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**COGNITIVE, EMOTIONAL, AND CONTEXTUAL FACTORS RELATED TO  
DELUSIONAL IDEATION**

by

Sharanjit D. Pujji

A Thesis

Submitted to the  
Department of Psychology  
College of Science and Mathematics  
In partial fulfillment of the requirement  
For the degree of  
Masters of Arts in Clinical Mental Health Counseling  
at  
Rowan University  
June 1, 2018

Thesis Chair: Thomas Dinzeo, Ph.D.

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## **Dedications**

I would like to dedicate this thesis to all of those who have provided me with an immense amount of support over the years.

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## **Abstract**

Sharanjit D. Pujji  
COGNITIVE, EMOTIONAL, AND CONTEXTUAL FACTORS RELATED TO  
DELUSIONAL IDEATION

2017-2018

Thomas Dinzeo, Ph.D.  
Masters of Arts in Clinical Mental Health Counseling

Our beliefs profoundly influence how we interact and understand the experiences we have and the world around us. However, some individuals may develop “false” beliefs (i.e., delusions) that are not grounded in consensual reality that may create adversities for the individual or others. Although various theories have been developed relating to the formation and maintenance of delusions, explaining their origins, meanings, and precise influence is a difficult task due to the highly individualistic nature of beliefs. The current study examined a number of likely candidate processes suspected of contributing to the formation and maintenance of delusional ideation in a sub-clinical sample of 200 undergraduate students. Overall, mixed support for our hypotheses were found. As expected, sub-clinical schizophrenia-spectrum symptomology were highly correlated. Additionally, delusional ideation was predicted by cognitive and mood facets, and normative beliefs such as spirituality. Expansive delusions in particular were predictive of self-esteem, sense of purpose, and approaching significance with positive affect, highlighting potential positive influences of delusional ideation. Certain elements of cognitive processes, symptomology, emotional, and contextual factors may interact with an individual’s self-view, which in turn may influence the content of specific types of delusional ideation, perhaps leading to the formation and maintenance of such beliefs.

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## Chapter 1

### Introduction

Our beliefs fundamentally shape how we view our daily experiences; these perceptions influence how we behave and the life choices we make. Theorists have attempted to define and explain how false beliefs that significantly deviate from shared consensus (i.e., delusions) are formed and maintained. Early theories have consistently linked the notion of delusions to that of madness or mental disorders (Jaspers, 1968), though explaining its origins and meaning proved to be a difficult task. Many contemporary models of delusion formation stem from the pioneering work of Karl Jaspers harkening back to the early 1900s. Jaspers states there are three main criteria that explain the presence of delusions: 1) staunch conviction that the belief is true, 2) not yielding to contrary evidence that may discredit the belief and 3) the factual implausibility of the belief (Jaspers, 1968). Jaspers used the term *delusion-like ideas* to denote delusional beliefs that are derived from the individual's background and familial/cultural experiences, whereas *delusion-proper* did not have this basis (Jaspers, 1968).

Modern theories influenced by Jaspers' work tend to reference the notion of anomalous experiences contributing to the formation of delusional beliefs. Roberts (1991, 1992) suggests that based on previous research there are three phases that contribute to the formation and maintenance of delusional beliefs. The first phase is a state of pre-psychosis. Within this phase, there are stages of predisposing (innate, biological) and precipitating factors (life events, experiences) that exist. The second phase is called the acute phase and involves a prodromal stage of an anomalous experience. The individual

attempts to put meaning onto and explain this experience. Most often this is a non-complex delusion and perhaps might be novel to the individual. If the individual suggests a meaning that is not in line with the experience or their own background *delusions-proper*, or primary delusions are formed. Phase three is the chronic phase in which the individual elaborates and expands their delusional belief to similar, new, or existing experiences (Roberts, 1991, 1992). Maher (1992) adds that individuals seek to put meaning to anomalous experiences in order to relieve any tension that might arise from the unknown-like quality and confusion of such experiences. Many beliefs, whether delusional or “normal” (fitting with the surrounding culture and society) involve an attribution of meaning or explanation to experiences (Maher, 1992). However, the contributing factors to the formation and maintenance of beliefs are highly individualized and can vary greatly from person to person (Roberts, 1992).

Importantly, Jaspers (1968), Maher (1992), and Roberts (1991, 1992), have all noted that delusions might form in order to provide a sense of meaning, explanation, or purpose to the individual. In fact, the concepts of Maher and Roberts include this notion as a central point. Once meaning is applied to an experience, many individuals report a diminishment in the internal distress that was related to their uncertainty. In this sense, certain delusions might provide the means for an individual to cope with their surrounding experiences and perhaps even aid in explaining and putting meaning to certain physical and mental symptoms that they might be experiencing. On the other side, studies have found that the presence of delusions can also be associated with levels of depression and anxiety (Colbert, Peters, & Garety, 2010) and can further alienate individuals from social supports (Saha, Scott, Varghese, & McGrath, 2012; Ertugrul, &

Uluğ, 2004) or lead to potentially dangerous behaviors (Joseph, Victor, & Rimona, 2011; Onwumere, Learmonth, & Kuipers, 2016). Thus, the adaptive (or meaning-creating) nature of delusional beliefs and the potential harm to the individual and society are two sides of the same coin that must be considered when working clinically with individuals who have formed delusional beliefs. Treatment plans that take into account this duality have a much greater likelihood of being effective.

With this in mind, basic research on belief-formation and belief-maintenance in subclinical populations is quite rare. This is unfortunate since this form of research has the potential to aid in the prediction of future clinical diagnoses and symptomology (Verdoux & van Os, 2002). More information is needed regarding the factors that influence how an individual perceives, interprets, and copes with the circumstances that surround them. The development of delusional beliefs can occur across a range of physical health and mental health diagnoses (Maher 1992). In particular, delusional beliefs and ideation are listed among the possible criteria for all the schizophrenia-spectrum disorders listed in the Diagnostic and Statistical Manual (DSM-5; American Psychiatric Association, 2013). The DSM-5 is used by mental health professionals in North America to formally diagnose mental disorders. Thus, delusions or delusion-like beliefs are viewed as being a central feature of the primary psychotic disorders that range from the sub-clinical symptoms of schizotypy (Debbané, Van der Linden, Gex-Fabry & Eliez, 2009) to cluster A personality disorders (e.g., schizotypal personality disorder) (American Psychiatric Association, 2013), through the various clinical manifestations of the schizophrenia-spectrum disorders (Barrantes-Vidal, Chun, Myin-Germeys & Kwapil, 2013; Debbané, Van der Linden, Balanzin, Billieux & Eliez, 2012; Nunn, Rizza & Peters,

2001; Smith, Riley & Peters, 2009; Verdoux & van Os, 2002). The concepts of multifinality (i.e., similar pathways to multiple symptomology outcome presentations) and equifinality (i.e., multiple pathways to a single or similar symptomology outcome presentation) apply to the development of delusional beliefs since the exact factors are not necessarily consistent and present across all those that experience delusions (Cicchetti & Rogosch, 1996). Thus, studying a multitude of potential factors is needed to illuminate the “common” and idiopathic mechanisms behind the formation and maintenance of delusional beliefs. In fact, Roberts (1992) stated that there is a need to attempt to develop an intricate and multifaceted approach to understanding delusions across disciplines. Thus, prior to articulating the purpose of the present study, some basic background on potential factors that can be involved in belief (normative and abnormal) formation and maintenance is provided.

## **Chapter 2**

### **Literature Review**

#### **Potential Factors Involved in Belief Formation and Maintenance**

There are several likely candidates that may be involved in belief formation and maintenance. These may include elements of symptomology, cognitive processes, and the influence of society. We have organized the following review based on the major themes present within the literature.

**Anxiety, uncertainty, and meaning.** Maher (1992) states that an odd experience (i.e., one that cannot be accounted for based on previous understandings) can generate the need for an individual to explicitly construct new explanations, or rationalizations for the experience in order to avoid the angst associated with the unknown, which may be experienced as threatening or confusing. Thus, in the context of Robert's (1991, 1992) precipitating and predisposing factors, delusions might be constructed in essence to protect the individual from the fear of the unknown and to maintain the integrity of the individual's core belief systems (Roberts, 1992, Maher, 1992) and sense of wellbeing (Jolley, Garety, Bebbington, Dunn, Freeman, Kuipers &...Hemsley, 2006). However, the newly constructed belief may not fit in with the most plausible explanation. Self-esteem might also have a role in the formation and maintenance of delusions (Jolley et al., 2006), where beliefs are formed in order to preserve an individual's self-esteem. This has particular clinical implications because individuals with higher self-esteem and purpose might be prone to higher levels of delusional ideation, and find their delusions to be on the rewarding and positive side (Roberts, 1991).

