

2012

# The moderating effects of perceived intentionality: exploring the relationships between ideas of reference, paranoia, and social anxiety in schizotypy

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THE MODERATING EFFECTS OF PERCEIVED INTENTIONALITY: EXPLORING THE  
RELATIONSHIPS BETWEEN IDEAS OF REFERENCE, PARANOIA, AND SOCIAL  
ANXIETY 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  
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B.A., Baylor University, 2008  
May, 2012

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## ABSTRACT

Ideas of reference (IOR), paranoia, and social anxiety are three common symptoms of schizophrenia-spectrum disorders, which appear to be conceptually related. However, the precise nature of these relationships is unclear. A new measure that assesses perceived intentionality (PI), a social-cognitive bias for perceiving the actions of others during unpleasant social situations as being directed at oneself in an intentionally malicious manner, has provided preliminary evidence for a link between PI and paranoia. The primary aim of this study was to examine the moderating role of PI on the relationships between IOR and paranoia, and between IOR and social anxiety amongst individuals with psychometrically-defined schizotypy. As we expected, the schizotypy group exhibited significantly higher levels of IOR, paranoia, and social anxiety compared to controls. Correlational analyses within the schizotypy group found that paranoia was positively related to IOR and social anxiety. However, social anxiety was not related to IOR. Consistent with what we expected, the results revealed that PI moderated the relationship between IOR and paranoia such that higher PI predicted higher levels of paranoia as IOR increased. However, our results did not support our hypothesis that PI would moderate the relationship between IOR and social anxiety such that lower PI would predict higher levels of social anxiety as IOR increased. Instead the present study found that PI moderated the relationship between IOR and social anxiety such that *higher* PI predicted *lower* levels of social anxiety as IOR increased. Theoretical and practical implications are discussed.

## INTRODUCTION

Ideas of reference, paranoia, and social anxiety are three common symptoms of schizophrenia-spectrum disorders that appear to be conceptually related to one another in an interesting way (e.g., they can all involve beliefs that others are taking special notice of themselves). However, the precise nature of these relationships is unclear. Ideas of reference, or referential thinking, refer to erroneous beliefs that random events have a particular or special meaning for oneself. Historically, few studies have sought to specifically examine ideas of reference as it was traditionally considered to simply be a component of paranoia, a symptom of schizophrenia-spectrum disorders that involves suspiciousness and/or beliefs that other individuals are trying to harm oneself. However, referential thinking is indeed a separate symptom that can occur independent of paranoia, and often times the content of these ideas of reference appear to be socially anxious in nature (Wing et al., 1974). One example of this type of socially anxious idea of reference would be mistakenly believing that other people are taking special notice of, and negatively evaluating, one's own flaws (e.g., "When I take notes in class the other students stare at my notebook and think poorly of me because my handwriting is sloppy").

Recently, a new measure was created to assess a social-cognitive bias for perceiving the actions of other people during negative social situations as being directed at oneself in an intentionally malicious manner (The Ambiguous Intentions Hostility Questionnaire; Combs et al., 2007). Preliminary studies have linked this perceived intentionality bias to paranoia (Combs et al., 2007; An et al., 2010), and this bias may be able to shed light on the interconnected nature of the relationships between ideas of reference, paranoia, and social anxiety.

The present study had three goals. The first goal was to replicate findings of increased ideas of reference, paranoia, and social anxiety in individuals with schizotypy. Second, we sought to replicate findings that these three symptoms are positively correlated with each other within a schizotypy sample. Our third and primary goal was to examine the role of perceived intentionality as a possible moderator between ideas of reference and social anxiety, and between ideas of reference and paranoia within a schizotypy sample.

In the following sections, a review of the literature pertaining to ideas of reference, paranoia, and social anxiety in schizophrenia-spectrum disorders will be presented. Next, the literature regarding perceived intentionality will be examined with regards to how this variable may be able to explain the relationships between the aforementioned symptoms. Then, further explanation of the present study's goals and hypotheses will be introduced. Lastly, a description of the methodology and analyses used in the current study will be discussed.

## **Schizophrenia**

Schizophrenia is a devastatingly debilitating disease affecting roughly .5 – 1% of the population (Lenzenweger, 2006; Kessler et al., 2005). It is one of the most economically and socially taxing diseases (Wu et al., 2005), and it is one of the leading causes of disability (World Health Organization, 2001). The typical age of onset ranges from the early 20s to mid-30s (Kessler et al., 2005). Compared to men, women tend to have a later age of onset by approximately 3 to 10 year (Taylor & Langdon, 2006). While the precise nature of the etiological underpinnings of this disorder is unclear, evidence suggests genetics and environmental variables interact with each other in the development of schizophrenia (Meehl 1962, 1990; Shi, Gershon, & Liu, 2008).

Schizophrenia can present with a wide array of symptoms, and there is considerable variability in symptom presentation amongst individuals with schizophrenia (Tsuang, Lyons, & Faraone, 1990). To date, schizophrenia research has been unable to identify any psychological or biological markers present in all schizophrenia cases. In response to the heterogeneous nature of this disorder, many researchers use a three-factor model (Liddle, 1987; Buchanan & Carpenter, 1994), which separates symptoms into three clusters: positive (i.e., delusions and hallucination), negative (e.g., blunted affect, anhedonia, apathy), and disorganized (e.g., disorganized speech and behavior). This model is commonly used to categorize schizophrenia patients. Interestingly, many of these schizophrenia symptoms appear to be relatively common in non-psychiatric populations, albeit at subclinical levels. In the next section, we will examine this phenomenon as explained by Paul Meehl (1962, 1990).

### **Schizotypy**

Meehl (1962, 1990) proposed a model for the development of schizophrenia-spectrum disorders stating that roughly 10% of the population has a genetic predisposition for developing schizophrenia, however the vast majority of these individuals do not go on to develop full-blown schizophrenia. Instead, these individuals exhibit only subclinical symptoms. Meehl argued that a “schizogene” codes for synaptic aberration in the central nervous system during brain development. This genetic predisposition, referred to as “schizotaxia”, is characterized by poor discrimination in neural transmissions, or “synaptic slippage”. While Meehl suggested that there is only one “schizogene”, current research suggests that there are probably polygenic influences at work. Meehl argued that schizotaxia is influenced by social environmental learning factors, which results in the development of “schizotypy”. Schizotypy refers to a personality organization ranging from almost undetectable aberrant behaviors to near-schizophrenic

symptoms, and is estimated to occur in roughly 10% of the population according to Meehl. The vast majority of individuals with schizotypy will never meet criteria for any DSM schizophrenia-spectrum diagnoses (e.g., schizophrenia or schizotypal personality disorder). However, a minority of these individuals will encounter additional polygenetic factors and stressors resulting in the onset of one of these more severe psychopathologies.

Individuals with schizotypy exhibit traits, which can be conceptualized as less severe subclinical versions of the symptoms seen in schizophrenia (Raine, Reynolds, Lencz, & Scerbo, 1994), and studying these traits is an important step towards understanding their clinical manifestations in schizophrenia. As with schizophrenia, schizotypy traits can be clustered into three factors: cognitive-perceptual traits (positive schizotypy traits), interpersonal deficits (negative schizotypy traits), and disorganized traits (Wuthrich & Bates, 2006; Kerns, 2006). Compared to studies using schizophrenia patients, schizotypy research is advantageous in that there are fewer confounding variables related to institutionalization, medication, and compliance problems. In the present study, we explored the relationships between several positive (ideas of reference and paranoia) and negative (social anxiety) schizotypal traits.

