. All subjects involved in this phase of the study were compensated \$20.

Several demographic variables were examined in order to determine whether the schizotypy and control group demonstrated any significant differences. Age and Hours worked/week were measured using a ratio scale, and gender (1= Male, 2= Female) and ethnicity (1= Caucasian, 2= African-American, 3= Other Ethnicity) were measured utilizing a nominal scale. All other group comparisons were measured using an ordinal scale. These comparisons included: Highest grade level (1= High School Graduate or Below, 2= 1+ Year of College Completed, 3= 2+ Years of College Completed), GPA (1=  $< 2.00$ , 2= 2.01 - 3.00, 3= 3.01 – 4.00), and mother and father’s level of education (1= High School Graduate or Below, 2= Some College or College Graduate, 3= Master’s or Doctoral Degree).

## Measures

### A. Schizotypal Personality Questionnaire (SPQ)

The Schizotypal Personality Questionnaire (Raine, 1991) is one of the most commonly used measures to screen schizotypal traits in large populations (N. C. Stefanis, Smyrnis, Avramopoulos, Ntzoufras, & C. Stefanis, 2004). It has been used in over one hundred peer-reviewed studies. It consists of 74 items and measures nine distinct clusters of schizotypy based on DSM-III criteria. The nine domains measured on the SPQ are: Ideas of Reference, Excessive Social Anxiety, Odd Beliefs/Magical Thinking, Unusual Perceptual Experiences, Odd or Eccentric Behavior, No Close Friends, Odd Speech, Constricted Affect, and Suspiciousness.

The SPQ has a 3-factor structure consisting of Positive, Negative, and Disorganization (Chen et al., 1997; Fossati et al., 2003; Raine et al., 1994). It has demonstrated high internal reliability (0.91) and high sampling validity across all nine subscales (ranging from 0.71 to 0.78). In addition, test-retest reliability (0.82) and both convergent and discriminant validity have been demonstrated.

Total SPQ score and scores for each of the three factors were obtained by summing the raw scores of corresponding scales. To compute positive schizotypy, the Ideas of Reference, Odd Beliefs/Magical Thinking, Unusual Perceptual Experiences, and Paranoid Ideation subscales were used. To derive negative schizotypy scores, the No Close Friends and Constricted Affect subscales were added, and Disorganized scores were obtained by summing the Odd Behavior and Odd Speech subscales (Raine, 2002).

### B. Narrative Task

Participants were fitted with a head-mounted microphone and their speech was recorded in two separate three minute intervals across two conditions. In each condition, subjects were presented with either pleasantly or stressfully valenced photographs and asked to speak for the full



time that pictures are being displayed. Instructions were provided by the research assistant as follows:

“In a moment, I will ask you to rate your mood. Then I will show you a series of pictures for 3 minutes. While you are focusing on these pictures, I want to record you as you talk. I am curious about how the picture relates to you. I want you to talk about what the picture means to you, what it reminds you of, and how it makes you feel. Each picture will be up for about 40 seconds and it is important that you talk for the full time that the pictures are being displayed. Please maintain your focus on the picture as you talk for the full time.”

### C. International Affective Picture Systems (IAPS)

Photographs presented to participants were selected from the International Affective Picture Systems (IAPS). The IAPS is a library of approximately 1000 pictures designed to elicit a wide range of reactions. Affect intensity of photographs is associated with stronger emotional reactions to both pleasant and stressful stimuli (Larsen, Diener, & Emmons, 1986) and to stress (Gilboa & Revelle, 1994). In several studies utilizing a schizophrenia cohort, reliability for invoking emotion has been demonstrated using the IAPS (Herbener, Rosen, Khine, & Sweeney 2007; Taylor, Liberzon, Decker, & Koeppel, 2002; Volz, Hamm, Kirsch, & Rey, 2003). All photographs in this study will be either positively or negatively valenced (Appendix 1). In our study, participants viewed two sets of photographs (one pleasant, one stressful) in random order. Each condition consists of 10 photographs displayed for approximately 40 seconds each at a total time of 6 minutes. Self-reported mood and arousal ratings were administered before and after each set of photos.

### D. Communication Disturbances Index (CDI)

The Communication Disturbances Index (CDI) was developed to capture subtle instances of speech disturbances and is used to differentiate between six types of SD. SD is calculated as number of errors per 100 words in order to control for differences in the amount of speech

generated by participants. The CDI includes six subscales used to generate a total CDI score. The six subscales and examples of each are (Docherty et al., 2003):

1) Vague references

*Ex.* I'm hoping they don't get caught up in **some of the ills of our life, of our society**

2) Confused references

*Ex.* He stabbed the dude and I kicked **him**. I thought **he** punched **him**. I thought **he** was on the ground just acting like he was hurt.

3) Missing information references

*Ex.* They let **George** go home, so why not me? (with no prior mention of George)

4) Ambiguous word meanings

*Ex.* Those people don't belong the Earth. God will **get** them.

5) Wrong word references

*Ex.* I used to sit in the café, have something to eat, and just **glare** out into the night (probably meant "stare").

6) Structural unclarities

*Ex.* I got a sister living in Buffalo, New York. I've been there... must have been about **twice since I was up there.**

Current evidence suggests that the CDI provides a measure of speech disturbance that is associated with exacerbations in schizophrenia symptomology (Kerns, 2007). The CDI has also shown moderate correlations with other measures of speech disturbance, such as the TLC Index (Docherty & Gordinier, 1999). This scale focuses on errors in speech, rather than underlying thought disorder or disorganization (Docherty, 2005). To be considered an error, the meaning of a phrase must be ambiguous or unclear.

In the current study, the first author and an undergraduate student rated all transcripts according to CDI criteria. Prior to rating the transcripts, raters spent several weeks scoring sample transcripts and resolving points of contention in the rating system. To establish interrater reliability, the first author rated thirty transcripts previously rated by the undergraduate student, blind to the initial ratings. Overall, total CDI ratings had high interrater reliability (.91) between the two raters.

#### E. Quality of Life- Brief Version

Quality of Life was assessed for all participants by utilizing a modified version of Lehman's Quality of Life interview (QOL {Lehman, 1995}). The brief version was utilized in order to limit overall administration time. We were primarily interested in social functioning and used objective and subjective questions that assessed social relationships. To compute the Objective Social QOL score, we combined two subscales: 1) objective family relationships, and 2) objective social relationships. In order to compute the Subjective Social QOL score, we combined: 1) subjective family relationships, and 2) subjective social relationships. In total, 8 items were administered from the QOL-I (Objective Social QOL: 6 items, Subjective Social QOL: 2 items). Selected items are listed in the appendix.

#### Procedure

A preliminary screening questionnaire (SPQ) was administered to selected undergraduate courses at Louisiana State University. Individuals exhibiting deviating scores on one of three factors were contacted to participate in the second part of the study. Control participants were randomly selected and offered the opportunity to participate. Subjects who participated in the second part of the study were given a cash reward and the possibility of additional extra credit.

In the laboratory, participants met with a trained research assistant blind to subject group. The research assistant obtained consent forms and provided subjects with a head mounted microphone to record speech. Next, participants provided baseline mood and arousal ratings and

viewed two sets of emotionally valenced photographs (pleasant, stressful) for three minutes apiece. Each set contained 5 photographs shown for approximately 40 seconds each. The order of both photographs and condition was randomized. Subjects were instructed to talk about what each photograph “means to them, what it reminds them of, and how it makes them feel” for the full three minutes while their speech was recorded. Mood and arousal ratings were obtained before and after each set of photographs. Following completion of a series of questionnaires unrelated to the current study, participants repeated this procedure with the remaining set of photos. In total, six minutes of speech was provided by each participant for both conditions. Narratives were later transcribed by trained research assistants and each narrative was analyzed individually for instances of speech disturbances. A small number of the total speech samples were lost due to either problems with the software or human errors during the recording process. Participants’ speech samples were only included in the final analysis if they had four completed transcripts (two in both the pleasant and stressful conditions). Thirteen participants were excluded due to missing data.

### Analyses

The analyses in the current study were conducted in three parts. To test the hypothesis that individuals with schizotypal traits have an increased rate of SD, an analysis of variance (ANOVA) was conducted with group (schizotypy, control) and condition (stressful, pleasant) serving as independent variables (IV), and instances of SD as the dependent variable (DV). In this analysis, we wanted to determine whether: a) groups differ in SD, b) rate of SD is affected by condition (pleasant, stressful), and c) there is an interaction between group and condition (i.e., schizotypes may display significantly higher rates of SD than controls in the stressful compared to pleasant condition). In addition, a correlation analysis was conducted in order to determine whether individual schizotypy symptoms (positive, negative, disorganized) are associated with rates of speech errors, with the expectation that increased positive and disorganized schizotypy symptoms

are positively correlated with SD. Symptoms were based on z-scores from the SPQ that were computed for each individual in the schizotypy group. To conduct this analysis, a correlation matrix was created with five variables: 1) SD in pleasant condition, 2) SD in negative condition, 3) positive schizotypy, 4) disorganized schizotypy, 5) negative schizotypy.

Reactivity scores were computed to analyze the hypothesis that those in the schizotypy group demonstrate more affective reactivity compared to controls. Scores were computed for each participant in SPSS using statistical regression, with condition (pleasant, stressful) as the IV and SD as the DV. After scores were computed, an independent-samples *t*-test was analyzed with AR as the DV and group (schizotypy, control) as the IV. A secondary hypothesis is that AR will increase as positive and disorganized symptoms of schizotypy increase. Again, symptoms are based on z-scores from the SPQ and were computed for all individuals in the schizotypy group. This hypothesis was tested using a correlation matrix with four factors: 1) affective reactivity, 2) positive schizotypy, 3) disorganized schizotypy, 4) negative schizotypy.

Finally, we wanted to test whether there are real world correlates to our laboratory findings by utilizing a Social QOL measure. To test whether there is an association between affective reactivity and Social QOL, correlational analysis was conducted between reactivity scores and Social QOL. We hypothesized that there would be a negative association between affective reactivity scores and Social QOL. To test the hypothesis that the schizotypy group will display lower Social QOL than the control group, an independent-samples *t*-test was conducted with group (schizotypy, control) as the DV and Social QOL as the IV. Correlations were utilized to analyze whether specific symptoms of schizotypy contribute to overall and specific components of Social QOL, measured by the Lehman subscales. In all, 5 factors were entered into the matrix: 1) Objective Social QOL, 2) Subjective Social QOL, 3) positive schizotypy, 4) disorganized schizotypy, 5) negative schizotypy.

In total, 118 individuals (91 schizotypy, 27 control) participated in both phases of the study. However, 13 subjects had missing data in one of four transcripts due to software complications. The final sample consisted of 22 control subjects and 83 individuals with schizotypal traits. An alpha level of .05 was used for all analyses in this study. Power analyses conducted for each of the primary hypotheses using G\*Power software 3.0.8 (G\*Power, 2007) indicated that a large effect size could be observed with at least twenty-two participants in each group (ANOVA: fixed-effects, main effects and interactions design,  $f(V) = 0.65$ ,  $\alpha = 0.05$ ,  $\beta = 0.80$ , groups = 2).