Incompatible situations and explanations might be viewed as a defensive act if the plausible explanation is somehow threatening to their perceived integrity/wellbeing. Stated another way, individuals might try to irrationally explain anomalous experiences due to a fear or intolerance of the unknown combined with other indefinite predisposing and precipitating factors. The intolerance of uncertainty can invoke depression and anxiety (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994; Maher, 1992), both of which tend to have relationships with delusions (Colbert, Peters, & Garety, 2010) and schizotypy (Debbané, Van der Linden, Gex-Fabry, & Eliez, 2009). Furthermore irrational beliefs may be reinforced through the comfort and relief from tension and anxiety that they provide regardless of the soundness of that explanation (Maher, 1992). However, once formed, these irrational beliefs create their own potential for distress and conflict. The formation and presence of delusions can be related to reported levels of stress (Maher, 1992), anxiety, and depression (Colbert, Peters, & Garety, 2010). Affect and feelings may also influence perceptual experiences, symptomology, and memory (Ditman & Kuperberg, 2005; Johnson, Hashtroudi, & Lindsay, 1993). Daily life stressors in particular have been linked to negative lifestyle factors and symptoms of psychosis and perhaps even precipitating certain psychological symptoms (Barrantes-Vidal, Chun, Myin-Germeys, & Kwapil, 2013).

Similarly, this process of delusional formation stated above can be applied to medical issues. Currently, there is a desire in multiple fields for research that seeks to focus on relationships between schizophrenia-spectrum and mental health diagnoses and physical illnesses as well as how they impact the individual (Slavich, 2015; Vancampfort, De Hert, Sweers, De Herdt, Detraux, & Probst, 2013). Previous associations with

schizophrenia include: asthma (Pedersen, Benros, Agerbo, Børghlum, & Mortensen, 2012); obesity and other persistent diagnoses (Shen, Sambamoorthi, & Rust, 2008); and cognitive impairments in immediate memory and attention in individuals that have been diagnosed with both schizophrenia and diabetes (Han, Huang, Chen, Xiu, Kosten, & Zhang, 2013). However, very little to no research exists on physical illnesses and schizotypy. If an individual has a medical experience, they might also seek to find an explanation or cause. If the resulting explanation is not rational, similar dysfunctional and perhaps delusional beliefs and ideation might arise in order to experience the relief associated with understanding the source of a medical ailment. It is also possible for an individual to feel that a remission from a medical issue or even the initial diagnoses means that they were chosen or are being punished by something. This follows the thought pattern of self-serving attributional biases in which individuals determine and interpret the meaning of events around them in a way that best serves them. This includes placing the cause of positive events on themselves, and the cause of negative events on others (Bradley, 1978; Roese & Olson, 2007).

**Cognitive processes and obsessions.** According to modern cognitive theory, all people form a wide range of mental representations (schema) that work to organize information about the world and help anticipate future events (Beck & Haigh, 2014). When an individual encounters a scenario, these automatic processes help to provide meaning to, or explain, the individual's experiences. Cognitive biases and distortions are actually quite common and are believed to underlie clinical issues such as anxiety and depression (Beck & Haigh, 2014). For example, many individuals with depressive tendencies engage in catastrophizing, which is the inclination to focus on the most



negative potential outcome of a situation. Similarly, research suggests that there is some level of overlap between schizophrenia-spectrum and obsessive-compulsive symptoms whereby an idea becomes difficult to shake and may lead to seemingly irrational behavioral responses (Sobin, Blundell, Weiller, Gavigan, Haiman, & Karayiorgou, 2000). Thus, cognitive failures may be quite common and represent instances when cognitive processes such as thoughts and memory cease to operate in a functional, productive, and adaptive manner. Yet, for the schizophrenia-spectrum conditions, there appears to be additional cognitive errors involved in the formation and maintenance of delusional beliefs and hallucinatory experiences. Therefore, examining obsessive and compulsive symptoms and beliefs on a sub-clinical level might further provide insight on how this and similar phenomena contribute to the formation and maintenance of delusional beliefs and additional beliefs.

One cognitive process, called source monitoring, that has received a good deal of attention involves the incorrect attribution of the source of material and information presented to an individual (Arguedas, Stevenson, & Langdon, 2012; Johnson et al., 1993; McKague, McAnally, Skovron, Bendall, & Jackson, 2012; Woodward & Menon, 2011; Woodward, Menon, & Whitman, 2007). Source monitoring is linked with memory (Hekkanen, & McEvoy, 2002; Johnson et al., 1993; Moritz & Woodward, 2006) and can be studied in situations where individuals are presented with material that can be interpreted as internally generated (e.g., imagine themselves turning a door knob) or as externally generated (e.g., viewing the experimenter's pantomime of turning the door knob). The individual would later be presented with the stimuli and asked to recall its source. Individuals with delusions and hallucinations tend to have higher amounts of

misattributions in such activities (Johnson et al., 1993), especially where they view internally created experiences as externally generated, a process commonly referred to as the externalization bias (Bentall, 1990; Woodward & Menon, 2011). Source monitoring errors may contribute to hallucinatory experiences (Arguedas et al., 2012; Larøi, Collignon, & Van der Linden, 2005; Woodward & Menon, 2011; Woodward et al., 2007) as hallucinations can be viewed as internal experiences attributed to external sources (Woodward & Menon, 2011). Individuals with schizophrenia, when indicating the confidence of their recall source response, tend to be more confident when they are making misattributions and exhibit a reduced amount of confidence when they indicate an accurate response (Moritz & Woodward, 2006). This is a particularly important point when considering the influence of misattributions, self-certainty, and confidence in inaccurate or false situations. For example, if an individual sees a stranger multiple times throughout their day while they are shopping, they may then have the thought (internally generated) “This person must be following me” which may or may not be true. If this situation is a coincidence, but the individual strongly believes that the stranger is up to no good, this can lay the foundation for further alarming thoughts and delusional beliefs (e.g., “I am in danger”, “It must be the government”). These misattribution errors may be a potential target for clinical interventions whereby individuals can begin to evaluate the veracity of their thoughts and perceptions using the principles of cognitive behavioral theory (Kingdon & Turkington, 2005). Understanding the source of information can also be central to the cognitive aspects of thinking, forming, and constructing belief systems, thoughts, interactions, and opinions (Johnson et al., 1993). Therefore if faulty notions or

attribution errors begin to form the basis of these cognitive aspects, delusional and dysfunctional beliefs may become apparent.

One additional cognitive process termed metacognition has also received attention as a possible contributor to the schizophrenia-spectrum conditions. Metacognition involves thinking about our thoughts and cognitions and trying to regulate them (Schraw, 1998). These metacognitive processes have been linked to anxiety (Debbané et al., 2012) and schizotypy (Debbané et al., 2012; Chan, Spencer, West, Viegas, & Bedwell, 2015). Specific types of metacognitive beliefs tend to be present in those prone to hallucinations and exhibiting the externalization bias in source monitoring (Larøi et al., 2005). Individuals with a diagnosis on the schizophrenia spectrum overall have higher metacognitive subscale scores related to the beliefs that thoughts are uncontrollable and dangerous, positive beliefs about worrying (i.e., “I need to worry or I will not be safe”), and beliefs regarding the need to control their thoughts (Perona-Garcelán, García-Montes, Ductor-Recuerda, Vallina-Fernández, Cuevas-Yust, Pérez-Álvarez, & ... Gómez-Gómez, 2012). Metacognitions have also been linked to the prediction of the presence of delusional ideation (Stainsby & Lovell, 2014) and higher levels of schizotypy (Chan et al., 2015). Bruno et al. (2012) corroborated other recent research and found that individuals with schizophrenia tend to have impairments with metacognitions. They also found that those with delusions had more impairments than others with schizophrenia, and higher conviction in their delusional ideation themselves. Though research is mixed, studies have speculated that metacognitive beliefs are more involved in the maintenance than and not so much the formation of delusional beliefs (Bruno et al., 2012; Goldstone, Farhall, Thomas, & Ong, 2013)

**Social and societal experiences/beliefs.** The surroundings, social experiences, and lifestyle of individuals might certainly be very influential to the formation and maintenance of beliefs. Studies involving delusional beliefs often compare the formation and maintenance of these beliefs to beliefs such as religion and politics in that all three have the potential to be formed and maintained in a similar manner. However, religion and politics are considered to be widely accepted by many societies and do not tend to be grouped in the realm of delusional beliefs (Roberts, 1991; Maher, 1992; Jaspers, 1968), though those in the field tend to see delusional beliefs and other beliefs such as religion on a continuum that also includes normative and accepted beliefs (Smith, Riley, & Peters, 2009; Roberts, 1991).