### **Ideas of Reference, Paranoia, and Social Anxiety in Schizotypy**

Ideas of reference, paranoia, and social anxiety are three symptoms commonly observed in schizophrenia-spectrum disorders. Conceptually, these three symptoms appear to be related to each other in a meaningful way, however there has yet to be a cohesive explanation of how these symptoms relate to one another. One possible explanation for this knowledge gap is related to the traditional misconception that ideas of reference are simply a component of paranoia as opposed to a separate symptom. Historically, schizotypy research has largely overlooked studying ideas of reference in lieu of its focus on paranoia (Startup & Startup, 2005; Leon, Bowden, & Faber,

1989). The paucity of literature specifically examining ideas of reference has resulted in a great deal of ambiguity regarding the nature of this symptom, and how it differs from paranoia. Recently, a growing body of literature has provided support for the notion that paranoia and ideas of reference, while related to one another, are two distinct symptoms. In fact, several preliminary studies have provided compelling evidence suggesting ideas of reference do not always show paranoid feature, but can instead exhibit socially anxious qualities (Lenzenweger et al., 1997; Meyer & Lenzenweger, 2009). In order to understand the nature of the relationships between ideas of reference, paranoia, and social anxiety it is important to first understand what these terms mean, and how they differ from one another.

Ideas of reference, also referred to as referential thoughts, are described by the DSM-IV-TR as “the feeling that casual incidents and external events have a particular and unusual meaning that is specific to the person” (American Psychiatric Association, 2000, p. 824). Similarly, an earlier version of the DSM defines ideas of reference as “an idea, held less firmly than a delusion, that events, objects, or other people in the person’s immediate environment have a particular and unusual meaning specifically for him or her” (DSM-III-R; American Psychiatric Association, 1987, p. 399). Ideas of reference can include thoughts that other people are paying particular attention or taking special notice of oneself, and thinking that the things they see on TV or read in the newspaper have special meaning for oneself (Raine, 1991). Ideas of reference differ from delusions of reference only in that the latter involves a belief that is held with a much stronger conviction in spite of evidence clearly indicating the belief is false (DSM-IV-TR; American Psychiatric Association, 2000, p. 299). Referential thinking is common in schizophrenia, occurring in about 67% of individuals with schizophrenia according to one study (World Health Organization, 1973). Additionally, elevated referential thinking has been

observed in individuals with psychometrically-defined schizotypy (Meyer & Lenzenweger, 2009) and relatives of schizophrenic probands (Kremen, Faraone, Toomey, Seidman, & Tsuang, 1998; Yarialian et al., 2000) compared to controls.

Another common symptom of schizophrenia-spectrum disorders is paranoia, which involves suspiciousness and/or beliefs that one is being harassed, mistreated, or plotted against (American Psychiatric Association, 2000, p. 826). Paranoid ideations are estimated to occur in approximately 50% of individuals with schizophrenia (Sartorius et al., 1986), and have been shown to be elevated in relatives of schizophrenic probands (Kremen et al., 1998; Yarialian et al., 2000) and in individuals with psychometrically-defined schizotypy (Spitznagel & Suhr, 2004) when compared to controls. Freeman and Garety (2000) explain that there has been some confusion in the field about what exactly is meant by the terms “paranoia” or “persecutory delusions”. They posit that in order for a belief to be considered paranoid or persecutory in nature, one must believe that they are at risks of being harmed by someone, and that this person is *intentionally* trying to harm them.

Some ideas of reference appear to exhibit paranoid features, however this is not always the case. Startup and Startup (2005) found paranoia correlated with referential thoughts involving beliefs about other people watching them or spreading rumors about them (“delusions of observation”), but did not correlate with “delusions of communication”, which refer to thoughts that other people are trying to communicate with them in vague or subtle ways. Similarly, Wing et al., (1974) described two different types of ideas of reference, which he referred to as *guilty* and *simple* ideas of reference, but only the former appears to be related to paranoia. *Guilty* ideas of reference refer to thoughts that other people are blaming them for some action or attribute, and in more severe cases may exhibit paranoid themes related to thoughts that

others are “out to get them” or punish them. On the other hand, *simple* ideas of reference exhibit more socially anxious themes characterized by self-consciousness and the belief that other people are taking special notice of their flaws, criticizing them, or laughing at them.

This description of *simple* ideas of reference exemplifies the notion that referential thoughts are not always paranoid, but can sometimes exhibit features of social anxiety. Social anxiety, which involves fears associated with social situations in which one may be embarrassed or negatively evaluated by others, is common in schizophrenia-spectrum disorders. It has been estimated that roughly one-third of patients with schizophrenia meet criteria for a comorbid diagnosis of social anxiety disorder (Pallanti, Quercioli, & Hollander, 2004), and elevated levels of social anxiety have been observed in siblings of schizophrenia patients compared to controls (Torgersen, Onstad, Skre, Edvardsen, & Kringlen, 1993). Research examining ideas of reference in relation to social anxiety is minimal, although there have been preliminary findings that otherwise healthy participants with elevated levels of social anxiety endorsed experiencing more ideas of reference compared to non-anxious controls (Meyer & Lenzenweger, 2009).

Specifically, socially anxious participants reported experiencing more ideas of reference about other people laughing at them, commenting on their behavior, and feelings of guilt or shame.

Social anxiety and paranoia appear to be related in a number of ways. Gilbert, Boxall, Cheung, and Irons (2005) note that both social anxiety and paranoia can involve ideas of reference such as thoughts that other people are paying special attention to oneself. Additionally, individuals with social anxiety and paranoid ideation both tend to devote more of their attentional resources to detecting potentially anxiety-inducing or threatening stimuli in social situations. However, there is at least one feature required for paranoia that is not necessarily present in social anxiety: the belief that another person is *intentionally* trying to harm them.

In sum, there appears to be an interesting relationship amongst three symptoms of schizophrenia-spectrum disorders: ideas of reference, paranoia, and social anxiety. While these three symptoms conceptually converge and share several common features, they are distinct from one another. Schizotypy research has largely ignored the interconnected nature of these three symptoms, and there has yet to be a cohesive explanation of how these symptoms relate to one another. The belief that someone is *intentionally* trying harm oneself is a fundamental characteristic of paranoia, and this perception of intentionality may shed light on the relationships between ideas of reference, paranoia, and social anxiety in individuals with schizotypy.

### **Perceived Intentionality**

Several preliminary studies have found that a social-cognitive bias for interpreting other people's actions as being directed at oneself in an intentionally malicious way appears to be related to paranoia, however it is unclear if this bias is related to other symptoms of schizophrenia-spectrum disorders such as social anxiety. Considering the nature of these two symptoms, it would seem logical that this intentionality bias would be more commonly associated with paranoia, which is defined by the belief that someone is intentionally trying to cause them harm, and not as commonly associated with social anxiety. If this is the case, this intentionality bias may be able to provide insight into the interconnected relationships between ideas of reference, paranoia, and social anxiety. Previous studies examining the role of perceived intentionality in paranoia have typically used measures that may not have been optimal considering the nature of the symptom. Recently, several studies have employed a new measure that would appear to be more appropriate for examining how perceived intentionality relates to paranoia. These studies have provided compelling, albeit preliminary, evidence for a link

between an intentionality bias and elevated levels of paranoia. However, this new approach to measuring perceived intentionality has yet to be applied to other schizotypy symptoms (i.e., social anxiety or ideas of reference), and doing so would appear to be a logical next step.

As was previously mentioned, the vast majority of studies examining perceived intentionality have used measures that were not ideal for examining its relationship with paranoia. Most studies employed theory of mind measures in which participants read short stories, and were asked to infer the intentions of one character with regards to how they interacted with another character in the story (Harrington, McClure, & Siegert, 2009). However, more recent studies have started using a measure in which participants imagine that *they* are the other character in the story, and are asked to infer the intentions of the other character with regards to how they interact with the participants themselves (An et al., 2010; Harrington, McClure, & Siegert, 2009; Combs et al., 2009; Combs, Penn, Wicher, & Waldheter, 2007). Considering that paranoia typically involves beliefs regarding other people's actions towards oneself, not towards other people, this new approach seems much more appropriate than traditional measures. While this approach is still relatively new, several preliminary studies using this novel measure have provided intriguing findings.