## Results

### Group Comparisons

To begin, we conducted group comparisons in order to determine if the schizotypy and control groups differed in demographic characteristics. These analyses were conducted in order to determine whether the two groups were well-matched and to account for any potential differences that might be confounding factors in later analyses. Complete demographic data is contained in Table 1. No significant differences were observed between the control and schizotypy groups on any demographic variables.

**TABLE 1.**  
Demographic data for participants in the control and schizotypy groups.

	<b>Schizotypy (N= 83)</b>	<b>Control (N= 22)</b>	<i>t</i>	<i>p</i>
<b>Age</b>	19.18 ± 1.42	19.86 ± 3.50	1.41	0.16
<b>Gender</b>			0.54 <sup>+</sup>	0.46
Male	27 (33 %)	9 (41 %)		
Female	56 (67 %)	13 (59 %)		
<b>Ethnicity</b>			8.95 <sup>+</sup>	0.06
Caucasian	74 (89 %)	17 (77 %)		
African-American	2 (2 %)	4 (18 %)		
Other Ethnicity	7 (8 %)	1 (5 %)		
<b>Highest Grade Level</b>			1.50	0.14
High School Graduate or Below	47 (57 %)	9 (41 %)		
1+ Year of College Completed	22 (27 %)	6 (27 %)		
2+ Years of College Completed	14 (17 %)	7 (32 %)		
<b>Current GPA</b>			0.37	0.71
< 2.0	9 (11 %)	0 (0 %)		
2.0 – 2.99	26 (31 %)	14 (64 %)		
3.0 - 4.0	48 (58 %)	8 (36 %)		
<b>Mother's Education</b>			1.86	0.07
High School Graduate or Below	23 (28 %)	4 (18 %)		
Some College or College Graduate	53 (64 %)	14 (64 %)		
Master's or Doctoral Degree	7 (8 %)	4 (18 %)		
<b>Father's Education</b>			1.19	0.24
High School Graduate or Below	19 (23 %)	4 (18 %)		

<b>(TABLE 1 Continued)</b>				
Some College or College Graduate	42 (51 %)	9 (41 %)		
Master's or Doctoral Degree	22 (27 %)	9 (41 %)		
<b>Hours Worked/Week</b>	10.94 ± 9.67	9.77 ± 10.74	-0.49	0.62

<sup>+</sup> Chi-square statistic

### Hypothesis I: SD higher in schizotypy group

The results of the directional ANOVA (Table 2) indicated significant main effects for group ( $F[1, 103] = 3.10, p < .05$ , baseline  $d = 0.40$ , stressful  $d = 0.32$ ) and condition ( $F[1, 103] = 10.12, p < .01$ , control  $d = 0.40$ , schizotypy  $d = 0.40$ ). Across both conditions, the schizotypy group exhibited increased SD compared to the control group. In addition, both groups produced significantly higher SD in the stressful compared to the baseline condition. The group X condition interaction was not significant ( $F[1, 103] > 0.01, p = .95$ ). These data suggest that, in line with expectations, the schizotypy group demonstrated significantly more overall SD compared to controls, but that speech disorder did not dramatically increase as a function of stress for individuals with schizotypy as a group.

### TABLE 2.

Analysis of variance comparing schizotypy and control groups on speech disturbances (SD) across conditions.

	<b>Control (n= 22)</b>	<b>Schizotypy (n= 83)</b>
<b>SD: Pleasant Condition</b>		
Mean ( <i>StDev</i> )	1.66 (0.79)	2.00 (0.93)
<b>SD: Stressful Condition</b>		
Mean ( <i>StDev</i> )	2.04 (1.12)	2.36 (0.88)
<b>Significant Main Effect for Group</b>		3.10*
<b>Significant Main Effect for Condition</b>		10.12**
<b>Interaction</b>		0.01

\*\*  $p < .01$

\*  $p < .05$



Hypothesis II: Higher AR in schizotypy compared to control group

Next, we conducted an independent samples *t*-test to test our hypothesis that the schizotypy group would have a higher rate of AR compared to the control group (Table 3). The *t*-test revealed no significant relationship between group status and reactivity. Therefore, we are unable to provide evidence for our hypothesis that individuals with schizotypal traits are more reactive to stress than the control group.

**TABLE 3.**

Independent t-test comparing schizotypy and control groups on affective reactivity (AR).

	<b>Control (<i>n</i>= 22)</b>	<b>Schizotypy (<i>n</i>= 83)</b>
<b>AR: Mean (StDev)</b>	- 0.13 (1.29)	0.01 (0.98)

A. Correlation Analysis: Positive, negative, and disorganized schizotypy symptoms and SD

To examine whether specific schizotypal symptoms were associated with SD, we created a correlation matrix (Table 4). In the pleasant condition, no significant correlations were found between SD and symptoms of schizotypy. In the stressful condition, two significant correlations were observed. Disorganized symptoms were positively correlated with SD and negative schizotypy was inversely correlated with SD. In this analysis, evidence supporting our hypothesis that disorganized symptoms would be associated with SD was provided. However, a significant relationship between positive symptoms and SD was not observed.

Correlations were also conducted to test whether AR was related to specific symptomology. A significant inverse correlation was observed between AR and negative schizotypy. Positive trends were found when AR was correlated with disorganized and positive symptoms. Our hypotheses that positive and disorganized symptoms would be associated with AR were not supported, although trend level correlations were found for both symptoms.

**TABLE 4.**

Bivariate correlations between specific symptoms of schizotypy, speech disturbances, and affective reactivity (df= 81).

	<b>Speech Disturbance: pleasant condition</b>	<b>Speech Disturbance: stressful condition</b>	<b>Affective Reactivity</b>
<b>Positive Schizotypy</b>	-0.08	0.12	0.20 <sup>+</sup>
<b>Disorganized Schizotypy</b>	0.17	0.28*	0.18 <sup>+</sup>
<b>Negative Schizotypy</b>	-0.07	-0.33**	-0.31**

\*\*  $p < .01$

\*  $p < .05$

+  $p < .10$

Hypothesis III: Social QOL decreased in schizotypy group

Next, we examined whether Objective and Subjective Social QOL were related to group status using an independent-samples t-test (Table 5). Observed differences between groups on both measures of Social QOL were significant. On both subscales, control participants rated their satisfaction in social areas higher than individuals in the schizotypy group. In this analysis, we are able to reject the null hypothesis and demonstrate that the schizotypy group rated their Social QOL significantly lower compared to the control group.

**TABLE 5.**

Independent-samples t-tests comparing schizotypy and control groups on Objective and Subjective Social Quality of Life (QOL).

	<b>Control (n= 22)</b>	<b>Schizotypy (n= 83)</b>
<b>Objective Social QOL</b>		
Mean (StDev)	- 9.59 (2.56)	- 13.33 (3.93)
<i>t</i>	4.22***	
<b>Subjective Social QOL</b>		
Mean (StDev)	12.36 (1.73)	9.11 (2.33)
<i>t</i>	6.12***	

\*\*\*  $p < .001$

## B. Correlation Analysis: Specific symptoms of schizotypy and Social QOL

Correlations were again used to analyze how Social QOL was related to the separate symptoms of schizotypy (Table 6). Our hypothesis was that all three symptoms would be negatively correlated with Social QOL. Results from the correlation matrix indicated three significant findings. First, positive symptoms were correlated with Objective Social QOL. Second, negative symptoms were inversely correlated with both Objective and Subjective Social QOL score. Disorganized traits were not significantly associated with either Social QOL score. These data suggest that lower Social QOL is correlated with an increase in negative schizotypal symptoms, and that positive symptoms are positively correlated with Objective Social QOL.

**TABLE 6.**

Bivariate correlations between specific symptoms of schizotypy and objective/ subjective social quality of life within the schizotypy group (df= 81).

	Objective Social QOL	Subjective Social QOL
Positive Schizotypy	0.24*	-0.16
Disorganized Schizotypy	0.16	0.02
Negative Schizotypy	-0.30**	-0.29**

\*\*  $p < .01$

\*  $p < .05$

+  $p < .10$

## C. Correlation between AR and QOL

Finally, in order to test our hypothesis that QOL would be negatively associated with AR, a correlation matrix was conducted (Table 7). Factors in this analysis included AR, SD: pleasant condition, SD: stressful condition, Objective Social QOL, and Subjective Social QOL. There were no significant associations between Subjective Social QOL and AR or SD. However, two significant findings were observed in regard to Objective Social QOL. Both AR and SD in the

stressful condition were related to increased Objective Social QOL scores. From these analyses, we fail to reject the null hypothesis and demonstrate that AR is inversely correlated with QOL. In fact, the two significant associations that we observed were in the opposite direction as was expected.

**TABLE 7.**

Bivariate correlations between affective reactivity, speech disturbances, and subjective/objective social quality of life (df= 81).

	<b>Objective Social QOL</b>	<b>Subjective Social QOL</b>
<b>Speech Disturbance: pleasant condition</b>	-0.07	0.04
<b>Speech Disturbance: stressful condition</b>	0.26*	0.04
<b>Affective Reactivity</b>	0.33**	0.01

\*\*  $p < .01$

\*  $p < .05$

## Discussion

The goal of this study was to elucidate the relationship between schizotypy and speech disorder, a symptom common in patients with schizophrenia (Andreasen, 1979a; Docherty, 2005). Several interesting findings emerged from this study. First, we found significant differences in the amount of SD and no discernible difference in AR when individuals with schizotypal traits and healthy controls were compared. Second, we observed that within schizotypy, two subtypes emerged whenever stress was induced. One subtype appears to be more reactive to stressful situations, whereas the second subtype seems to be less reactive. Third, we found that individuals in the schizotypy group reported lower satisfaction with social relationships compared to healthy controls when a real world element, Social QOL, was examined. In addition, AR was related to improved objective Social QOL in the schizotypy group, not declining levels of satisfaction as predicted. These findings will be discussed in depth in the following paragraphs.

Our first finding focuses on differences in SD between the schizotypy and control groups. Individuals at risk for schizophrenia demonstrated significant differences compared to controls. In patients with schizophrenia, elevations are more clear-cut, with differences between patients and controls usually reaching a large effect size (Cohen & Docherty, 2005; Docherty, DeRosa et al., 1996; Docherty, Cohen et al., 2003). In the current study, differences between groups were observed at the level of a medium effect size for both the pleasant and stressful conditions. One possible reason for differences in the amount of SD between individuals with schizotypal traits and patients is that the level of cognitive impairment between the two groups is vastly different. Some researchers have proposed that speech disorder reflects a more basic failure in neurocognitive processes (Docherty, DeRosa, & Andreasen, 1996). Patients have demonstrated severe cognitive deficits in comparison to controls (Dickinson, Ramsey, & Gold, 2007; Fioravanti, Carlone, & Vitale, 2005), whereas individuals with schizotypy show less severe (Kerns & Becker, 2008;

Sitskoorn, Aleman, & Ebisch, 2004) differences. If speech disorder does contain a strong cognitive component, the minor differences in cognitive functioning between the schizotypy and control groups may account for the modest differences in SD. Upon onset of schizophrenia, cognitive functioning worsens and more noticeable differences may become apparent between patients and controls (Lieberman, 1999). A second possibility for the difference between the amount of SD in schizotypy and schizophrenia could be that the two groups may express a different endophenotype. As the vast majority of individuals with schizotypy will never develop manifest illness, it should be expected that those who do not go on to develop the full disorder will have fewer SD compared to patients.