Research has also shown that individuals with mental health diagnoses, including diagnoses on the schizophrenia-spectrum, can sometimes feel more empowered and have more positive outlooks on their diagnoses and life if they feel a sense of influence or involvement in their community (Lawn, McMillan, Comley, Smith, & Brayley, 2014; Liberman, 2012). Therefore these individuals might be more proactive in seeking to understand and cope with their symptoms. This might also be due to supportive social interactions within their community (Jolley, Ferner, Bebbington, Garety, Dunn, Freeman, &...Kuipers, 2014).

The importance of social support in the development and consolidation of delusional beliefs is not well understood. The process of social isolation could conceivably contribute to consolidation of delusions since the individual may not be able to gauge the veracity of their personal thoughts with trusted others. The absence of corrective feedback could foster the drift from consensual reality during formative

periods (Saha et al., 2012). However, delusions can certainly develop and persist even in the presence of stable and supportive social networks that are providing corrective feedback (Onwumere et al., 2016). So, the quality of social relationships may be an idiopathic factor that is more relevant in the development of delusions for some individuals than others.

In keeping with the notion that many factors can possibly contribute to delusional ideation, the present study sought to identify potential factors that could influence the formation and maintenance of beliefs, more specifically, delusional ideation and beliefs. Based on current literature, we have developed 3 *a priori* hypotheses. Hypothesis 1: levels of delusional ideation will be significantly related to scores on the cognitive-perceptual (“positive symptoms”) dimension of our schizotypy measure, and hallucinatory experiences. These relationships would provide evidence for construct validity (theoretical basis) of our primary measures and would be consistent with robust findings from the empirical literature. Hypothesis 2: delusional ideation will be predicted by the presence of greater negative emotions and cognitive biases/errors (i.e., source monitoring errors, metacognitive beliefs, intolerance of uncertainty, attributional errors, obsessional beliefs) and unique experiences (physical health problems, social network). As the literature has shown that the path to the formation and maintenance of delusions is highly individualized, acknowledging potential phenomena present would provide foundational ground to further elaborate on specific pathways to delusional belief formation and maintenance. Certain factors might be present prior to delusion formation, or occur concurrently, or afterwards in a state of maintenance. Hypothesis 3: sense of purpose, self-esteem, and positive affect would be predicted by delusional ideation,

especially expansive delusions. Research Question 1: finally, as an exploratory component (no directional predictions made) we will examine the extent to which the variables in this study are related to religiosity, spirituality, personal beliefs, and beliefs relating to community involvement and connection.

To our knowledge, this is the first time the aforementioned influences have been studied together. The potential findings from this study could illuminate the processes underlying the formation and maintenance of delusional beliefs and ideation. Clinically, understanding the role of delusional beliefs and beliefs in diagnoses might ultimately aid in the development of more effective treatment for individuals with delusional beliefs.

## **Chapter 3**

### **Methods**

#### **Participants**

Data was collected from 200 (males=118, females=81, other gender spectrum=1) Rowan University undergraduate students (ages 18-36) enrolled in Essentials of Psychology courses. Within this course, students are required to participate in research as a way to earn points towards their grade. The students have the choice of participating in an ongoing university affiliated study or an alternative project involving reading journal articles and writing a short review. Inclusion criteria for participation in this study involved being 1) a Rowan University student in an Essentials of Psychology course, and 2) 18 years old or older. A total of seven participants were excluded from data analysis as they provided responses to open ended items consisting of random strings of letters or similar response patterns (n=3) or if they did not complete all of the measures due to technical difficulties with the online platform (n=4). Of our participants, 66% identified as Caucasian, 15% identified as African American, 8% identified as African American, 6% identified with multiple ethnicities, 3.5% identified as Asian, and 1.5% identified as ethnicities not listed.

#### **Measures**

Participants completed the following measures related to our variables of interest in this study.

**Delusional ideation.** Delusional ideation was measured using an expanded version of the Peters et al., Delusions Inventory (PDI-40; Peters, Joseph, & Garety, 1999). The original PDI-40 contains eight categories of delusions represented through 40

items, with 5 items per category. The eight categories include delusions of control; misinterpretations, misidentification, delusions of reference; delusions of persecution; expansive delusions; delusions concerning various types of influence and primary delusions; other delusions; simple delusions based on guilt, depersonalization, hypochondriasis; and thought reading, insertion, echo, and broadcast delusions. For each item, the participants responded either “yes” or “no” to a question representing a delusional belief. If “no” is selected, the participant goes on to the next item. Items include, “Do you ever feel as if things in magazines or on TV were written especially for you?” If “yes” is selected, additional sub-items were presented to the participant. The original PDI-40 has 3 sub-items that involve the distress, preoccupation, and conviction the participant feels they have in terms of the original item. All three sub-items are measured on a 5-point Likert scale ranging from 1 to 5. The distress dimension ranges from “Not at all distressing” to “Very distressing.” The preoccupation dimensions ranges from “Hardly ever think about it” to “Think about it all the time.” The conviction dimension ranges from “Don’t believe it’s true” to “Believe it is absolutely true.”

In order to gain a deeper understanding of what these items mean in terms of their influence on the individual, the authors have amended the PDI-40 by adding additional sub-items to the 3 original sub-items of the scale. Participants were asked to provide a response to the sub-items if they select “yes” to the main item. Since beliefs can be accepted in certain societies and be normative and in others be considered to be odd or delusional (i.e., certain religious practices, feelings, or political endeavors) we added an item to examine whether the beliefs or ideas endorsed are representative of a culture to which the participant belongs. The response choices are yes/no with an option to provide



the name of the culture. We also asked how much the initial item means and its importance to the participant on a 5-point Likert scale similar to the 3 sub-items explained above. We asked a yes/no question regarding whether the participant thinks that the endorsed belief is something that influences other parts of their life. They are also provided the option to elaborate on this item through an optional opened ended response if they would like. The next additional item asked participants if they think that the endorsed belief arose to explain something around them. This has a yes/no response and a similar option for elaboration. We also asked whether they think the endorsed belief happened more recently in their life or when they were younger. This sub-item also has an optional elaboration response. We then asked if they have shared this belief with others and how the other person reacted or how participants think others would react. Response options are yes/no, with an open-ended elaboration response. Finally, we provided an additional comments option, in case participants wanted to write or describe anything else about the item. Findings from the expanded portion of this measure are not included in this study.

The original PDI-40 has good psychometric properties with internal consistency represented by a Cronbach alpha of 0.88. The original measure also demonstrates test-retest reliability ( $r = 0.82$ ,  $p < 0.001$ ). Concurrent validity was seen when the measure was compared to similar measures and criterion validity was also established (Peters et al., 1999).

**Schizotypy.** Schizotypy was measured using the Schizotypal Personality Questionnaire-Brief Revised (SPQ-BR; Cohen, Matthews, Najolia, & Brown, 2010). Seven subscales are incorporated into 32 items on a 5-point Likert scale ranging from 0

(“Strongly Disagree”) to 4 (“Strongly Agree”). The measure includes three commonly accepted subscales that mirror the symptom clusters of schizophrenia: positive (i.e., odd perceptual experiences and magical thinking), negative (i.e., social isolation, constrained affect), and disorganized (i.e., odd behaviors, disorganized speech and thought content). Items on the positive domain include “Do you believe in clairvoyance (psychic forces, fortune telling)?” Negative schizotypy is represented by items such as “I feel very uncomfortable in social situations involving unfamiliar people.” The disorganized subscale includes items such as “I sometimes jump quickly from one topic to another when speaking.” The SPQ-BR demonstrates convergent validity and an internal reliability of a Cronbach alpha of 0.95 (Cohen et al., 2010).