This new measure of perceived intentionality has only been used in three studies, and all three studies have found a link between an intentionality bias and elevated levels of paranoia. Combs et al. (2007) found that the interpretation of another person's actions in negative social situations (e.g., a friend not returning one's phone call) as being more intentional, as opposed to accidentally, was positively correlated with paranoia in a nonclinical sample of college students. Moreover, this relationship was strongest in ambiguous scenarios in which the character's intentions were exceptionally unclear. In a different study, Combs et al. (2009) found psychiatric

patients with persecutory delusions exhibited higher levels of perceived intentionality in ambiguous scenarios when compared with non-delusional psychiatric controls and healthy controls. Most recently, a study conducted by An et al. (2010) found that first-episode schizophrenia patients and individuals at ultra-high risk for psychosis exhibited higher levels of perceived intentionality compared to healthy controls, and this intentionality bias was related to increased paranoia. Overall, these preliminary findings suggest that paranoia is related to a biased interpretation of people's actions as being directed towards oneself with malicious intent. However, it is unclear if this relationship is present in other schizotypy symptoms.

While there are only a few studies examining how perceived intentionality relates to paranoia, even less is known about how it relates to other schizotypy symptoms such as social anxiety or ideas of reference. In fact, to the author's knowledge, there are no studies that look at how perceived intentionality relates to these symptoms in a schizophrenia-spectrum sample. Investigating how this bias relates to these other symptoms would seem to be a logical next step in investigating the relationship between ideas of reference, paranoia, and social anxiety. It is not surprising that this social-cognitive bias is more common in individuals with paranoia, compared to non-paranoid individuals, considering this symptom is defined by the belief that someone is intentionally trying to harm oneself. However, this belief is not a requirement of socially anxious thoughts. As such, this intentionality bias may relate to social anxiety in a completely different way than it does to paranoia. If this is the case, this social-cognitive bias may be able to shed light on the relationship between social anxiety and paranoia, as well as how these two symptoms relate to ideas of reference. As was previously mentioned, both paranoia and social anxiety can involve ideas of reference (i.e., people paying special attention to oneself), and it can be difficult to differentiate an idea of reference with paranoid features from one that is socially

anxious in nature. For example, if an individual were to walk past a group of strangers who happened to be laughing, and interpret the situation to mean that the strangers were laughing at them one might initially assume this idea of reference is socially anxious in nature. However, if the person believed these strangers were intentionally trying to hurt their feelings by laughing at them, then it would appear that this individual is exhibiting paranoia more so than social anxiety.

In sum, previous studies have found a relationship between paranoia and a bias regarding the interpretation of other people's intentions towards oneself. However, it is unclear if this social-cognitive bias is specific to paranoia, or if it is related to other schizotypy symptoms such as social anxiety and ideas of reference. The primary aim of the current study was to examine this social-cognitive bias in a schizotypy sample, and investigate its role in explaining the relationships between ideas of reference, paranoia, and social anxiety.

### **Purpose**

Ideas of reference, paranoia, and social anxiety are three common features of schizotypy, which appear to be conceptually related to each other in an interesting way. However, the precise nature of these relationships is unclear. This may be due to the fact that while a considerable amount of schizotypy research specifically focuses on examining paranoia, ideas of reference have largely gone unstudied possibly due to the traditional misconception that they are simply a component of paranoia as opposed to a separate symptom (Startup & Startup, 2005; Leon, Bowden, & Faber, 1989). However, ideas of reference and paranoia are undoubtedly separate features of schizotypy. In fact, while many ideas of reference are paranoid in nature, it appears that the content of some ideas of reference may be more related to social anxiety.

In order to address this knowledge gap, the current study examined how the relationships between ideas of reference, paranoia, and social anxiety may be explained by a social-cognitive

bias for perceiving other people's actions during negative social situations as being intentionally malicious. While several preliminary studies suggest a link between this social-cognitive bias and paranoia, little is known about how it relates to other features of schizotypy (i.e., social anxiety and ideas of reference). We hypothesized that this social-cognitive bias may moderate the relationship between ideas of reference and social anxiety such that a tendency to perceive other people's actions in negative social situations as being less intentional would predict higher levels of social anxiety. Additionally, we hypothesized that this social-cognitive bias would also moderate the relationship between ideas of reference and paranoia such that perceiving other people's actions in negative social situations as being more intentional would predict higher levels paranoia.

Overall, the current study had three primary goals: 1) replicate findings of elevated ideas of reference, paranoia, and social anxiety in individuals with schizotypy compared to controls, 2) replicate findings that these three symptoms are positively correlated with each other within a schizotypy group, and 3) examine the role of perceived intentionality as a possible moderator between ideas of reference and social anxiety, and between ideas of reference and paranoia.

## **Hypotheses**

The current study examined three sets of hypotheses:

1) Schizotypy group versus control group:

- a. The schizotypy group will exhibit significantly higher levels of ideas of reference compared to controls.
- b. The schizotypy group will exhibit significantly higher levels of paranoia compared to controls.

c. The schizotypy group will exhibit significantly higher levels of social anxiety compared to controls.

2) Within the schizotypy group positive relationships will be found between:

a. Ideas of reference and paranoia

b. Ideas of reference and social anxiety

c. Social anxiety and paranoia

3) Perceived intentionality will act as a moderator between:

a. Ideas of reference and social anxiety such that a tendency to perceive other people's actions in unpleasant social situations as being less intentional will predict higher levels of social anxiety as ideas of reference increases.

b. Ideas of reference and paranoia such that a bias for perceiving other people's actions in unpleasant social situations as being more intentional will predict higher levels paranoia as ideas of reference increases.

## METHOD

### Participants

Undergraduate students ( $n = 6887$ ) at Louisiana State University were invited via e-mail to participate in an online survey for a chance to win a prize of \$25. Approximately one-sixth ( $n = 1148$ ) of those invited participated in the online survey which included a consent form, demographic items, validity items (Chapman & Chapman, 1983), and the Schizotypal Personality Questionnaire-Brief Revised (SPQ-BR; Cohen, Mathews, Najolia, Brown, 2010), which was used to separate participants into schizotypy and control groups. Participants in the schizotypy group were required to have an elevated z-score (above 1.65) on at least one of three SPQ-BR subscales: positive (cognitive-perceptual), negative, or disorganized. Participants in the control group were required to obtain z-scores below the mean on all three subscales.

Participants who met the above criteria to be included in the schizotypy or control group received e-mails and/or phone calls inviting them to participate in the laboratory phase of the study. During the laboratory phase of the study, participants sat in front of a computer, and were asked to read the direction on the screen while a laboratory assistant read them aloud. Several computer-based measures were administered as part of a larger data collection project. The entire administration lasted roughly 2 hours, and participants received a monetary compensation of \$20 for their time. Participants were given the option of receiving class participation credits instead of monetary compensation in both the online and laboratory phases. Of the 84 participants that completed both phases of the study, four were excluded due to missing data. Overall, the final sample consisted of 44 psychometrically-identified schizotypy participants and 36 controls.

The Ambiguous Intentions Hostility Questionnaire (AIHQ; Combs et al., 2007) was used in order to measure participants' perceived intentionality bias by asking participants to read five

vignettes describing unpleasant social scenarios in which a character's intentions were ambiguous (e.g., "you are supposed to meet a new friend for lunch at a restaurant but he/she never shows up), and speak into a microphone what they thought was the "real reason" for a character's (see below for a more detailed description of the AIHQ). Two independent research assistants were trained to transcribe and rate participants' responses on a 5-point Likert scale ranging from 1 ("accidental/not at all hostile") to 5 ("intentionally inflicting harm/very hostile") in order to obtain a "hostility index." Each rater rated all items independently, and weekly consensus meetings were held over the course of four weeks in order to discuss any discrepant scores. The present study exhibited good inter-rater reliability (Brennan & Silman, 1992) with kappa values ranging from .62 to .72.