Whereas subtle differences were observed when comparing SD between the control and schizotypy group, associations between groups were negligible when examining AR. AR has been found to be significantly increased in patients compared to controls (Docherty et al., 1996; Docherty & Hebert, 1997; Docherty, Rhinewine, Nienow, & Cohen, 2001) and we expected to observe significant differences in the current study. One possibility why pronounced differences were not seen is the heterogeneity within the schizotypy group. When individual symptoms were examined, individuals with increased negative symptoms demonstrated less AR compared to controls, whereas those high in disorganized and positive symptoms displayed more AR than controls. Individuals with increased negative symptoms may have negated any possible effect. Future studies should examine the relationship between AR and schizotypy by comparing healthy controls with a more homogeneous schizotypy group consisting of individuals with primarily positive and disorganized schizotypal symptoms.

A second possibility why no association was observed could be that significant differences in AR only manifest at a later stage of illness. Perhaps, increases in AR are not apparent in individuals with schizotypal traits while they are functioning at a relatively high level, but may

become noticeable once an individual reaches a later stage of illness, such as at onset or during the prodromal phase. Although differences in AR concerning speech disorder may not be apparent until later stages of illness, recent evidence has suggested differences in other types of stress reactivity are significant between schizotypy and control groups when different methodologies are implemented (Myin-Germeys, 2007; Walker, Mittal, & Tessner, 2008). For example, an innovative study by Myin-Germeys (2007) reviewed the literature and proposed that stress reactivity might be an endophenotype for psychosis, after observing that several studies, using event-sampling methodologies, found that subjects vulnerable to psychosis demonstrated elevated emotional reactions to daily stressors. Researchers should examine this issue further to determine at what stage significant differences in AR emerge between individuals at risk for schizophrenia and healthy controls. Overall, comparisons between individuals in the schizotypy and control groups were promising, as we observed trend level differences in SD within the schizotypy group. Next, we shift our focus to the role of individual schizotypal symptoms.

To our knowledge, this is the first study to examine the relationship between SD and AR with schizotypal symptoms. In patients with schizophrenia, AR has shown associations with severe levels of positive symptoms (Docherty, Evans et al., 1994; Docherty & Hebert, 1997), whereas patients with primarily negative symptoms have displayed less AR compared to other patients (Cohen & Docherty, 2004). In the current study, a similar pattern appears to emerge. Schizotypy symptoms were not related to SD in the pleasant condition. However, when stress was induced, both positive and disorganized schizotypy symptoms demonstrated trend level correlations with AR. An adverse effect was observed when examining negative symptoms, as both AR and SD in the stressful condition were inversely correlated with negative schizotypy.

Results in this study appear to resemble the classic two-process theory of stress reactivity in schizophrenia, where individuals with primarily positive and disorganized symptoms have increased

reactivity to stress (Docherty, Evans et al., 1994; Docherty & Hebert, 1997; Schwartz & Myers, 1977) and individuals with primarily negative symptoms are less reactive when stress is elicited (Cohen & Docherty, 2004). According to this theory, symptom reactivity is viewed as an individual difference variable, reflecting both physiological and phenomenological reactivity (Docherty et al., 1996; Docherty & Hebert, 1997; Docherty, Rhinewine et al., 2001). In patients with schizophrenia, this theory proposes that there is a reactive subset of patients who are higher functioning, experience symptoms of variable severity, and are more highly reactive to emotional content. There is a separate process subset of patients who have more stable symptoms, are lower functioning, and are less reactive to emotional content (Docherty, 1996; Schwartz & Meyers, 1977). Although participants in this study did not display symptoms of similar severity compared to those described in this theory, it is interesting that a similar pattern seemed to emerge in regard to reactivity. Next, we want to further the discussion by delving into findings concerning a variable that reflects everyday functioning.

In order to determine how these findings pertain to real world functioning, we examined correlations between SD and AR with Subjective and Objective Social QOL. In this study, individuals in the schizotypy group reported worse Subjective and Objective Social QOL when compared to controls. This finding suggests that individuals with schizotypal traits are already reporting more difficulties establishing and maintaining relationships with friends and family members compared to their peers. It also provides support for similar findings, which show that difficulties in social and family functioning manifest well before illness onset and are apparent in individuals across the schizophrenia-spectrum (Henry, Bailey, & Rendell, 2008; Jahshan & Sergi, 2007).

When examining specific symptom dimensions of schizotypy, individuals with increased negative symptoms reported the least interaction in social and family relationships. In contrast,



positive symptoms were correlated with better Objective Social QOL, meaning that individuals with schizotypy are more active in relationships with friends and family members as positive symptoms increase. Interestingly, correlations between positive symptoms and Subjective Social QOL scores, although not significant, are in the opposite direction. This may suggest that individuals with high levels of positive symptoms rate their relationships with friends and family members as less than satisfactory, even though their objective scores demonstrate that they are active in these relationships. One possible explanation for this is that individuals high in positive symptoms endorse more suspicious traits, and this suspiciousness may play a role in their negative appraisals of relationships with friends and family.

For our final hypothesis, we examined correlations between Objective and Subjective Social QOL with SD and AR. We hypothesized that AR would be associated with declining Social QOL. Surprisingly, it was associated with improved Objective Social QOL, indicating that as AR increased, individuals were likely to be more active in establishing or maintaining relationships with friends and family members. One potential explanation ties into the process/ reactive concept discussed earlier. In this study, individuals who have primarily positive or disorganized symptoms appear to be active in their relationships with friends and family and display increases in Objective Social QOL. Individuals with primarily negative symptoms appear to be significantly less active and demonstrate lower Objective Social QOL. One reason why these opposing relationships would lead to an overall higher Objective Social QOL is that individuals with primarily positive or disorganized symptoms had high rates of AR, whereas individuals with primarily negative symptoms had significantly lower rates of AR. Therefore, positive and disorganized symptoms had the most influence on the relationship between AR and Social QOL.

A number of strengths and limitations should be mentioned regarding this study. One strength is that we identified participants using a psychometric method. The advantages of using a

validated, psychometric instrument to measure schizotypy include: screening can be conducted efficiently as several psychometric measures are relatively brief, many individuals can be screened at once, and psychometric identification methods screen individuals who would be ignored using other methodologies (Gooding et al., 2005). In addition, we also identified disorganized schizotypy, which is often omitted from studies that do not utilize the SPQ. A second strength of this study is that speech disturbance is measured using a subtle measure that identifies some speech errors in healthy individuals (Docherty, 1996). As SD is not overt in individuals with schizotypy, it is important to utilize an instrument sensitive enough to distinguish between schizotypy and control groups.

The use of an undergraduate sample is one possible limitation of this study. Although the use of undergraduates is common in large-scale schizotypy studies (L. J. Chapman et al., 1995; Gooding et al., 2005; Kerns, 2007; Kwapil et al, 1997) such as this one, there are some problems with this strategy. Foremost among them is that individuals with schizotypal traits who are able to successfully maintain enrollment in a university setting are most likely at the high end of functioning in schizotypy. Thus, they might not be representative of lower functioning individuals with schizotypy.

Another limitation of the current study is a result of employing emotionally valenced photographs in order to investigate SD. Although this method is novel and appears to offer great promise, the downside of this strategy is that there is not rigorous evidence supporting it in a schizotypy sample. In addition, the original CDI protocol is written to code SD in free speech conditions where participants are instructed to discuss emotionally valenced topics. There were some areas of contemplation when applying CDI ratings to speech samples produced in response to photographs. These areas were addressed by writing a slightly amended protocol in order to account for differences introduced by the presented stimuli.

Several suggestions should be mentioned when discussing future research examining SD and AR in individuals with schizotypy. First, researchers should utilize both laboratory methods of inducing stress, such as the one used in the current study, as well as ‘real-world’ methods, like the experience-sampling techniques implemented by Myin-Germeys (2001; 2008), in order to determine whether stress reactivity in the laboratory translates to reactivity outside of the lab. Second, physiological responses should be further examined in individuals at risk for schizophrenia in order to determine the correlation between stress response and AR. For example, researchers should seek to determine what role cortisol plays in individuals with schizotypy. Third, larger sample sizes should be included in order to increase power and reduce the likelihood of Type II errors. Fourth, research should focus on underlying cognitive factors that are associated with increases in SD and AR in patients with schizophrenia and those at risk for the disorder. If SD/AR increases could be linked to neurocognitive underpinnings, researchers would be one step closer to identifying potential risk factors for schizophrenia. As mentioned previously, it is also important to consider similarities between cognitive factors involved in speech disorder in patients compared to those at risk. Finally, speech disorder should be measured using a variety of validated instruments in order to compare the convergent validity between measures and determine unique contributions of each type of instrument. By doing so, researchers may be able to determine specific components of speech disorder and develop a better understanding for the role this symptom plays in schizophrenia.

## Conclusion

In the current study, we observed several interesting findings regarding SD and AR. Although no significant differences were observed when comparing individuals with schizotypy and controls in AR, there was a trend level difference in their severity of SD. In addition, participants displayed more SD in the stressful compared to the pleasant condition. Individuals in the schizotypy group also reported significantly lower levels of Subjective and Objective Social QOL compared to controls. When investigating specific symptoms, individuals with disorganized symptoms showed significantly increased SD in the stressful, but not the baseline condition. Conversely, individuals with negative symptoms showed significantly lower SD in the stressful, but not the pleasant condition. As these differences were only apparent in the stressful condition, it appears that stress does appear to play an important role in schizotypy in addition to schizophrenia. In fact, a pattern emerged that was similar to the two-process theory in schizophrenia. According to this theory, one subgroup of patients demonstrates a more variable symptom presentation and is more reactive to stress and a separate subgroup presents with stable symptoms and blunted reactivity. Although the participants in this study are experiencing subtle symptoms in comparison to patients, this pattern appears to emerge as individuals high in negative symptoms appear to show less reactivity to stress and those with high levels of disorganized or positive symptoms or more reactive when stress is introduced.