**Hallucinatory-like experiences.** The Launay-Slade Hallucinations Scale-Revised (LSHS-R) was regenerated based on a description of items provided by Bentall & Slade (1985) and included alternate response guidelines. Following the alternate response guidelines, the version of the LSHS-R used in the present study includes 12 items whose responses are rated by selecting from the following Likert-style scale: Certainly applies (5), Possibly applies (4), Unsure (3), Possibly does not apply (2), and Certainly does not apply (1). Items include “In the past I have had the experience of hearing a person’s voice and then found that no one was there.” The LSHS-R has acceptable internal consistency with a Cronbach alpha of 0.90 (Fonseca-Pedrero, Lemos-Giráldez, Paino, Sierra-Baigrie, Villazón-García, García-Portilla González, & Muñiz, 2010).

**Mood.** The Depression, Anxiety, Stress Scales (DASS; Lovibond & Lovibond, 1995) functioned as a measurement of mood related to depression, anxiety, and stress. The DASS contains 42 items with 3 subscales (depression, anxiety, stress) that each

contain 14 items. Responses are in the form of a 4 point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time.). Items include “I found myself getting upset by quite trivial things.” Internal consistency of the DASS subscales are adequate with the following Cronbach’s alphas: 1) depression (0.97), 2) anxiety (0.92), and 3) stress (0.95). Concurrent validity was also demonstrated (Antony, Bieling, Cox, Enns, & Swinson, 1998).

**Metacognitions.** The Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004) is a 30 item questionnaire regarding metacognitive beliefs. Each item is scored on a 4-point Likert scale ranging from 1 (“do not agree”) to 4 (“agree very much”). There are 5 subscales: cognitive confidence, positive beliefs about worrying, cognitive self-consciousness, uncontrollability and danger, and need to control thoughts. Items include “Worrying helps me to avoid problems in the future.” The MCQ-30 has good-excellent internal consistency with Cronbach’s alpha ranging from 0.72 to 0.93 for the subscale scores and the total score. Construct and convergent validity were also demonstrated (Wells & Cartwright-Hatton, 2004).

**Demographics and health.** In order to gain helpful background information involving the demographics of each participant, the Demographics and Health Questionnaire, compiled by the researchers involved in this study, allowed participants to provide demographic information such as age, gender, and ethnicity. Aspects of their health were also asked, but not examined, in the current study including items relating to smoking, family history of mental illnesses, diet, brief information on physical illnesses, and fitness.

Items about health attitudes were obtained from the Sample Questionnaire: Diabetes (Stanford Patient Education Research Center). Although these were written with a person who has diabetes in mind, the items we selected are general enough to allow us to gauge the health attitudes of the participants in order to see how variances in responses to these items potentially relate to the variables in this study. We have also generated six items involving the number and satisfaction felt by participants regarding their specific social relationships.

**Sense of purpose.** This construct was measured using a subscale from the Lifestyle and Habits Questionnaire-Brief Version (LHQ-B; Dinzeo, Thayasivam, & Sledjeski, 2014). This questionnaire is broken up into eight lifestyle categories consisting of health and exercise, psychological health, substance use, nutrition, environmental concern, social concern, accident prevention, and sense of purpose. Each of these categories have a total score that matches with a scoring sheet provided to the participants that rates their scores in each category into bottom, middle, and top ranges based on the participant's gender. Sense of purpose was the only subscale from this measure used in the current study. Items on this subscale include "I find meaning in my life," "I believe every life has a purpose," and "I have a sense of connectedness to something larger than myself, whether it is organized religion, nature, or social causes." Responses are indicated via a 5 point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Preliminary psychometric data for the sense of purpose subscale was fair at 0.66 (Dinzeo et al., 2014), which slightly improved in the current sample ( $\alpha = 0.75$ ).

**Quality of life beliefs.** The WHOQOL-SRPB (Saxena, 2006) measured quality of life factors viewed through the frame of spirituality, religiousness, and personal beliefs. It consists of 32 items where each participant can choose how they would like to answer each item. That is, they can decide whether they view their beliefs from a place of spirituality, religiousness, or personal beliefs. Saxena (2006) noted that they added four additional items that allow the participant to express their level of spirituality, religiousness, and personal beliefs. These four items are added to the beginning of the questionnaire bringing the total number of items to 36. Items include “To what extent do you have feelings of inspiration/excitement in your life?” Cronbach’s alpha for this measure was 0.91 (Saxena, 2006). The present study only utilized the four additional items assessing the extent of endorsement of spirituality, religiosity, and personal beliefs.

**5 conditions (source monitoring).** We have adapted a source monitoring activity presented in a study by Larøi et al. (2005), which involves 5 different types of conditions. The conditions include a verbal phase in which the participant listens to an action phrase, a visual phase in which the experimenter carries out an action in the item, an imagined visual phase in which the participant imagines the experimenter carrying out an action in the item, a motor phase where the participant completes the action present in the item, and an imagined motor phases in which the participant imagine themselves carrying out the action present in the item. In total for the original activity, there were 60 items present in the study or memorization phase, which were divided into 15 blocks each containing 4 items. After every 4 items, the condition changes and this is explained at each time to the participant. Each condition has 12 items. Two action and two imagined conditions cannot directly follow each other, so the order we have chosen is verbal, imagined motor, visual,

imagined visual, and motor. The order of the conditions stayed the same but we have randomized the items within each condition in order to create 3 different versions to lessen fatigue and aspects of order effect. The recall phase consisted of the participant going through items that presented the phrases in the study phase randomly mixed with an additional 60 phrases, bringing the total item number to 120. The participant selected whether they felt each phrase in each item was “New” or “Old.” If they believed it was old, then they indicated what condition they believed it was from. For all items, the participant provided a confidence level of their overall response. The measure that we adapted from Larøi et al. (2005) contained additional aspects that we felt were not required for the purposes of our study. Therefore, we did not use such aspects.

Due to time constraints and other factors, we chose to shorten the 5 conditions activity. The basic frame described above still stands with amended numbers. There were still 5 different types of conditions, with an amended total of 40 items presented in the study or memorization phases, which were divided up into 10 blocks that each contained 4 items. As stated above, after every 4 items the conditions changes. Each condition now has 8 instead of 12 items. The revised recall phase contained the 40 study and 40 additional phrases, bringing the total to 80 items. Response options remained the same. Total scores of correctness for the old/new items and for the correct attribution of sources were created. Due to the highly individualized nature of each item, and the notion that each item response does not have to be related to any other item because of the nature of the study phase and recall phase, there is no psychometric information provided for this measure.

**Cognition and explanatory styles.** The Cognitive Bias Questionnaire for Psychosis (Peters, Mortiz, Schwannauer, Wiseman, Greenwood, Scott & ...Garety, 2014) is a questionnaire designed to examine cognitive (thinking/thoughts/interpretations) biases that may exist and contribute to reasoning which, in turn can contribute to the formation and maintenance of delusional beliefs. There are 30 statements, each with 3 response choices that represent different cognitive biases (intentionalising, catastrophizing, dichotomous thinking, jumping to conclusions, emotional reasoning). Fifteen items fall into the theme of anomalous perceptions, and 15 are related to threatening events. There are 6 responses per bias. The responses that go along with the statements are rated on a Likert scale from 1 to 3 (1= absence of bias; 2= presence of bias with some qualification; and 3= presence of bias). A total score for each theme and bias, and a total overall score were generated. Items include “Imagine that the phone rings. When you answer, the other party hangs up.” Responses this particular item are a) “I wonder if there’s something suspicious about this”, b) “somebody is definitely checking up on me”, and c) “someone’s probably got the wrong number.” This measure has excellent psychometrics with a Cronbach’s alpha of 0.89 representing internal consistency and test-retest scores of 0.96 (Peters et al., 2014).

**Obsessive-compulsive thoughts and beliefs.** The Obsessive-Compulsive Inventory-short form (OCI-R: Foa, Huppert, Leiberg, Langner, Kichic, Hajack, & Salkovskis, 2002) is an 18 item questionnaire that provides statements and asks the participant to indicate to what level were they distressed or bothered by the matter in the statement. Responses ranged from 0=not at all to 4= extremely, on a 5-point Likert scale. Items include “I check things more often than necessary.” The OCI-R has demonstrated

good internal consistency, test-retest reliability, and convergent and divergent validity (Foa et al., 2002).