## **Measures**

The Schizotypal Personality Questionnaire-Brief Revised (SPQ-BR; Cohen et al., 2010) is a 32-item self-report questionnaire based on a longer questionnaire commonly used in schizotypy research to assess a broad range of schizotypy traits (SPQ; Raine, 1991). Compared to the full SPQ, fewer incomplete responses have been observed on the shorter SPR-BR (Cohen et al., 2010). Items are answered using a five-point Likert scale ranging from "strongly disagree" to "neutral" to "strongly agree". The SPQ-BR consists of seven subordinate factors (social anxiety, no close friends/constricted affect, odd/eccentric behavior, magical thinking, odd speech, unusual perceptual experiences, and ideas of reference/suspiciousness), and three superordinate factors: positive (cognitive-perceptual), negative, and disorganized traits. The current study employed this measure in order to identify participants that were eligible for the schizotypy group and the control group (see *Participants* section for group selection criteria).

The Referential Thinking Scale (REF; Lenzenweger et al., 1997) is a 34-item questionnaire designed to assess a broad range of ideas of reference by asking true/false questions about participants' perceptions of daily life events (e.g., "When I overhear a conversation, I often wonder if people are saying bad things about me"). A factor analysis revealed that the items loaded onto five factors related to referential thoughts regarding: 1) being laughed at or other people commenting on their behavior; 2) other people paying close attention to them or criticizing their appearance; 3) feelings of embarrassment, shame, or thoughts that other people blame them for things they did not do; 4) written and visual media specifically directed at them; and 5) common external events (e.g., "dogs seem to bark a lot when I am near"). The REF total score is calculated by summing the number of items marked "true" with the exception of item 19, which is reverse-keyed and should only add a point to the REF total score when marked false. Lenzenweger et al. (1997) found the REF exhibited strong psychometric properties with regards to test-retest reliability (.86), internal reliability (alpha coefficients of .80 or more), high convergence with other measures of schizotypy, and discriminant validity.

The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) is a 20-item questionnaire used to assess social anxiety. Using a Likert scale ranging from 0 "never" to 4 "extremely", participants were asked to rate the degree to which each item was true of their own experiences (e.g., "I am nervous mixing with people I don't know well"). The SIAS has shown high test-retest reliability after 4 weeks ( $r = 0.92$ ) and 12 weeks ( $r = 0.92$ ), high internal consistency ( $\alpha = 0.93$ ), and adequate convergent and discriminant validity (Mattick & Clarke, 1998).

The Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983) is a 53-item questionnaire used to assess a broad range of psychopathological symptoms. Participants are instructed to rate how distressing each item has been for them in the last seven days using a Likert scale ranging from 0 “not at all” to 4 “extremely.” The BSI yields nine subscales: Somatization, Obsessive-Compulsivity, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Psychoticism, and Paranoid Ideation. To measure paranoia, the present study used the 5 items of the BSI that make up the Paranoid Ideation subscale, which has demonstrated good internal reliability ( $\alpha = 0.77$ ), test-retest reliability ( $r = 0.79$ ), and acceptable discriminant, convergent, and construct validity (Derogatis & Melisaratos, 1983).

The Ambiguous Intentions Hostility Questionnaire (AIHQ; Combs et al., 2007) was created to assess a social-cognitive bias for perceiving other people’s actions in negative social scenarios as being directed at oneself in an intentional and malevolent way. The AIHQ consists of 15 short vignettes depicting negative social interaction, which vary in the degree of intentionality. There are five “intentional” scenario and five “accidental” scenarios in which it is relatively obvious whether or not the character’s actions were done on purpose. Additionally, there are five “ambiguous” scenarios in which the character’s intentions are unclear. In this study, participants were asked to read each scenario and pretend that it was actually happening to them (e.g., “You walk past a bunch of teenagers at a mall, and you hear them start to laugh”). After reading each scenario, participants were asked to speak into a microphone explaining what they thought was the real reason for why the character acted as they did. Two independent research assistants rated these responses on a 5-point Likert scale ranging from 1 (“accidental/not at all hostile”) to 5 (“intentionally inflicting harm/very hostile”) in order to obtain a “hostility index.” Next, participants were asked to rate if they believed the character acted this way on

purpose (1 “definitely no” to 6 “definitely yes”), how angry the scenario would make them feel (1 “not at all angry” to 5 “very angry”), and how much they blame the other person for what they did (1 “not at all” to 5 “very much”). Lastly, participants were instructed to speak into a microphone and describe how they would respond to the scenario. Combs et al. (2007) demonstrated the AIHQ exhibited adequate convergence with related paranoia measures as well as discriminant validity with unrelated measures. The present study used the “hostility index” to measure participants’ social-cognitive biases for perceiving intentionality in only the five “ambiguous” vignettes in light of previous findings that this bias is most apparent in ambiguous scenarios (Combs et al., 2007).

## ANALYSES

In order to test the three sets of hypotheses, we conducted three sets of analyses. First, we conducted a multivariate analysis of variance (MANOVA) in order to examine whether individuals in the schizotypy group differed from controls on measures of ideas of reference, social anxiety, and paranoia. Second, correlational analyses were conducted to explore the relationships between ideas of reference, social anxiety, and paranoia amongst individuals with schizotypy. Third, two hierarchical linear regressions were conducted to test the whether perceived intentionality moderated the relationship between ideas of reference and social anxiety, and the relationship between ideas of reference and paranoia. In order to understand the nature of significant interactions we conducted post hoc examinations of the simple slopes using the methodology described by Holmbeck (2002). All variables were normally distributed (skew  $>1.5$ ; kurtosis  $> 1.5$ ) unless otherwise stated.

## RESULTS

### Demographics

Participants in the schizotypy group were similar to controls with regards to gender and ethnicity. Age was positively skewed (skew = 7.64) therefore a Man-Whitney U test was used, which found no significant group differences in age,  $U = 669.50$ ,  $z = -1.25$ ,  $p = .21$  (see Table 1).

Table 1  
Means and Standard Deviations for Demographic and Clinical Variables for Schizotypy and Control Groups

Variable	Schizotypy	Controls	$\chi^2$ or $F$	$p$
	( $n = 44$ )	( $n = 36$ )		
	$M(SD)$	$M(SD)$		
% female	77.27	69.44	.63	.43
% Caucasian	86.36	75.00	1.68	.20
Age	19.45 (1.58)	19.97 (6.27)	669.50 <sup>a</sup>	.21
REF	11.86 (5.11)	5.14 (3.78)	43.02*	<.01
SIAS	34.07 (16.23)	9.92 (7.16)	68.65*	<.01
BSI Paranoia	7.11 (3.26)	1.31 (1.39)	99.41*	<.01

Note. REF = Referential Thinking Scale, SIAS = Social Interaction Anxiety Scale, BSI = Brief Symptom Inventory.

<sup>a</sup> Mann Whitney U

\*  $p < .001$

### Group Differences in Ideas of Reference, Social Anxiety, and Paranoia

A MANOVA was used to test for group differences for ideas of reference, social anxiety, and paranoia. The Roy's largest root multivariate test of overall differences among groups was statistically significant,  $\theta = 1.72$ ,  $F(3, 76) = 43.61$ ,  $p < .001$ . To follow up on this finding,

separate univariate ANOVA's were employed for each of the three dependent variable (Table 1). Supporting the first set of hypotheses, the schizotypy group exhibited significantly higher levels of ideas of reference,  $F(1, 78) = 43.02, p < .001$ , social anxiety,  $F(1, 78) = 68.65, p < .001$ , and paranoia,  $F(1, 78) = 99.41, p < .001$ , compared to controls.