## References

- Allen, J. J., Chapman, L. J., Chapman, J. P., Vuchetich, J. P., & Frost, L. A. (1987). Prediction of psychotic-like symptoms in hypothetically psychosis-prone college students. *Journal of Abnormal Psychology, 96*(2), 83-88.
- American Psychological Association. (1987). *Diagnostic and statistical manual of mental disorders* (3<sup>rd</sup> ed. rev.). Washington, DC: Author.
- American Psychological Association. (2000). *Diagnostic and statistical manual of mental disorders* (4<sup>th</sup> ed. – text revision). Washington, DC: Author.
- Andreasen, N. C. (1979a). Thought, language, and communication disorders: I. Clinical assessment, definition of terms, and evaluation of their reliability. *Archives of General Psychiatry, 36*(12), 1315-1321.
- Andreasen, N. C., Arndt, S., Alliger, R., Miller, D., & Flaum, M. (1995). Symptoms of schizophrenia: Methods, meanings, and mechanisms. *Archives of General Psychiatry, 52*(5), 341-351.
- Andreasen, N. C., & Olson, S. (1982). Negative v. positive schizophrenia: Definition and validation. *Archives of General Psychiatry, 39*(7), 789-794.
- Arndt, S., Alliger, R. J., & Andreasen, N. C. (1991). The distinction between positive and negative symptoms: The failure of a two-dimensional model. *British Journal of Psychiatry, 158*, 317-322.
- Baron, M., Gruen, R., Rainer, J. D., Kane, J., Asnis, L., & Lord, S. (1985). A family study of schizophrenic and normal control probands: Implications for the spectrum concept of schizophrenia. *American Journal of Psychiatry, 142*(4), 447-455.
- Battaglia, M., Cavallini, M. C., Macchiardi, F., & Bellodi, L. (1997). The structure of DSM-III-R schizotypal personality disorder diagnosed by direct interviews. *Schizophrenia Bulletin, 23*(1), 83-92.
- Bentall, R. P., Claridge, G. S., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. *British Journal of Clinical Psychology, 28*(4), 363-375.
- Bergman, A. J., Harvey, P. D., Mitropoulou, V., Aronson, A., Marder, D., Silverman, J., et al. (1996). The factor structure of schizotypal symptoms in a clinical population. *Schizophrenia Bulletin, 22*(3), 501-509.
- Bergman, A. J., Silverman, J. M., Harvey, P. D., Smith, C. J., & Siever, L. J. (2000). Schizotypal symptoms in the relatives of schizophrenia patients: An empirical analysis of the factor structure. *Schizophrenia Bulletin, 26*(3), 577-586.
- Bilder, R. M., Mukherjee, S., Rieder, R. O., & Pandurangi, A. K. (1985). Symptomatic

- and neuropsychological components of defect states. *Schizophrenia Bulletin*, 11(3), 409-419.
- Bishop, D. V. M. (1977). The P scale and psychosis. *Journal of Abnormal Psychology*, 86(2), 127-134.
- Blatt, S. J., & Ritzler, B. A. (1974). Thought disorder and boundary disturbances in psychosis. *Journal of Consulting and Clinical Psychology*, 42(3), 370-381.
- Bleuler, E (1911). *Dementia praecox or the group of schizophrenia* (J. Zinkin, translator). New York: International Universities Press.
- Block, J. (1977). P scale and psychosis: Continued concerns. *Journal of Abnormal Psychology*, 86(4), 431-434.
- Brown, G. W., & Birley, J. L. T. (1968). Crisis and life changes and the onset of schizophrenia. *Journal of Health and Social Behavior*, 9, 203-214.
- Burbridge, J. A., & Barch, D. M. (2002). Emotional valence and reference disturbance in schizophrenia. *Journal of Abnormal Psychology*, 111(1), 186-191.
- Burbridge, J. A., Larsen, R. J., & Barch, D. M. (2005). Affective reactivity of language: The role of psychophysiological arousal. *Emotion*, 5(2), 145-153.
- Cameron, N. (1938). Reasoning, regression and communication in schizophrenics. *Psychological Monographs*, 50(1), 1-34.
- Chapman, L. J., & Chapman, J. P. (1985). Psychosis proneness. In M. Alpert (Ed.), *Controversies in schizophrenia* (pp. 157-174).
- Chapman, J. P., Chapman, L. J., & Kwapil, T. R. (1994). Does the Eysenck Psychoticism Scale predict psychosis? A ten year longitudinal study. *Personality and Individual Differences*, 17(3), 369-375.
- Chapman, L. J., Chapman, J. P., & Kwapil, T. R. (1994). Putatively psychosis-prone subjects 10 years later. *Journal of Abnormal Psychology*, 103(2), 171-183.
- Chapman, L. J., Chapman, J. P., Raulin, M. L., & Edell, W. S. (1978). Schizotypy and thought disorder as a high risk approach to schizophrenia. In G. Serban (Ed.), *Cognitive deficits in the development of mental illness* (pp. 351-360). New York: Brunner/Mazel.
- Chen, W. J., Hsiao, C. K., & Lin, C. C. H. (1997). Schizotypy in community samples: The three-factor structure and correlation with sustained attention. *Journal of Abnormal Psychology*, 106(4), 649-654.
- Cohen, A. S., Alpert, M., Nienow, T. M., Dinzeo, T. J., & Docherty, N. M. (in press). Computerized analysis of negative symptoms in schizophrenia. *Journal of Psychiatric Research*.

- Cohen, A. S., & Docherty, N. M. (2004). Deficit versus negative syndrome in schizophrenia: Prediction of attentional impairment. *Schizophrenia Bulletin*, 30(4), 827-835.
- Cohen, A. S., & Docherty, N. M. (2005). Symptom-oriented versus syndrome approaches to resolving heterogeneity of neuropsychological functioning in schizophrenia. *Journal of Neuropsychiatry & Clinical Neuroscience*, 17(3), 384-390.
- Cohen, A. S., & Docherty, N. M. (2005). Effects of positive affect on speech disorder in schizophrenia. *Journal of Nervous and Mental Diseases*, 193(12), 839-842.
- Crow, T. J. (1980). Molecular pathology of schizophrenia: More than one disease process? *British Medical Journal*, 280, 66-68.
- Deutsch, H. (1942). Some forms of emotional disturbance and their relationship to schizophrenia. *Psychoanalytic Quarterly*, 11, 310-321.
- Dickinson, D., Ramsey, M. E., & Gold, J. M. (2007). Overlooking the obvious: a meta-analytic comparison of digit symbol coding tasks and other cognitive measures in schizophrenia. *Archives of General Psychiatry*, 64(5), 532-542.
- Docherty, N. M. (1993). Communication deviance, attention, and schizotypy in parents of schizophrenic patients. *Journal of Nervous and Mental Diseases*, 181(12), 750-756.
- Docherty, N. M. (1995). Linguistic reference performance in parents of schizophrenic patients. *Psychiatry: Interpersonal and Biological Processes*, 58(1), 20-27.
- Docherty, N. M. (2005). Cognitive impairments and disordered speech in schizophrenia: Thought disorder, disorganization, and communication failure perspectives. *Journal of Abnormal Psychology*, 114(2), 269-278.
- Docherty, N. M., Cohen, A. S., Nienow, T. M., Dinzeo, T. J., & Dangelmaier, R. E. (2003). Stability of formal thought disorder and referential communication disturbances in schizophrenia. *Journal of Abnormal Psychology*, 112(3), 469-475.
- Docherty, N. M., DeRosa, M., & Andreasen, N. C. (1996). Communication disturbances in schizophrenia and mania. *Archives of General Psychiatry*, 53(4), 358-364.
- Docherty, N. M., Evans, I. M., Sledge, W. H., Seibyl, J. P., & Krystal, J. H. (1994). Affective reactivity of language in schizophrenia. *Journal of Nervous and Mental Diseases*, 182(2), 98-102.
- Docherty, N. C., Gordinier, S. W., Hall, M. J., & Cutting, L. P. (1999). Communication disturbances in relatives beyond the age of risk for schizophrenia and their associations with symptoms in patients. *Schizophrenia Bulletin*, 25(4), 851-862.
- Docherty, N. M., & Gottesman, I. I. (2000). A twin study of communication disturbance in schizophrenia. *Journal of Nervous and Mental Disease*, 188(7), 395-401.

- Docherty, N. M., & Grillon, C. (1995). Affective reactivity of language and the startle response in schizophrenia. *Biological Psychiatry*, 38(1), 68-70.
- Docherty, N. M., Hall, M. J., & Gordinier, S. W. (1998). Affective reactivity of speech in schizophrenia patients and their nonschizophrenic relatives. *Journal of Abnormal Psychology*, 107(3), 461-467.
- Docherty, N. M., & Hall, M. J., Gordinier, S. W., & Cutting, L. P. (2000). Conceptual sequencing and disordered speech in schizophrenia. *Schizophrenia Bulletin*, 26(3), 723-735.
- Docherty, N. M., & Hebert, A. S. (1997). Comparative affective reactivity of different types of communication disturbances in schizophrenia. *Journal of Abnormal Psychology*, 106(2), 325-330.
- Docherty, N. M., Rhinewine, J. P., Nienow, T. M., & Cohen, A. S. (2001). Affective reactivity of language symptoms, startle responding, and inhibition in schizophrenia. *Journal of Abnormal Psychology*, 110(1), 194-198.
- Docherty, N. M., Sledge, W. H., & Wexler, B. E. (1994). Affective reactivity of language in stable schizophrenic outpatients and their parents. *Journal of Nervous and Mental Diseases*, 182(6), 313-318.
- Erlenmeyer-Kimling, L., & Cornblatt, B. (1987). The New York high-risk project: A follow-up report. *Schizophrenia Bulletin*, 13(3), 451-461.
- Eysenck, H. J. (1975). *Manual of the Eysenck Personality Questionnaire*. London: Hodder & Stoughton.
- Fioravanti, M., Carlone, O., & Vitale, B. (2005). A meta-analysis of cognitive deficits in adults with a diagnosis of schizophrenia. *Neuropsychology Review*, 15(2), 73-95.
- Fish, B. (1987). Infant predictors of the longitudinal course of schizophrenic development. *Schizophrenia Bulletin*, 13(3), 395-409.
- Fossati, A., Raine, A., Carretta, I., Leonardi, B., & Maffei, C. (2003). The three-factor model of schizotypal personality: Invariance across age and gender. *Personality and Individual Differences*, 35(5), 1007-1019.
- Freedman, R. (2003). Schizophrenia. *New England Journal of Medicine*, 349(18), 1738-1749.
- G\*Power, version 3.08, 2007.
- Gilboa, E., & Revelle, W. (1994). Personality and the structure of affective responses. In S. H. M. van Goosen, N. E. Van de Poll, & J. A. Sergeant (Eds.), *Emotions: Essays on emotion theory* (pp. 135-159). Hillsdale, NJ: Erlbaum.



- Goldstein, K., & Scheerer, M. (1941). Abstract and concrete behavior: An experimental study with special tests. *Psychological Monographs*, 53(2), 151.
- Gooding, D. C., Tallent, K. A., & Matts, C. W. (2005). Clinical status of at-risk individuals 5 years later: Further validation of the psychometric high-risk strategy. *Journal of Abnormal Psychology*, 114(1), 170-175.
- Gottesman, I. I. (1991). *Schizophrenia genesis: The origins of madness*. San Francisco: Freeman.
- Green, M. F. (2001). *Schizophrenia revealed: From neurons to social interactions*. New York: WW Norton & Co.
- Gruzelier, J. H. (1996). The factorial structure of schizotypy: I. Affinities with syndromes of schizophrenia. *Schizophrenia Bulletin*, 22(4), 611-620.
- Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.
- Harrow, M., & Miller, J. G. (1980). Schizophrenic thought disorders and impaired perspective. *Journal of Abnormal Psychology*, 89(6), 717-727.
- Harrow, M., & Prosen, M. (1978). Intermingling and disordered logic as influences on schizophrenic 'thought disorders'. *Archives of General Psychiatry*, 35(10), 293-296.
- Harrow, M., & Quinlan, D. (1977). Is disordered thinking unique to schizophrenia? *Archives of General Psychiatry*, 34(1), 15-21.
- Henry, J. D., Bailey, P. E., & Rendell, P. G. (2008). Empathy, social functioning, and schizotypy. *Psychiatry Research*, 160(1), 15-22.
- Herbener, E. S., Rosen, C., Khine, T., & Sweeney, J. A. (2007). Failure of positive but not negative emotional valence to enhance memory in schizophrenia. *Journal of Abnormal Psychology*, 116(1), 43-55.
- Heston, L. L. (1966). Psychiatric disorders in foster home reared children of schizophrenic mothers. *British Journal of Psychiatry*, 112(489), 819-825.
- Hoffman, R. E., Stopek, S., & Andreasen, N. C. (1986). A comparative study of manic vs. schizophrenic speech disorganization. *Archives of General Psychiatry*, 43(9), 831-838.
- Horan, W. P., Blanchard, J. J., Gangestad, S. W., & Kwapil, T. R. (2004). The psychometric detection of schizotypy: Do putative schizotypy indicators identify the same latent class? *Journal of Abnormal Psychology*, 113(3), 339-357.
- Ingraham, L. J. (1995). Family-genetic research and schizotypal personality. In A. Raine, T. Lencz, & S. A. Mednick (Eds.), *Schizotypal personality* (pp. 19-42). New York: Cambridge University Press.