**Self-esteem, wellbeing.** The Flourishing Scale (Diener, Wirtz, Tov, Kim-Prieto, Choi, Oishi, & Biswas-Diener, 2010) is an 8 item measure that provides statements for the participants to rate on a 1 (strongly disagree) to 7 (strongly agree) Likert scale. The statements involve how the individual feels about themselves, their self-esteem, and sense of purpose. Items include “I am engaged and interested in my daily activities” and “People respect me.” This measure has demonstrated very good internal consistency with a Cronbach’s alpha of 0.87 (Diener et al., 2010).

**Uncertainty.** The Intolerance of Uncertainty Scale (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994) is a 27 item measure with responses ranging from 1 (not characteristic of me at all) to 5 (entirely characteristic of me) on a 5-point Likert scale. Items include “Uncertainty stops me from having a strong opinion.” Internal consistency was excellent with a Cronbach’s alpha of 0.94. Test-retest reliability was shown to have a coefficient of  $r=0.74$  (Buhr & Dugas, 2002).

**Civic responsibility.** We compiled an amended version of the Civic Responsibility Questionnaire (Furco, Muller, & Ammon, 1998) in order to attempt to gauge participant’s beliefs about being involved in their community and if their involvement has positive or negative influence on their life. The original Civic Responsibility Questionnaires comes in 3 levels that correspond to 3 different schooling levels (elementary, middle, and high school). We have combined the 3 levels to form one questionnaire of 34 items. Responses are gauged on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Items include “I feel like I am part of a



community.” This questionnaire appears to be used typically in primary and secondary educational settings. Because of this, no psychometric information could be found for this measure. Any findings relating to this measure will be considered exploratory.

**Affect.** The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a 20 item measure that includes 10 positive emotion/feelings words and 10 negative emotion/feelings words. Participants are asked to rate how much the emotion/feelings word applies to them in the present moment based off of a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Items include “Interested” and “Upset.” The measure has demonstrated very good reliability and validity with a Cronbach’s alpha being 0.86 to 0.90 for positive words and 0.84 to 0.87 for negative words (Watson et al., 1988).

**Memory and cognition.** In order to assist in determining the value of the responses from the source monitoring (5 conditions) activity, we have chosen to include the Extended Cognitive Failures Questionnaire (ECFQ; Das-Smaal, deJong, & Koopmans, 1993), which assesses memory through a 35 item questionnaire with responses on a 5-point Likert scale from 0 (never) to 4 (very often). The measure, created by Das-Smaal et al., (1993), combines a number of existing measures including Broadbent et al.’s Cognitive Failures Questionnaire (1982), Hermann & Neisser’s (1978) Inventory of Everyday Memory Experiences, and Reason & Mycielska’s (1982) Error Proneness Questionnaire. This will be used to interpret the participant’s capacity for working and recent memory, and error proneness. Ideally, responses on this measure will let us know the participant’s self-reported baseline of their memory abilities. For example, if a participant’s responses to this questionnaire indicate that they do not have

any self-reported memory issues and if the same participant has a multitude of errors on the 5 conditions recall, we might be able to consider the recall results as more towards schizophrenia-spectrum symptomology, rather than attribute them to solely memory errors. However, this will be taken as a guiding point for interpretation and not an absolute final statement on the participant's memory and performance on the source monitoring recall. All other variables will also be taken into account and will also serve as a guide to interpreting the source monitoring (5 conditions) results. Items include "Do you find you forget why you went from one part of the house to the other?" Cronbach's alpha for this measure is 0.88. However, the Das-Smaal et al. suggest more studies should be done involving the psychometric properties.

## **Procedures**

This study has been approved by Rowan University's Institutional Review Board. Participants met with a trained lab member from Rowan University's Schizophrenia Spectrum Lab to complete the study in a face-to-face session. Upon arriving at the location and at the time that was selected by both groups online via Rowan University's SONA system, the lab member explained this study and the consent procedures to the participant. The information on the informed consent form was read, and there were opportunities for the potential participant to ask any questions they might have regarding the study and informed consent form and obtain answers from the researcher. It was also made clear to the potential participant that they were able to ask questions regarding their rights and elements of the study at any point in time. The participant was also informed that they were free to discontinue their participation in this study at any time, but would only receive the research credit for the completion of this study in its entirety. After this,

if the participant chose to participate in the study, they signed and dated the informed consent form. The lab member present also signed and dated this same form and a reproduction of the informed consent was given to the participant for their records.

After consent was obtained, the lab member guided the participant through the series of questionnaires and activities. A number of questionnaires were provided online to participants via the Qualtrics platform in an effort to conserve paper, but were completed in front of a lab member during the session. The remaining questionnaires, the activity, and consent documents were completed on paper. Three different versions, each containing a different order of the various assessments, were created in order to address possible confounding patterns of response fatigue and order effects.

### **Statistical Analysis**

All data was evaluated prior to analysis. Instances of potential random responding, or outlier responses, were also evaluated. Data distributions were examined for normality (skew/kurtosis  $<2$  for parametric tests). The existence of potential confounds related to sample characteristics such as gender and ethnicity were evaluated prior to analyses using independent sample t-tests and oneway ANOVAs for variables that were normally distributed and the Mann-Whitney U test and Kruskal-Wallis test for non-normally distributed variables.

Pearson and Spearman correlations were used in order to examine the relationships between delusional ideation, positive schizotypy, and hallucinatory experiences (Hypothesis 1).

Data reduction via a principle component analysis (PCA) was conducted in order to condense the large amount of variables of interests in Hypothesis 2. Prior to

conducting the PCA, all relevant variable scores were standardized using z-scores. Additionally, source monitoring scores were evaluated using the scores from the ECFQ in order to determine whether source monitoring attribution errors were due to general memory impairments. Pearson correlations were used to examine this potential relationship and yielded no significant correlations. This may suggest that errors on our source monitoring measure may not have been due to general memory impairments. Due to this, source monitoring variables were added into the PCA after being standardized. Source monitoring total scores, collapsing across the five experimental conditions, were entered into the PCA. Additionally, in regards to physical health information no participant endorsed the presence of a type one or type two diabetes diagnoses. Similarly, asthma was infrequently endorsed ( $n=32$ ). Thus, diabetes and asthma status were not included in the PCA.

A series of hierarchal linear regression models predicting overall and subtypes of delusional ideation (Hypothesis 2) and predicting sense of purpose, self-esteem, and positive affect (Hypothesis 3) were created. Gender and ethnicity were included in the first step of each model as a control. Components from the PCA (Hypothesis 2) or delusional ideation subscales (Hypothesis 3) were included in the second step of these models.

Research Question 1 was examined using modified versions of the hierarchal linear regression models that were used to test Hypothesis 2. Gender and ethnicity remained in the first step of these models as control variables. Normative beliefs (religiosity, spirituality, personal beliefs, and community involvement beliefs) were included in the second step. Components from the PCA were included in the third step.

## Chapter 4

### Results

All data was evaluated for normality and differences in gender and ethnicity were controlled for during analyses. The majority of data were normally distributed with some exceptions. Persecutory delusions, delusions of thought, anxiety, and health interference were skewed and demonstrated kurtosis. Other delusions, depression, health worries, and the total score from the DASS measure had high kurtosis. Means, standard deviations (SD), number of items, gender and ethnicity differences, and internal consistency represented by Cronbach's alpha are presented in Table 1. From the PCA components, health concerns and source monitoring were skewed and demonstrated kurtosis. The *cognitive-emotional* and *friend* component from the PCA had high kurtosis. Amongst the PCA groupings only *health concerns* had significant gender differences via the Kruskal-Wallis Test with females reporting higher concern for their health ( $p < .001$ ). No other gender or ethnicity differences were found amongst the PCA variables.