Additionally, a Roy-Bargmann stepdown analysis was performed in which paranoia was entered first, then social anxiety, and lastly ideas of reference. This analysis was performed in order to examine whether main effects were still present for each dependent variable after treating the dependent variables entered in the prior step(s) as covariates. In other words, we examined the main effect for social anxiety after controlling for paranoia, and then we examined the main effect for ideas of reference after controlling for paranoia and social anxiety. Significant main effects were found for paranoia, stepdown  $F(1, 78) = 99.41, p < .001$ , social anxiety, stepdown  $F(1, 77) = 9.06, p = .004$ , and ideas of reference, stepdown  $F(1, 76) = 5.36, p = .023$ .

### **Correlations Between Ideas of Reference, Social Anxiety, and Paranoia Within the Schizotypy Group**

Pearson's  $r$  correlations were computed in order to test the hypothesized relationships between ideas of reference, social anxiety, and paranoia within the schizotypy sample (Table 2). Providing partial support for the hypothesis, paranoia positively correlated with ideas of reference,  $r = .40, p$  (one-tailed) = .004, and social anxiety,  $r = .48, p$  (one-tailed) = .001. However, a significant relationship was not observed between social anxiety and ideas of reference  $r = .12, p$  (one-tailed) = .22.

A potential confound was discovered regarding the dramatically stronger correlations between ideas of reference, social anxiety, and paranoia amongst males in the schizotypy group compared to female schizotypy group participants (Table 3). In light of these findings, and prior studies finding gender differences in paranoia and social anxiety (e.g., Paino-Piñeiro, Fonseca-

Table 2

Pearson's Correlations Between Ideas of Reference, Social Anxiety, and Paranoia Within the Schizotypy Group ( $n = 44$ )

	REF	SIAS	BSI Paranoia
REF	-		
SIAS	.12	-	
BSI Paranoia	.40*	.48*	-

Note. REF = Referential Thinking Scale, SIAS = Social Interaction Anxiety Scale, BSI = Brief Symptom Inventory.

\*  $p < .01$ , one-tailed

Table 3

Intercorrelations, Means, and Standard Deviations for Ideas of Reference, Social Anxiety, and Paranoia for Male ( $n = 10$ ) and Female ( $n = 34$ ) Participants in the Schizotypy Group

Measure	1	2	3	<i>M</i>	<i>SD</i>
1. REF	-	.51 <sup>t</sup>	.76**	11.60	6.04
2. SIAS	-.02	-	.61*	35.00	17.14
3. BSI Paranoia	.25 <sup>t</sup>	.43**	-	6.80	3.82
<i>M</i>	11.94	33.79	7.21		
<i>SD</i>	4.91	16.21	3.13		

Note. Intercorrelations for male participants in the schizotypy group ( $n = 10$ ) are displayed above the diagonal, and intercorrelations for female participants in the schizotypy group ( $n = 34$ ) are displayed below the diagonal. Means and standard deviations for male participants in the schizotypy group are displayed in the vertical columns. Means and standard deviations for female participants in the schizotypy group are displayed in the horizontal rows. REF = Referential Thinking Scale, SIAS = Social Interaction Anxiety Scale, BSI = Brief Symptom Inventory.

<sup>t</sup>  $p < .10$ , one-tailed. \*  $p < .05$ , one-tailed. \*\*  $p < .01$ , one-tailed.

Pedrero, Lemos-Giráldez & Muñiz, 2008; Bora & Arabaci, 2009) we controlled for the effects of gender in the following analyses.

To examine whether these gender differences might be explained by problems with normality, we examined the distribution of these three variables amongst males and females separately and the distribution of these variables amongst both groups combined. All three variables were normally distributed (skew  $>1.5$ ; kurtosis  $> 1.5$ ) amongst males, females, and the combined sample.

### **The Moderating Role of Perceived Intentionality on Ideas of Reference and Social Anxiety**

In order to examine whether perceived intentionality moderated the relationship between ideas of reference and social anxiety within the schizotypy group a hierarchical linear regression was computed using the procedures described by Barron and Kenney (1986), and further clarified by Frazier, Tix, and Barron (2004). We controlled for paranoia and gender by entering these variables into Step 1. Both the predictor variable (ideas of reference) and the moderator variable (perceived intentionality) were centered, and these centered variables were entered in Step 2. The two centered variables were used to create an interaction term (ideas of reference X perceived intentionality), which was entered into Step 3. The addition of the interaction term significantly improved the model explaining an additional 7.4% of the variance (Table 4). The effect size of the interaction term was in the small range,  $f^2 = .11$  (Cohen, 1992).

In order to examine the nature of this interaction we calculated regression equations to depict how the level of social anxiety changes as ideas of reference increases (low IOR = 1 *SD* below the mean; high IOR = 1 *SD* above the mean) using the methodology described by Holmbeck (2002). Separate simple slopes (Figure 1) were calculated for low perceived intentionality (low PI = 1 *SD* below the mean) and high perceived intentionality (high PI = 1 *SD*

Table 4  
Hierarchical Linear Regression Analyses Examining the Moderational Role of Perceived Intentionality Between Ideas of Reference and Social Anxiety Controlling for Paranoia and Gender Within the Schizotypy Group ( $n = 44$ )

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$
Dependent Variable: Social Anxiety						
Step 1	.229	6.08	41			<.01**
Paranoia				.48	3.48	<.01**
Gender				-.06	-0.41	.68
Step 2	.006	1.284	39			.02*
Perceived Intentionality				-.01	-0.09	.93
Ideas of Reference				-.08	-0.53	.60
Step 3	.074	0.15	38			<.01**
Perceived Intentionality X Ideas of Reference				-.35	-2.02	.05*

Note. Social anxiety measured by the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998); Paranoia measured by the Brief Symptom Inventory (BSI; Derogatis, 1993); Perceived intentionality measured by the Ambiguous Intentionality Hostility Questionnaire (AIHQ; Combs et al., 2007); Ideas of reference measured by the Referential Thinking Scale (REF; Lenzenweger et al., 1997).