- Jahshan, C. S., & Sergi, M. J. (2007). Theory of mind, neurocognition, and functional status in schizotypy. *Schizophrenia Research*, 89(1-3), 278-286.
- Johnston, M. H., & Holzman, P. S. (1979). *Assessing schizophrenic thinking*. San Francisco: Jossey-Bass.
- Johnstone, E. C., & Frith, C. D. (1996). Validation of three dimensions of schizophrenia symptoms in a large unselected sample of patients. *Psychological Medicine*, 26(4), 669-679.
- Kallman, F. J. (1938). *The genetics of schizophrenia*. New York: J. J. Augustin.
- Kendler, K. S., & Hewitt, J. (1992). The structure of self-report schizotypy in twins. *Journal of Personality Disorders*, 6(1), 1-17.
- Kerns, J. G. (2006). Schizotypy facets, cognitive control, and emotion. *Journal of Abnormal Psychology*, 115(3), 418-427.
- Kerns, J. G. (2007). Experimental manipulation of cognitive control processes cause an increase in communication disturbances in healthy volunteers. *Psychological Medicine*, 37(7), 995-1004.
- Kerns, J. G., & Becker, T. M. (2008). Communication disturbances, working memory, and emotion in people with elevated disorganized schizotypy. *Schizophrenia Research*, 100(1-3), 172-180.
- Kety, S. S., Rosenthal, D., Wender, P. H., & Schulsinger, F. (1968). The types and prevalence of mental illness in the biological and adoptive families of adopted schizophrenics. In D. Rosenthal & S. S. Key (Eds.), *The transmission of schizophrenia* (pp. 345-362). Oxford: Pergamon Press.
- Kety, S. S., Rosenthal, D., Wender, P. H., Schulsinger, F., & Jacobsen, B. (1975). Mental illness in the biological and adoptive families of adopted individuals who have become schizophrenic. A preliminary report based upon psychiatric interviews. In R. Fieve, D. Rosenthal, & H. Brill (Eds.), *Genetic research in psychiatry* (pp. 147-165). Baltimore & London: The Johns Hopkins University Press.
- Kety, S. S., Wender, P. H., Jacobsen, B., Ingraham, L. J., Jansson, L., Faber, B., et al. (1994). Mental illness in the biological and adoptive relatives of schizophrenic adoptees: Replication of the Copenhagen study in the rest of Denmark. *Archives of General Psychiatry*, 51(6), 442-455.
- Kraepelin, E. (1913a). *Dementia praecox and paraphrenia* (trans. A. R. Diefendorf). Edinburgh: Livingstone.
- Kretschmer, E. (1925). *Physique and character: An investigation of the nature of constitution and of the theory of temperament*. 2<sup>nd</sup> ed. (English translation by WJH Sprott). New York: Harcourt.

- Kwapil, T. R. (1998). Social anhedonia as a predictor of the development of schizophrenia-spectrum disorders. *Journal of Abnormal Psychology, 107*(4), 558-565.
- Kwapil, T. R., Miller, M. B., Zinser, M. C., Chapman, J. P., & Chapman, L. J. (1997). Magical ideation and social anhedonia as predictors of psychosis proneness: A partial replication. *Journal of Abnormal Psychology, 106*(3), 491-495.
- Larsen, R. J., Diener, E., & Emmons, R. A. (1986). Affect intensity and reactions to daily life events. *Journal of Personality and Social Psychology, 51*(4), 803-814.
- Lehman, A. F. (1995). *Evaluating quality of life for persons with severe mental illness: Assessment toolkit*. Cambridge, MA: The Evaluation Center at Health Services Research Institute.
- Liddle, P. F. (1987a). The symptoms of chronic schizophrenia: A re-examination of the positive-negative dichotomy. *British Journal of Psychiatry, 151*, 145-151.
- Liddle, P. F., & Barnes, T. R. E. (1990). Syndromes of chronic schizophrenia. *British Journal of Psychiatry, 157*, 558-561.
- Lieberman, J. A. (1999). Is schizophrenia a neurodegenerative disorder? A clinical and neurobiological perspective. *Biological Psychiatry, 46*(6): 729-739.
- Lowing, P. A., Mirsky, A. F., & Pereira, R. (1983). The inheritance of schizophrenia spectrum disorders: A reanalysis of the Danish adoption study data. *American Journal of Psychiatry, 140*(9), 1167-1171.
- Malla, A. K., Ross, M. G., Norman, P. W., Cortese, L., & Diaz, F. (1993). Three syndrome concept of schizophrenia: A factor analytic study. *Schizophrenia Research, 10*(2), 143-150.
- Mason, O., Startup, M., Halpin, S., Schall, U., Conrad, A., & Carr, V. (2004). Risk factors for transition to first episode psychosis among individuals with 'at-risk mental states'. *Schizophrenia Research, 71*(2-3), 227-237.
- McGlashan, T. H. (1999). Duration of untreated psychosis in first-episode schizophrenia: Marker or determinant of course? *Biological Psychiatry, 46*(7), 899-907.
- McGlashan, T. H., Grilo, C. M., Skodol, A. E., Gunderson, J. G., Shea, M. T., Morey, L. C., et al. (2000). The collaborative longitudinal personality disorders study: Baseline Axis I/II and II/II diagnostic co-occurrence. *Acta Psychiatrica Scandinavica, 102*(4), 256-264.
- McGorry, P. D., Yung, A. R., Phillips, L. J., Yuen, H. P., Francey, S., Cosgrave, E. M., et al. (2002). Randomized controlled trial of interventions designed to reduce the risk of progression to first-episode psychosis in a clinical sample with subthreshold symptoms. *Archives of General Psychiatry, 59*(10), 921-928.
- McKenna, P. J., & Oh, T. M. (2005). Schizophrenic speech: Making sense of bathroots

- and ponds that fall in the doorways. New York: Cambridge University Press.
- Mednick, S. A., Parnas, J., & Schulsinger, F. (1987). The Copenhagen high-risk project, 1962-86. *Schizophrenia Bulletin*, 13(3), 485-495.
- Meehl, P. E. (1962). Schizotaxia, schizotypy, schizophrenia. *American Psychologist*, 17(12), 827-838.
- Menezes, N. M., Arenovich, T., & Zipursky, R. B. (2006). A systematic review of longitudinal outcome studies of first-episode psychosis. *Psychological Medicine*, 36(10), 1349-1362.
- Metsanen, M., Wahlberg, K. E., Saarento, O., Hakko, H., Tarvainen, T., Koistinen, P., et al. (2005). Stability of Thought Disorder Index among high-risk and low-risk adoptees in the Finnish adoptive family study of schizophrenia. *European Psychiatry*, 20(1), 35-40.
- Mishlove, M., & Chapman, L. J. (1985). Social anhedonia in the prediction of psychosis proneness. *Journal of Abnormal Psychology*, 94(3), 384-396.
- Morrison, A. P., French, P., Walford, L., Lewis, S. W., Kilcommons, A., Green, J., et al. (2004). Cognitive therapy for the prevention of psychosis in people at ultra high-risk: Randomised controlled trial. *British Journal of Psychiatry*, 185(4), 291-297.
- Murray, C. J. L., & Lopez, A. D. (Eds.). (1996). *The global burden of disease*. Boston: Harvard School of Public Health.
- Myin-Germeys, I. (2007). Stress-reactivity in psychosis: Evidence for an affective pathway to psychosis. *Clinical Psychology Review*, 27(4), 409-424.
- Myin-Germeys, I., van Os, J., Schwartz, J. E., Stone, A. A., & Delespaul, P. A. (2001). Emotional reactivity to daily life stress in psychosis. *Archives of General Psychiatry*, 58(12), 1137-1144.
- Norman, R. M., & Malla, A. K. (1993). Stressful life events and schizophrenia: I. A review of the research. *British Journal of Psychiatry*, 162, 161-166.
- Phillips, M. R., Xiong, W., Wang, R. W., Gao, Y. H., Wang, X. Q., & Zhang, N. P. (1991). Reliability and validity of the Chinese versions of the scales for the assessment of positive and negative symptoms. *Acta Psychiatrica Scandinavica*, 84(4), 364-370.
- Planarsky, K. (1972). Phenotypic boundaries and genetic specificity in schizophrenia. In A. R. Kaplan (Ed.), *Genetic factors in "schizophrenia"* (pp. 141-172). Springfield, IL: Charles C. Thomas.
- Rado, S. (1953). Dynamics and classification of disordered behavior. *American Journal of Psychiatry*, 110, 406-426.
- Raine, A. (1991). The SPQ: A scale for the assessment of schizotypal personality based

- on DSM-III-R criteria. *Schizophrenia Bulletin*, 17(4), 555-564.
- Raine, A. (2002). Manual for the Schizotypal Personality Questionnaire (SPQ and SPQ-B). Retrieved October 30<sup>th</sup>, 2007 from <http://www-rcf.usc.edu/~raine/spqrel.html>.
- Raine, A., & Allbutt, J. (1989). Factors of schizoid personality. *British Journal of Clinical Psychology*, 28(1), 31-40.
- Raine, A., Reynolds, C., Lencz, T., Scerbo, A., Triphon, N., & Kim, D. (1994). Cognitive-perceptual, interpersonal and disorganized features of schizotypal personality. *Schizophrenia Bulletin*, 20(1), 191-201.
- Reilly, F. (1975). Looseness of associations in acute schizophrenia. *British Journal of Psychiatry*, 127, 240-246.
- Reynolds, C. A., Raine, A., Mellinger, K., Venables, P. H., & Mednick, S. A. (2000). Three-factor model of schizotypal personality: Invariance across culture, gender, religious affiliation, family adversity, and psychopathology. *Schizophrenia Bulletin*, 26(3), 603-618.
- Rochester, S. R., & Martin, J. R. (1979). *Crazy talk: A study of the discourse of schizophrenic speakers*. New York: Plenum Press.
- Salzinger, K. (1973). *Schizophrenia: Behavioral aspects*. New York: John Wiley & Sons, Inc.
- Sarai, M., & Matsunaga, H. (1993). Symptom segregation in chronic schizophrenia: The significance of thought disorder. *Schizophrenia Research*, 10(2), 159-163.
- Sawa, A., & Snyder, S. H. (2002). Schizophrenia: Diverse approaches to a complex disease. *Science*, 296(5568), 692-695.
- Schwartz, C. C., & Myers, J. K. (1977). Life events and schizophrenia. II. Impact of life events on symptom configuration. *Archives of General Psychiatry*, 34, 1242-1245.
- Shenton, M. E., Solovay, M. R., Holzman, P. S., Coleman, M., & Gale, H. J. (1989). Thought disorder in the relatives of psychotic patients. *Archives of General Psychiatry*, 46(10), 897-901.
- Siever, L. J., & Gunderson, J. G. (1983). The search for a schizotypal personality: Historical origins and current status. *Comprehensive Psychiatry*, 24(3), 199-212.
- Silverman, J. M., Siever, L. J., Horvath, T. B., Coccaro, E. F., Klar, H., Davidson, M. (1993). Schizophrenia-related and affective personality disorder traits in relatives of probands with schizophrenia and personality disorders. *American Journal of Psychiatry*, 150(3), 435-442.
- Simon, A. E., Dvorsky, D. N., Boesch, J., Roth, B., Isler, E., Schueler, P., et al. (2006).