As presented in Table 1, some measures included in the current study have lower than recommended levels of Cronbach's alpha being below a 0.70 (Tavakol & Dennick, 2011). The PDI-40, which was our measure of delusional ideation, has an adequate total item alpha of 0.76. However, each individual sub-type of delusional ideation has an alpha lower than 0.6. This may be due to 1) the small number of items in each subscale (5 items), 2) infrequency endorsement rates of delusional ideation in a college sample either due to social desirability or prior to onset of delusional ideation, 4) the dichotomous nature of the items, and 5) the notion that not all aspects of a given subtype of delusional ideation needs to be related and endorsed together. Interestingly the authors of the PDI-

40 have stated that the goal of their development of this measure was not for high internal consistency values to be present amongst potential subscales as this may only act to limit the conceptualization and nuanced nature of delusional ideation (Peters et al., 1999; Peters, Joseph, Day, & Garety, 2004). Alphas for the CBQ-P subscales were also below the recommended levels at lower than 0.46. The alpha for the total score of the CBQ-P is 0.74. For the conceptual reasons mentioned above, we decided to include findings from these subscales in our analyses with an advisement of extra caution in any relating interpretations. For both of these measures the alpha at the total score levels were adequate. This further contributed to our decision to include the subscales in analyses with caution advised in any interpretations.

Table 1

*Means, SD, items, internal consistency, and gender (independent samples t-test)/ ethnicity (oneway ANOVA) differences amongst measures*

	Items	Mean	SD	$\alpha$	Gender/Ethnicity Differences
Delusional Ideation	40	4.85	3.70	0.76	AA>C, $p=.032$
Delusions of Control	5	0.55	0.69	0.03	F>M, $p=.045$
Delusions of Reference	5	1.41	0.92	0.19	C<AA & A<AA, Mu $p=.041$
Persecutory Delusions	5	0.23	0.57	0.45	
Expansive Delusions	5	1.03	1.17	0.56	C<H, AA, O, $p=.014$
Primary Delusions	5	0.70	0.77	0.11	C<AA,O; O>H, AA, A, Mu, $p=.003$
Other Delusions	5	0.44	0.77	0.44	F>M, $p=.004^{**}$
Simple Delusions	5	0.31	0.53	0.01	
Delusions of Thought	5	0.19	0.44	0.09	
Schizotypy	32	1.57	0.63	0.93	
Positive	14	1.22	0.66	0.87	
Interpersonal	10	1.75	0.78	0.86	
Disorganized	8	1.96	0.87	0.89	
Hallucinatory Experiences	12	2.30	0.70	0.84	
DASS	42	0.50	0.57	0.96	F>M, $p=.025^{**}$
Depression	14	0.43	0.54	0.94	
Anxiety	14	0.41	0.44	0.88	
Stress	14	0.66	0.58	0.92	F>M, $p<.001$
Metacognitions	30	2.08	0.43	0.88	
Cog. Confidence	6	1.78	0.56	0.79	F>M, $p=.013$
Pos. beliefs about worry	6	1.75	0.62	0.85	
Cog. Self-conscious	6	2.74	0.62	0.81	
Uncontrol & Danger	6	2.05	0.83	0.89	F>M, $p=.001$
Need to control	6	2.06	0.58	0.66	
Demographics and Health Questionnaire					
Health Worries	4	2.98	3.73	0.89	
Health Interference	4	1.02	1.90	0.79	
Number of friends*	1	11.63	26.43		
Satisfaction with friends	1	78.65	22.62		
Number of close family	1	6.93	5.77		
Satisfaction with family	1	81.46	23.09		
Partner Status	1	0.40	0.49		
Satisfaction with partner	1	67.82	28.96		
Lifestyle and Habits					
Sense of Purpose	3	4.03	0.91	0.75	
Normative Beliefs					
Religiosity	1	2.63	1.14		C<H,AA; AA>Mu, $p=.001$
Spirituality	1	2.75	1.16		C<H,AA; AA>Mu, $p=.002$
Personal Beliefs	1	3.65	1.00		
Civic Responsibility	35	4.03	0.79	0.96	
Source Monitoring					
Old/New	80	1.59	0.33		
Source	80	1.27	0.37		
Cognitive Biases	30	1.45	0.20	0.74	
Catastrophizing	6	1.48	0.28	0.38	
Dichotomous Thinking	6	1.41	0.32	0.41	AA>C; O>C, A, $p=.014$
Jumping to conclusions	6	1.62	0.32	0.46	F>M, $p=.005$
Emotional reasoning	6	1.35	0.28	0.36	C<H, AA, $p<.001$
Intentionalising	6	1.38	0.24	0.36	
Obsessive-Compulsive Symptoms	18	0.92	0.72	0.92	AA>C, H, A, $p=.017$
Intolerance of Uncertainty	27	1.99	0.71	0.95	F>M, $p<.001$
Self-esteem	8	5.80	0.80	0.88	
Affect	20				
Positive Affect	10	2.69	0.77	0.91	M>F, $p=.041$
Negative Affect	10	1.74	0.74	0.91	F>M, $p=.009$
Extended Cognitive Failures	35	1.64	0.52	0.93	

Note. \*n=196, \*\*Mann Whitney U-test statistic, M=Male, F=female, C=Caucasian, H=Hispanic, AA=African American, A=Asian, O=other ethnicity not listed Note: M=Male, F=female, C=Caucasian, H=Hispanic, AA=African American, A=Asian, O=other ethnicity not listed, Mu=multiple ethnicities endorsed.

For our first hypothesis, overall delusional ideation was positively correlated to hallucinatory experiences ( $r=.36, p<.001$ ), positive ( $r=.48, p<.001$ ), interpersonal ( $r=.14, p=.043$ ), and disorganized ( $r=.42, p<.001$ ) schizotypy. Hallucinatory experiences were positively correlated with positive ( $r=.62, p<.001$ ), interpersonal ( $r=.34, p<.001$ ), and disorganized ( $r=.46, p<.001$ ) schizotypy. Table 2 includes correlations amongst delusional ideation subscales, schizotypy, and hallucinatory experiences.

Table 2

*Excerpted Pearson and Spearman (in italics) correlations amongst delusional ideation subscales, schizotypy, hallucinatory experiences, and overall delusional ideation*

	Positive Schizotypy	Interpersonal Schizotypy	Disorganized Schizotypy	Schizotypy Total	Hallucinatory Experiences Total	Delusions Total
Del. of Control	.39***	.19**	.32***	.34***	.32***	.57***
Del. of Reference	.39***	.21**	.39***	.39***	.37***	.69***
<i>Persecutory del.</i>	.31***	.06	.30***	.28***	.16*	.49***
Expansive del.	.24***	-.07	.21**	.15*	.17*	.72***
Primary del.	.23***	-.03	.11	.13	.22***	.63***
<i>Other del.</i>	.37***	.07	.24***	.28***	.18*	.57***
Simple del.	.24***	.23***	.28***	.30***	.19**	.50***
<i>Del. of Thought</i>	.29***	.15*	.35***	.31***	.24***	.50***

Note. \*\*\* $p<.001$  \*\* $p<.010$  \* $p<.05$ , del.=delusions.

We conducted a PCA in order for data reduction purposes for Hypothesis 2 as this method is typically conducive for data reduction purposes as it allows for multiple variables of interest to be groups into meaningful groupings (Joliffe & Morgan, 1992). Bartlett's test of sphericity and the Kaiser-Meyer-Olkin values indicated that the PCA was an appropriate method of examining these variables. Varimax rotation was applied in order to derive well-defined components (Tabachnick & Fidell, 2007). Eight components emerged from the PCA with an Eigen value higher than 1. The total variance explained by these components are presented in Table 3 and the varimax rotations are presented in



Table 4. The first component contained many aspects relating to cognitions, emotions, and general mental health symptomology (**cognitive-emotional**). The second component related to health worries and interference in activities (**health concerns**), while the third component contained our **source monitoring** elements. The fourth component involved an individual's **partner** status and satisfaction with this status. The fifth component involved confidence in cognitions, and cognitive biases relating to intentions and emotions (**self-based reasoning**). The sixth component included **cognitive biases** such as dichotomous thinking, jumping to conclusions, and catastrophizing. The seventh component involved the number of **friends** and the related satisfaction, while the eighth component contained the number of **family** members and the related satisfaction.