\*  $p < .05$ ; \*\*  $p < .01$

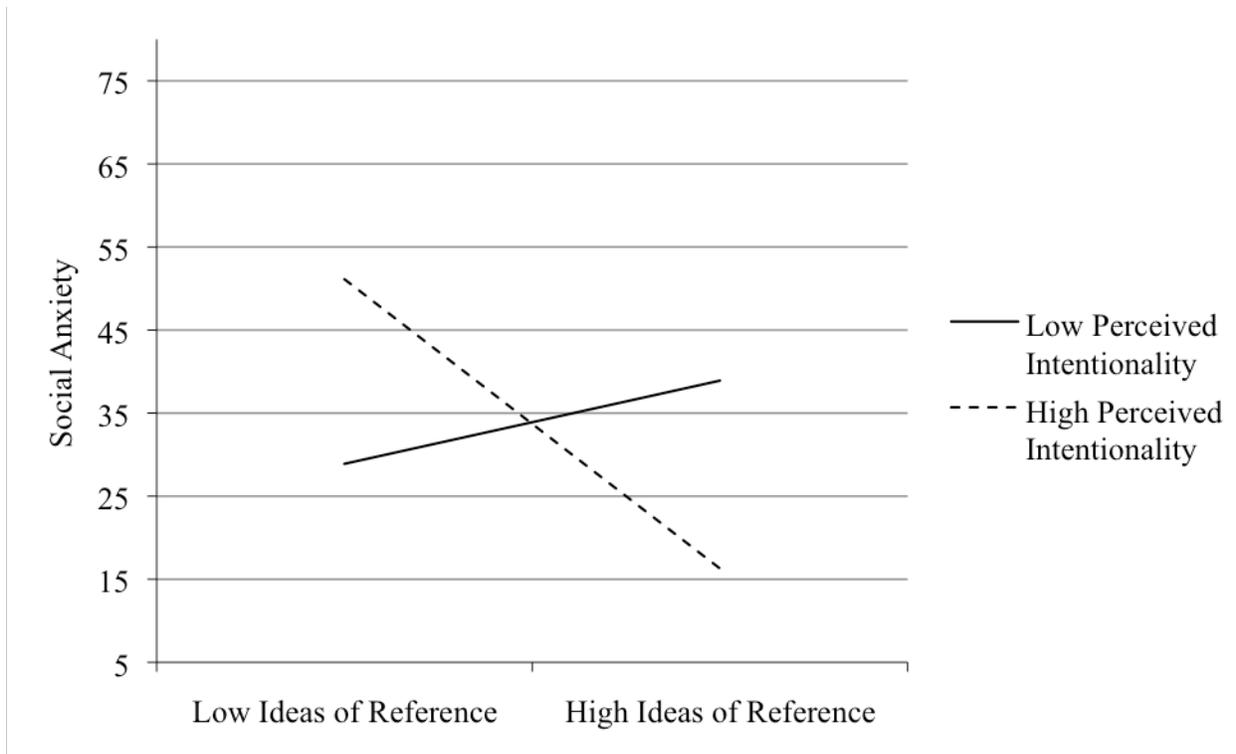


Figure 1. Interaction effects of perceived intentionality (low perceived intentionality = 1 SD below the mean; high perceived intentionality = 1 SD above the mean) and ideas of reference (low ideas of reference = 1 SD below the mean; high ideas of reference = 1 SD above the mean) on social anxiety amongst individuals with schizotypy.

above the mean). Post hoc probing of the interaction revealed a significant simple slope for high PI ( $t = -2.00, p = .05$ ), but not low PI ( $t = 0.84, p = .41$ ).

### **The Moderating Role of Perceived Intentionality on Ideas of Reference and Paranoia**

An additional hierarchical linear regression was run in order to examine whether perceived intentionality moderated the relationship between ideas of reference and paranoia within the schizotypy group. We controlled for social anxiety and gender by entering these variables into Step 1. Perceived intentionality and ideas of reference were centered and entered into Step 2, and the interaction term (ideas of reference X perceived intentionality) was entered into Step 3. The addition of the interaction term significantly improved the model explaining an additional 9.1% of the variance (Table 5). The effect size of the interaction term was in the medium range,  $f^2 = .17$  (Cohen, 1992).

In order to examine the nature of this interaction we calculated regression equations to depict how the level of paranoia changes as ideas of reference increases (low IOR = 1 *SD* below the mean; high IOR = 1 *SD* above the mean) using the methodology described by Holmbeck (2002). Separate simple slopes (Figure 2) were calculated for low perceived intentionality (low PI = 1 *SD* below the mean) and high perceived intentionality (high PI = 1 *SD* above the mean). Post hoc probing of the interaction revealed a significant simple slope for high PI ( $t = 3.63, p < .001$ ), but not low PI ( $t = 0.20, p = .84$ ).

### **Examining Alternative Hypotheses**

In an attempt to increase confidence in the effects observed in the previous moderator analyses we conducted two additional hierarchical linear regressions after switching the moderator variable with the outcome variable in order to test competing hypotheses for both models. To test the first alternative hypothesis that social anxiety moderates the relationship

Table 5  
 Hierarchical Linear Regression Analyses Examining the Moderational Role of Perceived  
 Intentionality Between Ideas of Reference and Paranoia Controlling for Social Anxiety and  
 Gender Within the Schizotypy Group ( $n = 44$ )

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$
Dependent Variable: Paranoia						
Step 1	.23	6.13	41			.01*
Social Anxiety				.48	3.48	<.01**
Gender				.07	0.50	.62
Step 2	.14	4.44	39			<.01**
Perceived Intentionality				.17	1.32	.20
Ideas of Reference				.33	2.58	.01*
Step 3	.09	6.42	38			.06
Perceived Intentionality X Ideas of Reference				.38	2.54	.02*

Note. Social anxiety measured by the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998); Paranoia measured by the Brief Symptom Inventory (BSI; Derogatis, 1993); Perceived intentionality measured by the Ambiguous Intentionality Hostility Questionnaire (AIHQ; Combs et al., 2007); Ideas of reference measured by the Referential Thinking Scale (REF; Lenzenweger et al., 1997).

\*  $p < .05$ ; \*\*  $p < .01$

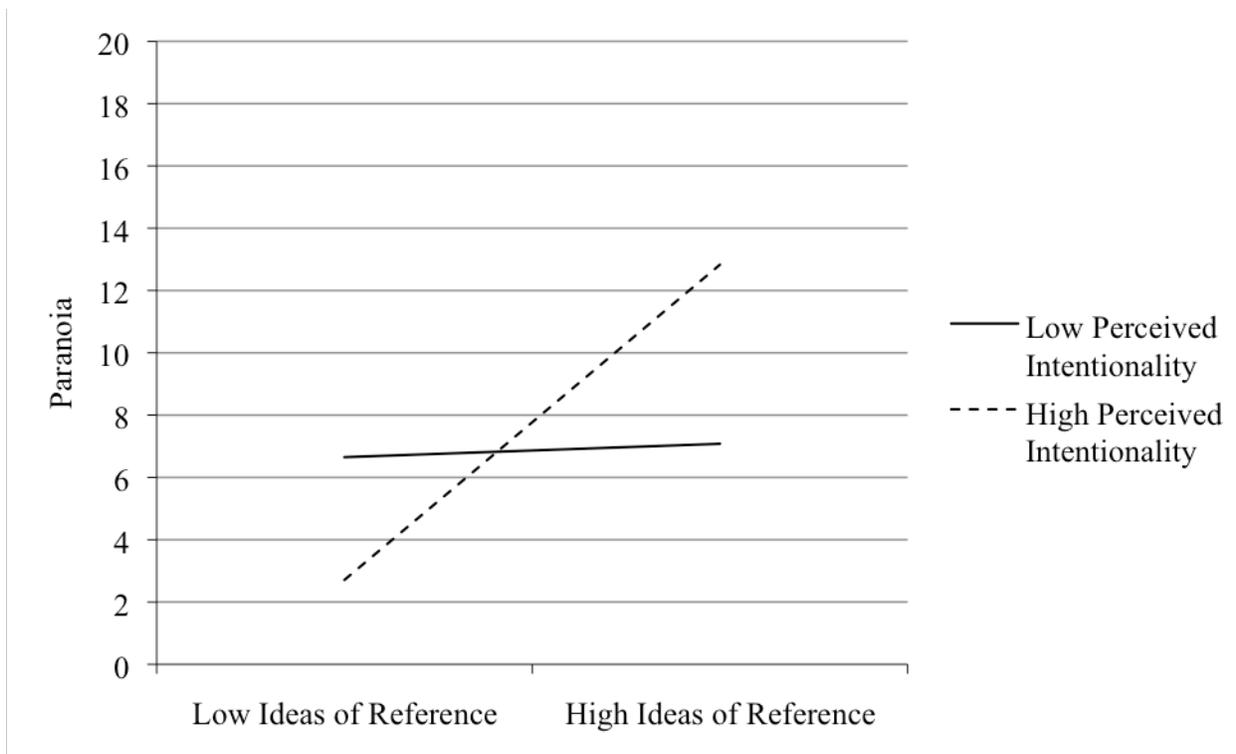


Figure 2. Interaction effects of perceived intentionality (low perceived intentionality = 1 SD below the mean; high perceived intentionality = 1 SD above the mean) and ideas of reference (low ideas of reference = 1 SD below the mean; high ideas of reference = 1 SD above the mean) on paranoia amongst individuals with schizotypy.

between ideas of reference and perceived intentionality we entered paranoia and gender as covariates in Step 1, the centered predictor variable (ideas of reference) and the centered moderator variable (social anxiety) in Step 2, and the interaction term (ideas of reference X social anxiety) in Step 3. The interaction was not significant,  $\Delta R^2 = .02$ ,  $\Delta F(1, 38) = 0.68$ ,  $p = .41$ .