- Defining subjects at risk for psychosis: A comparison of two approaches. *Schizophrenia Research*, 81(1), 83-90.
- Singer, M. T., & Wynne, L. C. (1965). Thought disorder & family relations of schizophrenia: IV. Results & implications. *Archives of General Psychiatry*, 12(2), 201-212.
- Sitskoorn, M. M., Aleman, A., & Ebisch, S. J. H. (2004). Cognitive deficits in relatives of patients with schizophrenia: A meta-analysis. *Schizophrenia Research*, 71(2-3), 285-295.
- Solovay, M. R., Shenton, M. E., Gasperetti, C., & Coleman, M. (1986). Scoring manual for the Thought Disorder Index. *Schizophrenia Bulletin*, 12(3), 483-496.
- Stefanis, N. C., Smyrnis, N., Avramopoulos, I. E., Ntzoufras, I., & Stefanis, C. (2004). Factorial composition of self-rated schizotypal traits among young males undergoing military training. *Schizophrenia Bulletin*, 30(2), 335-350.
- Stirling, J., Hellewell, J., Blakey, A., & Deakin, W. (2006). Thought disorder in schizophrenia is associated with both executive dysfunction and circumscribed impairments in semantic functioning. *Psychological Medicine*, 36(4), 475-484.
- Taylor, S. F., Liberzon, I., Decker, L. R., & Koeppe, R. A. (2002). A functional anatomic study of emotion in schizophrenia. *Schizophrenia Research*, 58(2-3), 159-172.
- Thaker, G., Adami, H., Moran, M., Lahti, A., & Cassady, S. (1993). Psychiatric illnesses in families of subjects with schizophrenia-spectrum personality disorders: High morbidity risks for unspecified functional psychoses and schizophrenia. *American Journal of Psychiatry*, 150(1), 66-71.
- Thompson, P.A., & Meltzer, H. Y. (1993). Positive, negative, and disorganization factors from the Schedule for Affective Disorders and Schizophrenia in the Present State Examination: A three-factor solution. *British Journal of Psychiatry*, 163, 344-351.
- Torgersen, S. (1984). Genetic and nosological aspects of schizotypal and borderline personality disorders. *Archives of General Psychiatry*, 41, 546-554.
- Tyrka, A. R., Cannon, T. D., Haslam, N., Mednick, S. A., Schulsinger, F., Schulsinger, H., et al. (1995). The latent structure of schizotypy: I. Premorbid indicators of a taxon of individuals at risk for schizophrenia-spectrum disorders. *Journal of Abnormal Psychology*, 104(1), 173-183.
- Venables, P. H., & Bailes, K. (1994). The structure of schizotypy, its relation to subdiagnoses of schizophrenia and to sex and age. *British Journal of Clinical Psychology*, 33(3), 277-294.
- Ventura, J., Nuechterlein, K. H., Lukoff, D., & Hardesty, J. P. (1989). A prospective study of stressful life events and schizophrenic relapse. *Journal of Abnormal Psychology*, 98(4), 407-411.

- Volz, M., Hamm, A. O., Kirsch, P., & Rey, E. R. (2003). Temporal course of emotional startle modulation in schizophrenia patients. *International Journal of Psychophysiology*, 49(2), 123-137.
- Wahlberg, K. E., Wynne, L. C., Oja, H., Keskitalo, P., Pykalainen, L., Lahti, I., et al. (1997). Gene-environment interaction in vulnerability to schizophrenia: Findings from the Finnish adoptive family study of schizophrenia. *American Journal of Psychiatry*, 154, 355-362.
- Walker, E., Mittal, V., & Tessner, K. (2008). Stress and the hypothalamic pituitary adrenal axis in the developmental course of schizophrenia. *Annual Review of Clinical Psychology*, 4, 189-216.
- Widiger, T. A., Frances, A., Warner, L., & Bluhm, C. (1986). Diagnostic criteria for the borderline and schizotypal personality disorders. *Journal of Abnormal Psychology*, 95(1), 43-51.
- Wing, J. K. (1961). A simple and reliable subclassification of chronic schizophrenia. *Journal of Mental Science*, 107, 862-875.
- Yeung, A. S., Lyons, M. J., Waternaux, C. M., Faraone, S. V., & Tsuang, M. T. (1993). A family study of self-reported personality traits and DSM-III-R personality disorders. *Psychiatry Research*, 48(3), 243-255.
- Yung, A. R., McGorry, P. D., McFarlane, C. A., Jackson, H. J., Patton, G. C., & Rakkar, A. (1996). Monitoring and care if young people at incipient risk of psychosis. *Schizophrenia Bulletin*, 22(2), 283-303.
- Zubin, J., & Spring, B. (1977). Vulnerability: A new view of schizophrenia. *Journal of Abnormal Psychology*, 86(2), 103-126.
- Zuckerman, M. (1989). Personality in the third dimension: A psychological approach. *Personality and Individual Differences*, 10(4), 391-418.

## Appendix A: Abbreviations Used

Abbreviations used throughout the document.

AIDS=	Acquired Immune Deficiency Syndrome
ANOVA=	Analysis of Variance
AR=	Affective Reactivity
CDI=	Communication Disturbances Index
CON=	Control
D/O=	Disorganized
DSM=	<i>Diagnostic and Statistical Manual of Mental Disorders</i>
DV=	Dependent Variable
GPA=	Grade Point Average
HIV=	Human Immunodeficiency Virus
HPA=	Hypothalamic-Pituitary Axis
IAPS=	International Affective Picture System
IV=	Independent Variable
NEG=	Negative
NOS=	Not Otherwise Specified
QOL=	Quality of Life
POS=	Positive
SD=	Speech Disturbance
StDev=	Standard Deviation
SPD=	Schizotypal Personality Disorder
SPQ=	Schizotypal Personality Questionnaire
SPSS=	Statistical Package for the Social Sciences
STYPY=	Schizotypy
TDI=	Thought Disorder Index
TLC=	Thought, Language, and Communication Index



## Appendix B: The Schizotypal Personality Questionnaire

The Schizotypal Personality Questionnaire was administered to participants as part of an on-line screening to identify individuals with schizotypic features.

Please indicate your level of agreement to the following items/questions using the following scale:

0	1	2	3	4
Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Definitely No	No	Neutral	Yes	Definitely Yes

### Item

- Do you sometimes feel that things you see on the TV or read in the newspaper have a special meaning for you?
- I am aware that people notice me when I go out for a meal or to see a film.
- Do some people drop hints about you or say things with a double meaning?
- Have you ever noticed a common event or object that seemed to be a special sign for you?
- Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you?
- When shopping, do you get the feeling that other people are taking notice of you?
- When you see people talking to each other, do you often wonder if they are talking about you?
- Do you sometimes feel that other people are watching you?
- Do you sometimes feel that people are talking about you?
- I sometimes avoid going to places where there will be many people because I will get anxious.
- I get very nervous when I have to make polite conversation.
- Do you ever get nervous when someone is walking behind you?
- I get anxious when meeting people for the first time.
- Do you often feel nervous when you are in a group of unfamiliar people?
- I feel very uncomfortable in social situations involving unfamiliar people.
- I would feel very anxious if I had to give a speech in front of a large group of people.
- I feel very uneasy talking to people I do not know well.
- Have you had experiences with the supernatural?
- Do you believe in telepathy (mind-reading)?
- Are you sometimes sure that other people can tell what you are thinking?
- Do you believe in clairvoyance (psychic forces, fortune telling) ?
- Can other people feel your feelings when they are not there?
- Have you had experiences with astrology, seeing the future, UFO's, ESP, or a sixth sense?
- Have you ever felt that you are communicating with another person telepathically (by mind-reading) ?
- Have you often mistaken objects or shadows for people, or noises for voices?
- Have you ever had the sense that some person or force is around you, even though you cannot see anyone?
- When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes?
- I often hear a voice speaking my thoughts aloud.
- Have you ever seen things invisible to other people?
- Do everyday things seem unusually large or small?
- Does your sense of smell sometimes become unusually strong?
- Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?
- Are your thoughts sometimes so strong that you can almost hear them?
- Other people see me as slightly eccentric (odd).
- People sometimes comment on my unusual mannerisms and habits.
- Sometimes other people think that I am a little strange.

Some people think that I am a very bizarre person.  
I am an odd, unusual person.  
I have some eccentric (odd) habits.  
People sometimes stare at me because of my odd appearance.  
I have little interest in getting to know other people.  
I prefer to keep myself to myself.  
I am mostly quiet when with other people.  
I find it hard to be emotionally close to other people  
Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems?  
Writing letters to friends is more trouble than it is worth  
I tend to keep in the background on social occasions  
I attach little importance to having close friends.  
Do you feel that you cannot get "close" to people.  
People sometimes find it hard to understand what I am saying.  
I sometimes jump quickly from one topic to another when speaking.  
I sometimes forget what I am trying to say.  
I often ramble on too much when speaking.  
Some people find me a bit vague and elusive during a conversation.  
I sometimes use words in unusual ways.  
Do you tend to wander off the topic when having a conversation?  
I find it hard to communicate clearly what I want to say to people.  
People occasionally comment that my conversation is confusing.  
People sometimes find me aloof and distant.  
I am not good at expressing my true feelings by the way I talk and look.  
I rarely laugh and smile.  
My "nonverbal" communication (smiling and nodding during a conversation) is not very good.  
I am poor at returning social courtesies and gestures.  
I tend to avoid eye contact when conversing with others.  
I do not have an expressive and lively way of speaking.  
I tend to keep my feelings to myself.  
I am sure I am being talked about behind my back.  
Do you often feel that other people have it in for you?  
Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?  
I feel I have to be on my guard even with friends.  
Do you often pick up hidden threats or put-downs from what people say or do?  
Have you found that it is best not to let other people know too much about you?  
I often feel that others have it in for me.  
Do you often have to keep an eye out to stop people from taking advantage of you?

## Appendix C: Communication Disturbances Index Modified Manual

A modified manual for coding speech disturbances using the Communication Disturbances Index (CDI). Original manual written by Dr. Nancy Docherty; this version is a slight modification, which was necessary in order to code speech disturbances in response to emotionally valenced photographs.