Table 3

*Total variance explained from 8 PCA components*

Total Variance Explained										
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	7.12	27.39	27.39	7.12	27.39	27.39	5.54	21.32	21.32	
2	1.99	7.64	35.02	1.99	7.64	35.02	2.12	8.15	29.47	
3	1.89	7.28	42.31	1.89	7.28	42.31	1.93	7.43	36.90	
4	1.65	6.33	48.64	1.65	6.33	48.64	1.87	7.17	44.07	
5	1.46	5.62	54.26	1.46	5.62	54.26	1.57	6.02	50.10	
6	1.28	4.93	59.19	1.28	4.93	59.19	1.55	5.94	56.04	
7	1.05	4.02	63.21	1.05	4.02	63.21	1.51	5.79	61.83	
8	1.03	3.94	67.15	1.03	3.94	67.15	1.38	5.32	67.15	

Table 4

*Rotated component matrix for PCA components*

Measure and variable	Rotated component matrix						
	Cognitive-emotional	Health concerns	Source monitoring	Partner	Self-biased reasoning	Cognitive biases	Family Friends
Intolerance of Uncertainty (IOU)	<b>.82</b>	.14				.15	
Stress (DASS)	<b>.79</b>	.33				.12	-.16
Need to control thought (MCQ-30)	<b>.77</b>	.11			.19	-.12	.12
Anxiety (DASS)	<b>.73</b>	.46				.12	
Obsessive Compulsive Symptomology (OCI-R)	<b>.69</b>			-.15	.20	.16	.14
Depression (DASS)	<b>.66</b>	.42		-.11			-.14
Uncontrollability and danger (MCQ-30)	<b>.65</b>	.10				.36	
Negative Affect (PANAS)	<b>.62</b>	.23			.14		.14
Cognitive self-consciousness (MCQ-30)	<b>.59</b>	-.13	.22				-.20
Positive beliefs about worrying (MCQ-30)	<b>.45</b>	-.25				.40	.21
Health Interference (Demographics and Health Questionnaire)	.27	<b>.80</b>			.12		.29
Health Worries (Demographics and Health Questionnaire)	.35	<b>.79</b>		-.11			
Old/New source monitoring (5 conditions)			<b>.96</b>				
Source correctness (5 conditions)			<b>.95</b>				
Satisfaction with partner (Demographics and Health Questionnaire)	-.15			<b>.87</b>		-.13	-.16
Partner status (Demographics and Health Questionnaire)				<b>.84</b>			
Intentionalising (CBQ-P)		.13			<b>.82</b>	.16	
Cognitive confidence (MCQ-30)	.46				<b>.53</b>	-.23	-.11
Emotional Reasoning (CBQ-P)	.19	-.16		-.21	<b>.50</b>	.25	.21
Dichotomous thinking (CBQ-P)	.15	.12		-.20		<b>.74</b>	-.25
Jumping to conclusions (CBQ-P)	.32	.17	-.12		.17	<b>.44</b>	.17
Catastrophizing (CBQ-P)	.38	.14			.36	<b>.39</b>	
Number of family members (Demographics and Health Questionnaire)				-.12		-.20	<b>.83</b>
Satisfaction with family members (Demographics and Health Questionnaire)	-.19	-.20		.22		.24	.14
Number of friends (Demographics and Health Questionnaire)				-.18			<b>.76</b>
Satisfaction with friends (Demographics and Health Questionnaire)	-.25	-.10		.38	-.19		.25

Note: Rotation method: Varimax with Kaiser Normalization, rotation converged in 9 iterations

A total of nine hierarchical linear regression models predicting overall and the eight sub-types of delusional ideation were examined for Hypothesis 2. Table 5 presents coefficient data for the nine regressions. The model predicting *overall delusional ideation* was significant. Both gender and ethnicity  $R^2\Delta = .03$ ,  $F(2, 197) = 3.29$ ,  $p = .039$  and the second step containing the eight components from the PCA  $R^2\Delta = .10$ ,  $F(8, 189) = 2.60$ ,  $p = .010$  significantly contributed to this prediction.

*Delusions of control, delusions of reference, and simple delusions* were significantly predicted by the eight components ( $R^2\Delta = .120$ ,  $F(8, 189) = 3.296$ ,  $p = .002$ ;  $R^2\Delta = .111$ ,  $F(8, 189) = 3.013$ ,  $p = .003$ ; &  $R^2\Delta = .101$ ,  $F(8, 189) = 2.670$ ,  $p = .008$ , respectively). The eight components were approaching significance in the prediction of *persecutory delusional ideation*  $R^2\Delta = .071$ ,  $F(8, 189) = 1.821$ ,  $p = .075$ . The prediction of *expansive delusions* and *primary delusions* were not predicted by the eight components. *Other delusions* were predicted by gender and ethnicity only  $R^2\Delta = .076$ ,  $F(2, 197) = 8.148$ ,  $p < .001$ .

Table 5

*Coefficient data for hierarchical linear regressions predicting delusional ideation by gender/ethnicity and PCA components*

*Note.* \* $p < .05$

For our third hypothesis, three hierarchal linear regression models predicting positive affect, self-esteem, and sense of purpose by delusional ideation were examined while controlling for gender and ethnicity differences. Table 6 presents the specific factors that significantly and independently contributed to the predictions of positive affect, self-esteem, and sense of purpose. The model predicting *positive affect* was approaching significance. The delusional ideation subscale step was approaching significance  $R^2\Delta = .075$ ,  $F(8, 189) = 1.981$ ,  $p = .051$ . Despite the gender and ethnicity step not being significant, gender contributed to the prediction of positive affect. *Self-esteem* was significantly predicted by the delusional ideation subscales step  $R^2\Delta = .227$ ,  $F(8, 189) = 6.945$ ,  $p < .001$ . *Sense of purpose* was significantly predicted by the delusional ideation subscales step  $R^2\Delta = .222$ ,  $F(8, 189) = 6.939$ ,  $p < .001$ .

Table 6

*Coefficient data for Hypothesis 3 hierarchal linear regression models*

Hierarchal linear regression coefficient summary						
Model	Positive affect		Self-esteem		Sense of purpose	
	$\beta$	t	$\beta$	t	$\beta$	t
Step 1						
Gender	-0.148	-2.077*	0.002	0.025	0.09	1.259
Ethnicity	-0.04	-0.557	-0.002	-0.033	0.111	1.553
Step 2						
Del. Control	-0.054	-0.699	-0.077	-1.083	-0.053	-0.751
Del. Reference	-0.115	-1.401	-0.155	-2.031*	-0.15	-2.000*
Persecutory del.	-0.145	-1.726	-0.249	-3.186**	-0.18	-2.330*
Expansive del.	0.193	2.238*	0.252	3.145**	0.297	3.761**
Primary del.	0.097	1.164	0.101	1.31	0.23	3.030**
Other del.	0.029	0.355	0.071	0.919	-0.01	-0.134
Simple del.	-0.047	-0.606	-0.236	-3.255**	-0.187	-2.608*
Del. Thought	0.075	0.95	0.007	0.088	-0.001	-0.012

Note. \* $p < .05$ , \*\* $p < .003$

For Research Question 1, normative beliefs were added into the regressions models presented for Hypothesis 2. Table 7 presents coefficient data for the nine regression models. The model predicting *overall delusional ideation* was significant including the first step with gender and ethnicity  $R^2\Delta = .032$ ,  $F(2, 197) = 3.288$ ,  $p = .039$ ; the second step including normative beliefs  $R^2\Delta = .108$ ,  $F(4, 193) = 6.083$ ,  $p < .001$ , and the third step including the eight components from the PCA  $R^2\Delta = .082$ ,  $F(8, 185) = 2.439$ ,  $p = .016$ .

*Delusions of control* were predicted by normative beliefs ( $R^2\Delta = .062$ ,  $F(4, 193) = 3.266$ ,  $p = .013$ ) and the eight components from the PCA  $R^2\Delta = .104$ ,  $F(8, 185) = 2.959$ ,  $p = .004$ . *Delusions of reference* were significantly predicted by the third step including the eight components  $R^2\Delta = .100$ ,  $F(8, 185) = 2.680$ ,  $p = .008$ . The model predicting *persecutory delusions* was not significant. Only the second step containing normative beliefs significantly predicted both *expansive delusions*  $R^2\Delta = .133$ ,  $F(4, 193) = 7.556$ ,  $p < .001$  and *primary delusions*  $R^2\Delta = .198$ ,  $F(4, 193) = 12.167$ ,  $p < .001$ . *Other delusions* were significantly predicted by gender and ethnicity  $R^2\Delta = .076$ ,  $F(2, 197) = 8.148$ ,  $p < .001$  and normative beliefs  $R^2\Delta = .045$ ,  $F(4, 193) = 2.449$ ,  $p = .048$ .