To test the second alternative hypothesis that paranoia moderates the relationship between ideas of reference and perceived intentionality we entered social anxiety and gender as covariates in Step 1, the centered predictor variable (ideas of reference) and the centered moderator variable (paranoia) in Step 2, and the interaction term (ideas of reference X paranoia) in Step 3. The interaction was not significant,  $\Delta R^2 = .02$ ,  $\Delta F(1, 38) = 0.92$ ,  $p = .35$ .

Our findings that both alternative hypotheses were not significant indicate that these models do not explain the relationships between these variables. As such, these findings increase confidence in the original models.

### **The Moderating Role of Perceived Intentionality Within the Control Group**

Lastly, we examined whether the moderator effects of perceived intentionality on the relationships between ideas of reference and social anxiety, and between ideas of reference and paranoia, which were observed in the schizotypy group, would also be present in the control group. Two additional hierarchical linear regressions were conducted for the control group following the same steps as those described above in the original models, however variables were centered around the control group's mean scores as opposed to the schizotypy group's means.

In the model examining whether perceived intentionality moderated the relationship between ideas of reference and social anxiety within the control group the interaction was not

significant,  $\Delta R^2 = .02$ ,  $\Delta F(1, 30) = 0.52$ ,  $p = .48$ . Additionally, in the model examining whether perceived intentionality moderated the relationship between ideas of reference and paranoia within the control group the interaction was not significant,  $\Delta R^2 = .04$ ,  $\Delta F(1, 30) = 1.53$ ,  $p = .23$ .

## DISCUSSION

The present study explored the role of perceived intentionality as it relates to ideas of reference, social anxiety, and paranoia amongst individuals with psychometrically-defined schizotypy. To the author's knowledge, this is the first study of its kind to examine the moderating effects of perceived intentionality on the relationship between ideas of reference and social anxiety, and the relationship between ideas of reference and paranoia amongst individuals at risk for developing schizophrenia.

### **Group Differences in Ideas of Reference, Social Anxiety, and Paranoia**

Consistent with our first hypothesis, we found that individuals with psychometrically-defined schizotypy exhibited elevated levels of ideas of reference, social anxiety, and paranoia compared to controls. These findings are not surprising considering the abundance of prior studies, which have produced similar results (e.g., Meyer & Lenzenweger, 2009; Spitznagel & Suhr, 2004; Torgersen et al., 1993). This provides additional support for the notion that this study employed effective recruitment methods that resulted in a schizotypy sample with characteristics similar to those seen in other studies, which improves confidence in the generalizability of our findings.

### **Correlations Between Ideas of Reference, Social Anxiety, and Paranoia Within the Schizotypy Group**

Our results partially supported our second set of hypotheses in which we predicted that positive correlations would exist between ideas of reference, social anxiety, and paranoia within the schizotypy group. Consistent with what we expected, paranoia was significantly correlated with social anxiety and ideas of reference such that higher levels of paranoia were related to higher levels of social anxiety and ideas of reference. However, contrary to what we expected, a significant relationship was not observed between ideas of reference and social anxiety.

One possible explanation for this null finding may be related to the aspects of social anxiety measured by the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), which measures discomfort caused by interacting with other people. Theoretically, it stands to reason that social anxiety would be related specifically to ideas of reference that involve incorrectly believing that one is being observed by other people. However, when one is engaging in a social interaction with another person then one would most likely be correct in believing that they are being observed (presumably by the person with whom they are interacting). As such, the SIAS may have not been an ideal measure of social anxiety for this study in that it does not necessarily tap into the aspects of social anxiety that we would expect to be related to ideas of reference. Future studies examining the relationship between ideas of reference and social anxiety may consider measuring several different aspects of social anxiety to assess whether specific facets of social anxiety may relate more to ideas of reference. For example, the Social Phobia Scale (SPS; Mattick & Clarke, 1998) may be more likely to correlate with ideas of reference because it measures fears of being negatively evaluated by others while performing everyday activities (e.g., eating, writing, talking), which would presumably involve beliefs that others are paying attention to oneself even while engaging in relatively banal activities in which it is not necessarily likely that they are actually being observed.

While examining these correlations we discovered dramatic gender differences with regards to the relationships between ideas of reference, social anxiety, and paranoia. Specifically, males in the schizotypy group exhibited stronger positive correlations between all three variables relative to females in the schizotypy group. Additionally, correlational analyses amongst only the male schizotypy participants revealed significant relationships (at trend level or higher) in spite of these analyses being underpowered as a result of the relatively few male participants in this

study ( $n = 10$ ), and the effect sizes of all three correlations were in the large range (Cohen, 1992). On the other hand, female participants in the schizotypy group exhibited fewer significant correlations, which all exhibited weaker relationships than those observed amongst the males. These gender differences did not appear to be explained by problems with normality as all the variables were normally distributed amongst males and females. It is unclear exactly why these variables were more strongly related amongst the males in this study. Regardless, considering such dramatic gender differences were present in our study we controlled for gender in the following moderator analyses.

### **The Moderating Role of Perceived Intentionality on Ideas of Reference and Paranoia**

In the model examining whether perceived intentionality (PI) moderated the relationship between ideas of reference and paranoia the addition of the interaction term significantly improved the model explaining an additional 9.1% of the variance. Post hoc probing of the interaction revealed a significant simple slope for high PI, but not low PI. These results are consistent with our hypothesis that PI would moderate the relationship between ideas of reference and paranoia such that perceiving other people's actions in negative social situations as being more intentional would predict higher levels paranoia as ideas of reference increased. These results are consistent with the body of research, which has produced relatively consistent findings that ideas of reference and paranoia are positively related (Startup & Startup, 2005; Leon, Bowden, & Faber, 1989). However, our results suggest that this relationship occurs as a function of high PI. Amongst the schizotypy participants with low PI there was virtually no change in paranoia as ideas of reference increased. On the other hand, schizotypy participants with high PI and high ideas of reference obtained paranoia scores roughly four times higher than those obtained by schizotypy participants with high PI and low ideas of reference.

One possible explanation for why this effect is present for high PI, but not low PI, may be that individuals with high PI experience different types of paranoid ideations compared to those with low PI. For example, it is possible that schizotypy participants with low PI may have more global and enduring paranoid beliefs (e.g., “the world is dangerous”) that do not necessarily have any relationship to ideas of reference. For instance, an individual who believes that the world is a dangerous place would likely believe that the world is just as dangerous regardless of whether or not people are taking special notice of them. On the other hand, individuals with high PI may be experiencing paranoia as it is more traditionally conceptualized (i.e., persecutory thoughts that others are trying to harm oneself), which would be more heavily affected by ideas of reference.

These findings have a number of practical implications. For instance, these findings may be of practical importance for less severe schizophrenia-spectrum populations experiencing subclinical symptoms (i.e., schizotypy) who seek mental health services. Morrison et al. (2004) found that it is not uncommon for individuals exhibiting subclinical symptoms of schizophrenia-spectrum disorders to seek therapy, generally for mood or anxiety-related symptoms. Measuring ideas of reference and perceived intentionality may be a valuable way of indirectly assessing paranoia. Mental health professionals may find this particularly useful for patients that they suspect may be purposefully denying paranoid ideations for any number of reasons (e.g., impression management, fear of forced hospitalization). It would seem reasonable that these individuals may be more likely to respond accurately to measures of perceived intentionality and ideas of reference as these measures may be viewed as less threatening. For instance, while a patient might be hesitant to admit to believing that they are being conspired against fearing that they might be labeled as severely mentally ill, they may be more comfortable answering questions about how they would interpret the hypothetical scenarios from the AIHQ (Combs et

al., 2007), which may be viewed as being less incriminating. Compared to patients with more severe paranoid delusions, this approach may be especially useful for at-risk populations considering that these individuals may exhibit more insight into their atypical beliefs, and may exhibit greater impression management for fear of appearing mentally ill (Morrison et al., 2004). Additionally, similar clinical implications could be applied to assessing and treating schizophrenia if similar effects are found to be replicable in schizophrenic populations.