### Communication Disturbances Index (CDI) Manual

The Communication Disturbances Index (CDI) attempts to classify instances of speech disturbance and separate them into six categories. In addition to gross disturbances, the CDI is designed to identify many subtle instances of disturbance. To this end, even nonpsychiatric controls should demonstrate low levels of speech disturbance. The goal in our laboratory will be to establish interrater reliability when applying CDI ratings to our transcribed speech samples. CDI ratings should be made using only the transcripts, you do not need to listen to the audio file to apply ratings. To find transcripts, go to Lab Projects > SPRL Projects > High Risk (Spring 07) > Narrative Data > Word Files Processed (High Risk 07) and select a narrative. When you have finished a narrative, please place your initials in accompanying slot in the CDI checklist. The CDI checklist can be found in the 'Narrative Data' folder alongside the word files.

#### CDI Ratings- General

Communication disturbances are instances in which the intended meaning of a phrase or a word is unclear and that unclarity obscures the clarity of the larger communication. The key is that there is a loss of larger meaning. In other words, an unclear word or phrase is counted as disturbance when it obscures meaning from the statement where it occurs. Unclear words that are unimportant to the understanding are not counted. For example:

*I went up the mountain to look for some things*

In this sentence, 'things' is unclear and it makes the larger meaning of the sentence unclear, so it is counted.

**OK-***He had gone to town to pick something up, so he wasn't there when the call came.*

In this sentence, 'something' is unclear; however, it does not impair the overall meaning of the statement so it is not counted.

Faulty grammar, structure, and word usage are not counted unless they obscure meaning. If they render the meaning unclear or ambiguous, or they give the rater significant pause before he/she ascertains the correct meaning, they are counted as disturbance. Instances of disturbance that are immediately corrected or clarified by the speaker are not counted.

#### EXAMPLES:

*He was doing well in the beginning, but then he sort of abused his study habits.*

"Abused" is the wrong word choice here. You can be negligent or lax with your study habits, but you can't abuse them.

*We seen Niagra Falls on both the American and Canarican side.*

“Seen” is okay because even though it is grammatically incorrect, it does not hinder meaning. However, “Canarican” should give you significant pause, before realizing that the participant means to say “Canadian”. “Canarican” should be counted.

**OK-***We saw Niagra Falls from both the American and **Canarican**, I mean Canadian, sides.* In this instance, “Canarican” would not be counted as an instance of disturbance because it is immediately corrected by the participant and the correct phrase is used.

Transcripts are rated by counting each instance of communication disturbance. Total words are calculated; however, since many instances of disturbance are multi-word phrases, they are only counted as one word. Total number of disturbances are then divided by this corrected word score to obtain overall CDI score. For example, let’s say you are rating a transcript that contains 109 words and that transcript has 2 instances of communication disturbance. One instance is a sentence that is structurally unclear and the entire ten word sentence is underlined as a case of communication disturbance. The other instance is one word long and is unclear because an ambiguous term is used. In this case, both the word one disturbance and the ten word disturbance would be counted as one word when determining CDI score. Here, you would divide 2 (the number of disturbances) by 100 (the corrected word score after counting each instance of disturbance as one word) to obtain a Total CDI score of 2.0%.

The basic unit is the unclear word or phrase, with phrases of several words being counted as one instance of disturbance. Disturbances will be classified into one of six categories, described below. An instance of disturbance can not be classified into multiple categories (i.e. only one category is assigned per disturbance). Interrater reliability on total CDI scores is relatively easy to obtain; however, agreeing on how to classify disturbances into categories is more difficult. Instructions for separating disturbances into categories will now be discussed.

### **General Tips:**

If applicable, use the photographs when you're coding- this will probably cut down a little bit on instances of CD, especially in the Missing Information category. The only time you should not use the photographs is in the free recall narratives.

### Six Types of Disturbance.

#### **1. Vague References**

Vague references are words or phrases that are unclear because they are overinclusive. They should be scored only if their lack of specificity is important and significantly diminishes the meaning communicated. These types of disturbance often leave the listener with a questionable impression about the intended meaning rather than a clearly communicated meaning.

The most difficult discrimination to make is between vague references and ambiguous word meanings. The vague reference category is limited to nominal or pronominal words and phrases in which the major source of unclarity is overinclusiveness.

The overwhelming majority (80-90%) that we will find will contain ‘things’ or ‘stuff’. Other examples: ‘There was a lot of stress when people talked about me’, ‘it’s a good show, they talk about anything and everything’, ‘The ohm law is basically a law of powers’

### EXAMPLES:

*I’m hoping they don’t get caught up in some of the ills of our life, of our society.*

In this example, it is not clear what ‘ills’ the speaker is referring to that are present in ‘our life’ or ‘our society’.

*We had to go to court and other bad things.*

It is unclear what ‘other bad things’ the speaker is referring to- are they talking about paying fines, being arrested, or did they have to do bad things separate from this court appearance like going to work afterward? It is impossible to know from this sentence.

*Special education helped me to obtain various levels of grades.*

This sentence is also structurally unclear; however, the main impediment to understanding is the vagueness of ‘various levels of grades’.

*We have all kinds of tools and stuff at our house.*

It is unclear what ‘and stuff’ means- does it refer to other building equipment or ‘things’ that are completely unrelated to fixing something.

*I like older houses, especially with those borders on the walls.*

‘Those’ does not clearly communicate to the reader what types of borders are on the walls.

**KEYS** to determining Vague References:

- a. Unclear because of overinclusiveness
- b. Lack of specificity diminishes overall meaning
- c. Difference between Ambiguous Word Meanings is that Vague References are limited to nominal and pronominal words (“things”, “stuff”, etc.)

## **2. Confused References**

Confused references are unclear because they can refer to one of at least two alternate referents and the correct choice isn’t obvious. Alternatives have usually been provided by the speaker, but it is not possible to determine which is correct. Confused references are counted if: a) it is impossible to be reasonably sure which referent is correct or b) it is only possible to be sure after some consideration.

The most difficult discrimination is between confused references and ambiguous word meanings. With confused references, there are two or more alternatives and one is most likely the intended meaning. Ambiguous word references are not clearcut or referents have not been previously presented by the speaker. Confused references are usually nominal or pronominal. In most cases, the term ‘we’, if coded, is an Ambiguous Word Meaning. However, ‘we’ may occasionally (10-20% of the time) ‘we’ be a confused reference. For example, if two different groups were mentioned (aunt, uncle, cousins), it is possible that we could be a confused reference. For instance: ‘While they went to work, we went to get food.’ (both would be coded as C).

EXAMPLES:

*My son has two children and my daughter has three. The kids have counted on me for a lot.*

Which kids? His son and daughter, his son’s kids, his daughter’s kids, or all of the grandchildren? The correct answer is most likely one of these three referents provided by the speaker, but it is difficult to determine which of these three they are referring to.

*The cat reminds me of the cat in the Edgar Allen Poe story except it’s not black.*

Which cat isn’t black? The cat in the story or the cat that is being referred to.

*Take the clock, for instance. You got ten, twelve on it, you got other numbers on it, you got a volume button on it, it go up and down.*

‘It’ (the final one) is unclear; it could refer to the clock, the volume button, or another part of the clock.

**KEYS** to determining Confused References:

- a. Unclear because these refer to one of at least two alternate referents.
- b. The alternate referents have been previously provided by the speaker, but it is unclear which the speaker is referring to.
- c. Difference between Ambiguous Word Meanings is that with Confused References there are two or more alternatives, whereas the number of possible referents are unlimited with ambiguous word references.

### **3. Missing Information References**

Missing information references assume that the listener has prior information that he or she does not have and should not be expected to have. With our samples, missing information references will be common since participants often describe a photo without giving background. Unqualified references to persons, places or things not previously presented by the speaker and unknown to the listener are classified here. This category includes comparative references for which the basis of comparison is not implicitly clear and has not been made clear by the speaker.

In some cases the meaning of the utterance is reasonably clear upon consideration, but it lacks the redundancy that normally facilitates comprehension.

Remember to use the photo. If the reference can be derived from the photo, it should NOT be coded. So, if the speaker said “I don’t like doing using these types of tools” and there is a picture of a wrench, it would not be coded as Missing. MIR is probably the toughest category to get a handle on and we’ll work through whatever problems you may have.

EXAMPLES:

*They let George go home, so why not me? (no previous mention of George)*

*I don’t like cats very much. It’s pretty gross.*

If what ‘it’s’ refers to is not mentioned, it is impossible to know what this is in reference to.

*I want to move out of New Haven and they won’t let me leave.*

If there is not prior mention of “they”, it is not possible to figure out who they are.

*In my mind I saw the Blessed Virgin Mary sitting on top of the concrete plaza in the back yard. I fought her off...and I went back to sleep.*

‘Back’ is counted because the speaker never mentioned having been asleep before. This example is more subtle than the others. The use of ‘the concrete plaza’ conveys that there was a concrete plaza in the back yard, but the use of ‘the’ implies that the speaker believes the listener already is aware of the existence of the plaza. Similarly, the use of ‘back to sleep’ conveys the information that the speaker was previously asleep, but the implication is that this was already known by the listener

**KEYS** to determining Missing Information References:

- a. When the reader assumes that the listener has previous knowledge that they do not have, nor should they be expected to have.
- b. Unqualified references to subjects not previously mentioned belong in this category.

#### 4. Ambiguous Word Meanings

These include instances in which a word or phrase has more than one possible meaning and is used in such a way that the intended meaning is uncertain. This does not include instances in which it seems that the wrong word has been chosen (Wrong Word References), but rather the word or phrase used could have a number of different meanings in its current context, and the correct meaning is not obvious. Pronouns with unknown referents are also included in this category unless there are clearcut alternative possible referents, in which case it would be classified as a confused reference.

Most instances of unclarity contain ambiguous words or phrases; therefore, if instances of unclarity do not meet criteria for any of the other categories, they are likely to be classifiable here. Any parts of speech may be rated as ambiguous words.

Back to the ‘we’ disturbances mentioned in the CR category. ‘We’ coded if there is no previous mention of who ‘we’ might be. For example, the phrase ‘My brother and I like football. We watch it a lot’ wouldn’t be coded because ‘we’ refers to the speaker and their brother. Other examples of AWM are clichéd sayings like ‘live life to the fullest’, where a specific meaning can’t be derived. Here are some more examples of AWM: ‘My Grandma died... when she went, I broke down. I had a nervous breakdown, crying all the time.’, ‘You have to deal with yourself, because sometimes I get depressed’, ‘My problems began after my father died. I was hurled into the mental health field by psychologists and counselors.’

EXAMPLES:

*I hope my GPA doesn't inhibit me from being accepted into graduate school.*

Here, ‘inhibit’ is a word that has multiple meanings and the most commonly associated meaning does not work. While an alternative meaning might work here, it is a confusing word choice.

*These people don't belong on Earth. God will get them.*

What is meant by ‘get’ them? Similar to confused reference, except here there are an unlimited number of possible meanings.

*We used to party a lot.*

If speaker does not provide a referent to ‘we’. This is a common ambiguous word meaning. One exception is if the person is married and you determine that they are referring to this dyad. In this case, ‘we’ is not counted.

*I'm all natural and don't hang in crowds.*

‘Natural’ is unclear here and could possibly work, but there is probably a better alternative word that would clarify the sentence.

KEYS to determining Ambiguous Word Meanings:

- a. These include instances in which a word or phrase has more than one possible meaning and is used in such a way that the intended meaning is uncertain.
- b. Most categories have unclarity; therefore, this is a rule out category. Before determining a disturbance is an ambiguous word meaning, rule out Vague References, Confused References, or Wrong Word References.



## **5. Wrong Word References**

This refers to when a seemingly incorrect word or phrase is used. Wrong word references go beyond awkwardness of usage. The words are not being used according to any of their possible correct definitional meanings, or else they seem to be used in the place of other identifiable more appropriate words (and often but not always resemble those words phonetically).

These can be confused with ambiguous word meanings. The difference is that with ambiguous word meanings, a word may be confusing because of multiple meanings; in the case of wrong word references, the meaning is incorrect using any definition. These also resemble structural unclarity. If the unclarity can be pinpointed to a single word or phrase and substituting another word in place would correct the disturbance, then it is a wrong word reference. If there are several words or the structure of the sentence causes confusion, it is a structural unclarity. This category will probably have the lowest frequency considering most of our participants are high functioning.

Here is a previous example (in the AWM section) that demonstrates the difference between AWM and WWR. Ex. ‘My problems began after my father died. I was hurled into the mental health field by psychologists and counselors.’ The difference being that ‘hurled’(coded AWM) could possibly work but this isn’t the best use of the word, while ‘field’ (coded WWR) is completely wrong (it implies she became a psychologist or psychiatrist).

### **EXAMPLES:**

*I used to sit in the café, have something to eat, and just glare out into the night.*  
In this instance, ‘glare’ is incorrect. The speaker probably meant to say ‘stare’.

*He was doing well in the beginning, but then he sort of abused his study habits.*  
Here is an example used earlier. “Abused” is the wrong word choice. You can be negligent or lax with your study habits, but you can’t abuse them.

*My mother and father wasn’t together... but it didn’t hinder my likeness for her.*  
Here, the speaker probably meant to say ‘like’ and not ‘likeness’. ‘Likeness’ makes the sentence unclear.

*In this photo, I can see a somewhat manicured background consisting of a beautiful lake.*  
In this sentence, ‘manicured’ is incorrect. ‘Pastoral’ might be what the speaker meant.

### **KEYS to determining Wrong Word References:**

- a. These include instances in which a word is not being used according to any of the possible correct definitional meanings, or else it seems to be used in the place of other more appropriate words
- b. Wrong Word References often are phonetically similar to the intended words.
- c. They differ from Ambiguous Word Meanings in that none of their alternative definitions would work correctly. They are all incorrect.
- d. These differ from Structural Unclarity in that Wrong Word References are single words or phrases that are incorrect, as opposed to a breakdown in the structure of the sentence.

## **6. Structural Unclarity**

Instances in which meaning is unclear due to a breakdown or inadequacy of language structure. This includes grammatical errors that impair meaning and incomprehensible statements that lack



sentence structure. Common disturbances found here are semantically unworkable combinations of words (ex. *I thought I was going to live forever because of the sun, the horizon of the sun.* ) where the sentence is not grammatically incorrect, but it is a semantically unworkable combination of words. This can also be a confusing category; there are quite a few judgment calls about what is or is not unclear.

#### EXAMPLES:

*I got a sister in Buffalo, New York. I've been there... must have been about twice since I was up there.*

'Twice since I was up there' does not make sense; what was about 'twice' ?

*Either I do custodial work.*

Again, this a grammatically incorrect sentence that does not make sense. It is basically a word salad.

*It looks wet, like it might have just lost it's eye.*

These are two separate thoughts that should not be placed together or if they do make sense, should be explained more thoroughly.

*I've been in three or four weddings... they've been fun, but I don't know, it's a big deal.*

The speaker is probably trying to convey that weddings are a big deal and they have had fun being in three or four weddings. However, the way this sentence is worded makes it hard to decipher that meaning and gives significant pause.

#### **KEYS** to determining Structural Unclarities:

- a. Unclear due to a breakdown or inadequacy of language structure.
- b. Grammatically incoherent sentences fit here.
- c. Grammatically correct sentences where meaning cannot be determined also belong in this category.

### SAMPLE

Um, this picture makes me happy I guess because I really like, I really enjoy reading um even though I'm not an English major I prefer English reading over anything else. Um, my aunt said I started learning to read at the age of three which like the earliest one in the family I don't know why I just enjoy reading. Um, I read almost, um, I enjoy story books like a mystery books. I read Japanese mystery books, English mystery books, and Chinese. Um, this cabinet. Doesn't make me feel I don't feel anything about the cabinet, it's just it looks kind of like my little cabinet at home. Um, it's about this size too. Um, mine, my small little small cabinet like this at home I use to keep is, I keep it next to my chair that's where I use to keep my little um nap books in there. Or sometimes I fall asleep on my couch and this cabinet is like right next to my couch my little chair so like um. This picture reminds me um I don't like this picture that much but it's not I don't hate it that much either I just don't like the dark. I'm afraid of dark blood anything like that. Um, this picture reminds me kind of like a pub I don't know I've never been to one my parents doesn't like me going out late after nine so I haven't been anywhere dark like that so. Um, especially they don't like me going out like to pubs so this kind of reminds me of a pub. Um, why is there, oh I seen those many times. My dad uses them he um before my dad my brother who's like only six before he had him he always wanted a boy I was the second child in the family he always treat me like a boy so every time when he do something like this, cutting wires or stuff he always calls me and it's really scary because he expects me to know the names of like each thing he use. Um, and right now I still don't know most of the names of the equipment he uses. Um, I feel happy to see a towel because towels make me I guess think of like warm you know. Um, I um, that's my color that's my sister's color she kind of like this color towel, I prefer purple though. Um, now it makes me want to take a bath right now I'm so gross. Um, what else? A towel, let's see.

### SAMPLE 1 Breakdown

*Um, this picture makes me happy I guess because I really like, I really enjoy reading um even though I'm not an English major I prefer English reading over anything else.*

'Anything else' should be coded as a Vague Reference. This description is overinclusiveness and assumes the reader knows what 'anything else' refers to. Since 'anything' is a nominal phrase it is coded as Vague Reference as opposed to Ambiguous Word Reference.

**OK-***Um, my aunt said I started learning to read at the age of three which is like **the earliest one** in the family I don't know why I just enjoy reading.*

Here, 'the earliest one' is poor grammatically; however, it can easily be determined that what is meant is the earliest or youngest 'person' in the family that could read.

**OK-***Um, I read almost, um, I enjoy story books like a mystery books.*

This sentence is poor grammatically, but the speaker corrects themselves immediately.

*I read Japanese mystery books, English mystery books, and Chinese.*

This is a tough one. It appears to me that the speaker means 'Chinese mystery books', but they could easily mean that they can read the language. I felt like this sentence gave me significant pause and coded it as a Confused Reference since there are two possible options,

**OK-***Um, this cabinet. Doesn't make me feel I don't feel anything about the cabinet, it's just it looks kind of like my little cabinet at home. Um, it's about this size too. Um, mine, my small little small cabinet like this at home I use to keep is, I keep it next to my chair that's where I use to keep my little um nap books in there. Or sometimes I fall asleep on my couch and **this cabinet** is like right next to my couch my little chair so like um.*

'This cabinet' is questionable since two cabinets are mentioned in the passage: the one in the photo and the one the speaker owns. However, since the speaker has been describing their cabinet at home in the previous sentence, I did not feel this caused enough of a pause to constitute coding it as a Confused Reference.

*This picture reminds me um I don't like this picture that much but it's not I don't hate it that much either I just don't like the dark.*

This sentence is a grammatical mess. I feel like the transition from how much the speaker does not like the picture to them disliking the dark comes out of nowhere and gives enough pause to code this as a Structural Unclarity.

*I'm afraid of dark blood **anything like that**.*

The phrase 'anything like that' is overinclusive and would usually be coded as either Vague or AWM; however, the speaker did not have a chance to explain what this meant due to the photo changing so I chose not to code this.

*Um, this picture reminds me kind of like a pub I don't know I've never been to one my parents doesn't like me going out late after nine so I haven't been anywhere dark like that so.*

While 'my parents doesn't like me going out late' is poor grammar, it does not hinder meaning. However, 'dark like that' could mean to a pub, to the 'pub' depicted in this photo (CANSI.7180), or somewhere dark like in the photo. This should be coded as a Confused Reference.

*Um, especially they don't like me going out like to pubs so this kind of reminds me of a pub. Um, why is there, oh I seen **those** many times.*

There is not enough information provided to understand what 'those' refers to; however, if you use the photo (CANSI.7056), it is obvious that the speaker is talking about the boltcutters.

*My dad uses **them** he um before my dad my brother who's like only six before he had him he always wanted a boy I was the second child in the family he always treat me like a boy*

'Them' refers to the boltcutters again. 'who's like six before he had him' is a poorly constructed phrase that I had to read several times to determine that the reader was probably trying to communicate that their father was six and wanted a boy until he had the reader's brother. Due to the difficulty in determining the meaning, I coded this as a Structural Unclarity.

*so every time when he do **something like this**, cutting wires **or stuff** he always calls me and it's really scary because he expects me to know the names of like each thing he use.*

'something like this' is okay because it is corrected to 'cutting wires'. 'or stuff' is filler and does not hinder meaning as it is not the subject of the sentence (if it said 'cutting stuff' it would be Vague). However, 'each thing' is overinclusive. Does it mean 'each tool'? It is impossible to know. This should be coded as a Vague Reference.

*Um, and right now I still don't know most of the names of the equipment he uses. Um, I feel happy to see a towel because towels make me I guess think of like warm you know. Um, I um, that's my color **that's my sister's color** she kind of like this color towel, I prefer purple though.*

The speaker never provides the information needed to know what this color the towel is but you can easily see it the color if you use the photo (CANSI.7002) . This should not be coded.

**OK-***Um, now it makes me want to take a bath right now I'm so gross. Um, what else? A towel, let's see.*

This sentence is fine, as the speaker is cut off at the end.

Corrected words (total words in parentheses)- 418 (433)

TOTAL CDI Score (frequency in parentheses)- 6 (1.44%)

Vague References- 2 (0.48%)

Confused References- 2 (0.48%)

Missing Information References- 0 (0%)

Ambiguous Word References- 0 (0%)

Wrong Word References- 0 (0%)

Structural Unclarity- 2 (0.48%)

## Appendix D: Sample Photographs from the International Affective Picture Systems

Sample photographs from the IAPS library that will be used in CANS administration. Examples include three photographs of both pleasant and stressful valence.

Pleasant



Stressful





## **Vita**

Born in 1980, Kyle Minor grew up in Glasgow, Kentucky, and graduated from Glasgow High School in 1999. He attended Northern Kentucky University, earning dual Bachelor of Arts Degrees in psychology and English: literature and writing in 2004. While at Northern Kentucky, Kyle completed an Honors Thesis focusing on methods of reducing relapse in patients with schizophrenia. Upon graduation, he spent one year working with Dr. Hiram C. Polk, Dr. Susan Galandiuk, and Dr. Suhal S. Mahid at the Price Institute of Surgical Research in the Department of Surgery at the University of Louisville School of Medicine. In 2006, Kyle entered the doctoral program in clinical psychology at Louisiana State University, where he is working with Dr. Alex S. Cohen and currently in his third year. Research and clinical interests include examining speech disorder in schizophrenia and schizotypy, and investigating the role of emotion, stress, and neurocognitive factors in a variety of symptoms experienced by patients with schizophrenia.