### **The Moderating Role of Perceived Intentionality on Ideas of Reference and Social Anxiety**

In the model examining whether perceived intentionality moderated the relationship between ideas of reference and social anxiety, the addition of the interaction term significantly improved the model explaining an additional 7.4% of the variance. Post hoc probing of the interaction revealed a significant simple slope for individuals with high PI, but not those with low PI. These results did not support our hypothesis that perceived intentionality would moderate the relationship between ideas of reference and social anxiety such that perceiving other people's actions in negative social situations as being less intentional (i.e., low PI) predicts higher levels of social anxiety as ideas of reference increases. Instead our findings suggest that perceived intentionality moderates the relationship between ideas of reference and social anxiety such that perceiving other people's actions in negative social situations as being *more* intentional predicts *lower* levels of social anxiety as ideas of reference increases.

Once again, these unexpected results may be partially explained by the measure we used to assess social anxiety. There are several items on the SIAS that are worded such that they essentially ask participants whether they are uncomfortable in a number of social situations, but they do not specifically assess what aspects of these situations cause one's discomfort. For example, one item asks if "when mixing socially, [they are] uncomfortable." The problem with

this item is that it is unclear what exactly about “mixing socially” causes their discomfort, and so it is unclear whether their feeling uncomfortable is indicative of social anxiety or if it may be indicative of another symptomology (e.g., paranoia, social anhedonia). That is, it is unknown whether the discomfort is caused by fears that they will embarrass themselves (social anxiety), that others will verbally attack them during a social interaction (paranoia), or if this discomfort is actually caused by a general lack of interest in interacting with other people because one finds social interactions boring or unenjoyable (social anhedonia).

Regardless, our findings suggest that amongst schizotypy participants with high PI, high ideas of reference actually may have served as a protective factor against discomfort in social interactions. One possible explanation for this is that these individuals may exhibit some degree of grandiosity or some other self-serving bias (e.g., “I’m unique and important, and others are jealous of me so they intentionally try to harm me”). Future studies may consider assessing different domains of social anxiety with multiple measures to examine which specific aspects of social anxiety are related to ideas of reference and perceived intentionality. Also, future research may consider examining how these variables relate to grandiosity and other self-serving biases.

### **Alternative Hypotheses and Examining Perceived Intentionality Amongst Controls**

We conducted two additional hierarchical linear regressions within the schizotypy group after switching the moderator variable (perceived intentionality) with the outcome variables (paranoia and social anxiety) in order to test competing hypotheses for both models. The interaction effects were not significant for either model thus increasing confidence in the effects observed in the original moderator analyses.

Lastly, we ran two final hierarchical linear regressions for the control group to examine if the moderator effects observed for the schizotypy group were also present amongst controls. The

interactions in both models were not significant indicating that within the control group perceived intentionality did not moderate the relationship between ideas of reference and social anxiety, nor the relationship between ideas of reference and paranoia. This suggests the moderating effects of perceived intentionality is not a phenomenon that occurs in a broad range of individuals, but rather may be specific to schizotypy and schizophrenia-spectrum disorders. Future studies may consider examining whether these moderating effects are observed in other clinical samples (e.g., depression) to examine whether this phenomenon is specific to schizophrenia-spectrum disorders, or if it may be characteristic of a variety of psychopathologies.

### **Limitations and Future Research**

The present study had several limitations. First, our sample consisted of exclusively college undergraduates, and the majority of our participants were Caucasian and female. This creates some concern regarding the generalizability of our findings to broader schizotypy populations. While this issue is rather typical of schizotypy research, future studies would benefit from selecting participants from a more diverse community-based sample in order to examine whether our findings are generalizable to a wide range of individuals with schizotypy. Additionally, considering the small number of male participants in this study, there is considerable uncertainty regarding the generalizability of the gender effects we observed in the correlational analyses. Future studies should strive to obtain a more balanced number of male and female participants.

Second, as has been previously mentioned, the SIAS (Mattick & Clarke, 1998) may have not been the most ideal measure of social anxiety for the present study. Future studies may consider employing a measure of social anxiety that examines aspects of social anxiety that,

theoretically, relate more to ideas of reference. For example, the Social Phobia Scale (SPS; Mattick & Clarke, 1998) may be a more useful measure as it assesses anxiety related to situations in which an individual is not necessarily being observed by other people (e.g., eating a meal) rather than the SIAS, which involves anxiety related to social interactions that generally do involve a reasonable expectation that they are being observed by others to some extent (e.g., talking to an authority figure).

Third, the mode in which we chose to assess perceived intentionality (AIHQ; Combs et al., 2007) could stand to be improved with regards to its ecological validity. The AIHQ described hypothetical vignettes in which participants were asked to imagine that the scenarios were actually happening to themselves. This method, while efficient, does not account for a number of “real world” variables that may influence one’s interpretation of these hypothetical scenarios were they to actually occur to an individual. Notably, these vignettes are unlikely to elicit any strong emotional reactions since they are indeed hypothetical. However, if these scenarios were to occur in real life it is conceivable that the participants may have an emotional reaction that may cause them to be more (or less) likely to exhibit a perceived intentionality bias. For example, if an individual went to a restaurant where they had planned to have dinner with their friend only to find that their friend had forgotten their plans, the individual would probably be somewhat agitated by the inconvenience and may exhibit a more extreme perceived intentionality bias. However, this type of emotional reaction would be unlikely to occur if the same individual was simply reading a vignette describing the same scenario. Future studies may consider employing role-play measures, methodologies involving contrived ambiguous unpleasant scenarios during the testing session with a confederate, and/or retrospective reports of ambiguous social situations to improve ecological validity.

## Conclusion

In summary, the primary focus of the current study was to examine the moderating effects of perceived intentionality on the relationship between ideas of reference and paranoia, and the relationship between ideas of reference and social anxiety amongst individuals with psychometrically-defined schizotypy. As we predicted, we found that perceived intentionality moderated the relationship between ideas of reference and paranoia such that ideas of reference and paranoia were positively related amongst schizotypy participants with high perceived intentionality. However, a significant relationship between ideas of reference and paranoia was not found for schizotypy participants with low perceived intentionality. We also found that perceived intentionality moderated the relationship between ideas of reference and social anxiety. However, contrary to what we expected, the nature of this effect was such that amongst schizotypy participants with high perceived intentionality a negative relationship existed between ideas of reference and social anxiety.

Overall, these findings suggest several theoretical and practical implications. First, the moderating effects of high, but not low, perceived intentionality on the relationship between ideas of reference and paranoia may suggest that within schizotypy the content of the paranoid ideations present in individuals with high perceived intentionality may differ from that which is present in individuals with low perceived intentionality. Second, this finding may be of practical importance in light of prior findings that it is not uncommon for individuals with schizotypy to seek therapy, and the notion that these individuals may be more likely to have insight into the abnormality of their paranoid ideations and engage in compensatory impression management strategies (Morrison et al., 2004). That is, when assessing clients with whom there is concern that they may be intentionally minimizing the severity of their paranoia it may be useful to assess

ideas of reference and perceived intentionality, which clients might view as less threatening and be more likely to answer accurately, as a proxy. Third, the observed moderating effects of perceived intentionality on the relationship between ideas of reference and social anxiety may suggest that amongst individuals with high perceived intentionality, ideas of reference may serve as a protective factor against social discomfort.

Future research may consider whether different moderating effects are present for different aspects of social anxiety (i.e., fear of negative evaluation versus general discomfort in social interactions). Also, future studies may consider examining how perceived intentionality, ideas of reference, and social anxiety relate to grandiosity and other self-serving biases. Lastly, future research could explore possible gender differences with regards to the relationships between ideas of reference, social anxiety, and paranoia amongst individuals with psychometrically-defined schizotypy.

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## VITA

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