Normative beliefs were approaching a statistically significant prediction of *simple delusions*  $R^2\Delta = .045$ ,  $F(4, 193) = 2.295$ ,  $p = .061$ . Only the eight components significantly contributed to this prediction  $R^2\Delta = .077$ ,  $F(8, 185) = 2.044$ ,  $p = .044$ . *Delusions of thought* were predicted by only the eight components of the PCA in the third step of the model  $R^2\Delta = .077$ ,  $F(8, 185) = 2.002$ ,  $p = .048$ .

Table 7

*Coefficient data for hierarchical linear regressions predicting delusional ideation by gender/ethnicity, normative beliefs, and PCA components*

Model	Hierarchical linear regression coefficient summary															
	Overall		Del. control		Del. Reference		Persecutory del.		Expansive del.		Primary del.		Other del.		Simple del.	
	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t
Step 1																
Gender	0.092	1.287	0.144	2.017*	0.04	0.554	0.033	0.463	-0.013	-0.184	0.043	0.606	0.181	2.612*	0.061	0.846
Ethnicity	0.14	1.965	0.028	0.391	0.109	1.52	-0.001	-0.02	0.123	1.717	0.117	1.632	0.18	2.586*	0.047	0.655
Step 2																
Religiosity	-0.182	-1.763	0.009	0.068	-0.144	-1.321	-0.168	-1.526	-0.058	-0.567	0.104	1.057	-0.284	-2.729*	-0.285	-2.631*
Spirituality	0.438	4.075**	0.245	2.205*	0.241	2.117*	0.142	1.235	0.381	3.562**	0.287	2.791**	0.31	2.848*	0.246	2.18*
Personal beliefs	0.02	0.267	0.009	0.12	0.005	0.06	0.003	0.037	-0.023	-0.297	0.107	1.466	0.012	0.161	-0.026	-0.327
Civic Res.	-0.008	-0.116	-0.083	-1.151	-0.042	-0.565	-0.065	-0.871	0.11	1.58	0.058	0.864	-0.026	-0.363	-0.085	-1.157
Step 3																
Cognitive-emotional	0.156	1.753	0.183	2.022*	0.171	1.829	0.043	0.448	0.086	0.94	-0.014	-0.161	0.158	1.714	0.01	0.103
Health concerns	0.065	0.822	-0.045	-0.564	0.098	1.188	0.177	2.068*	-0.007	-0.083	0.081	1.032	-0.038	-0.461	0.156	1.868
Source																
monitoring	-0.013	-0.19	-0.087	-1.279	0.03	0.424	-0.001	0.016	-0.05	-0.73	-0.028	-0.429	0.017	0.246	0.087	1.228
Partner	0.017	0.241	-0.048	-0.673	-0.048	-0.654	0.053	0.707	0.046	0.638	0.022	0.315	-0.027	-0.371	0.004	0.052
Self-biased reasoning	0.081	1.078	0.027	0.358	0.1	1.264	0.098	1.2	0.009	0.118	-0.03	-0.404	0.088	1.123	0.052	0.659
Cognitive biases	0.062	0.758	0.15	1.779	-0.008	-0.091	0.031	0.35	0.015	0.176	0.088	1.071	-0.008	-0.088	0.047	0.539
Family	-0.063	-0.898	-0.036	-0.506	-0.114	-1.551	0.025	0.323	-0.048	-0.667	0.048	0.686	-0.08	-1.105	-0.1	-1.352
Friends	0.003	0.037	-0.034	-0.455	0.025	0.326	-0.011	-0.136	0.09	1.204	-0.029	-0.399	0.061	0.808	-0.072	-0.94

*Note.* \* $p < .05$ , \*\* $p < .001$

## **Chapter 5**

### **Discussion**

The present study examined the potential contribution from a number of likely candidate processes in the formation and maintenance of delusional ideation and beliefs. Mixed support for the three over-arching study hypotheses was found. Possible evidence for the existence of idiopathic pathways to belief formation and maintenance will be discussed below. Due to the complex and large number of variables of interest in this study, the discussion of findings is organized according to the order of hypotheses. Interpretation regarding the PCA can be found primarily with Hypothesis 2 and Research Question 1.

#### **Hypothesis 1**

Our first hypothesis involved examining the sub-clinical schizophrenia spectrum symptomology scores (i.e., delusional ideation, the cognitive-perceptual domain or “positive symptoms” of schizotypy, and hallucinatory experiences) and their relationships with each other. Scores from the schizotypy subscales, hallucinatory experiences, and delusional ideation were positively associated with each other, providing support for the construct validity of these measurements that are each intended to represent different facets of sub-clinical schizophrenia-spectrum phenomena. While scores on these measures cannot forecast the actual transition to a clinical schizophrenia-spectrum diagnosis, they are viewed as vulnerability/risk indicators (Verdoux & van Os., 2002). Examining sub-clinical symptomology in non-clinical samples (such as college students) has the benefit of allowing researchers to study spectrum-phenomenon without the confounding effects of medication (Wang, Hu, Guo, Wu, Li, & Zhao, 2013). This type of



research helps to establish timelines of symptom development. This may be especially true for the study of delusional beliefs since college is often seen as a transition towards adulthood where an individual may be examining and developing various beliefs (Arnett, 1997; Arnett, 2000).

Our findings related to these symptom measures suggest that the PDI-40, SPQ-BR, and LSHS-R might be beneficial in settings where there is a need to measure psychosis-risk over time (e.g., college campuses). For example, the use of these measures as a screening tool, or to create a baseline for symptom severity, may help tailor services and preventative strategies. In addition, the scores on the other symptom measures included in the current study demonstrated good internal reliability and directional associations that are conceptually consistent with the constructs that they are intended to measure (e.g., DASS anxiety, Negative Affect, and OCS scores are all highly correlated).

## **Hypothesis 2**

Our *a priori* predictions regarding the specific factors predicting delusional development were partially confirmed, although with notable exceptions. Specifically, Hypothesis 2 examined delusional ideation being predicted by the presence of greater negative emotions and cognitive biases/errors (i.e., source monitoring errors, metacognitive beliefs, intolerance of uncertainty, attributional errors, obsessional beliefs) and unique experiences (physical health problems, social network). The first principle component, cognitive-emotional, significantly predicted *overall delusional ideation* as well as *delusions of control* (i.e., that others control the individual, that the individual is not in control of themselves), *delusions of reference* (i.e., that external stimuli are

directed towards the individual), and *other delusions* (i.e., those involving somatic aspects, influence and perceptions of others). Therefore, as we anticipated, scores on measure of negative emotion (e.g., DASS, PANAS-negative affect) and certain cognitive tendencies (i.e., obsessive symptoms, intolerance of uncertainty, several meta-cognitive processes) predicted the severity of certain delusional domains.

These findings suggest that the variables with the cognitive-emotional component are etiologically significant contributors to delusional beliefs. For example, it may be possible that risk for delusional ideation (especially involving external control/influence) increases in the presence of heightened negative mood, intolerance of uncertainty, and specific metacognitive tendencies. However, not all individuals who experience these cognitive-emotional symptoms would be expected to develop delusional beliefs. Thus, there is likely an underlying “vulnerability” element such as schizotaxia, which is the putative biological risk variable believed to underlie schizophrenia, that interacts with these cognitive-emotional elements and are necessary for the manifestation of delusions (Meehl, 1990; Lenzenweger, 2006). This etiological view is largely consistent with Roberts who theorized that individuals settle on the delusional explanations, even if they are distressing, in an effort to explain anomalous or odd experiences (1991; 1992). Those who are more inclined towards having an intolerance of uncertainty may be more readily open to such explanations in order to relieve any tension or anxiety relating to the unknown (Maher, 1992). This may result in an individual accepting an explanation towards a perceived external control source, which may lay the foundation for delusional beliefs in order to reduce any uncertainty that they may experience.

Our specific findings regarding “health-concerns” and paranoid ideation (i.e., *persecutory delusions*) can also be interpreted within a possible etiological framework. For example, at-risk individuals who are experiencing ambiguous internal (health-related) symptoms may be compelled to develop an explanation of their symptoms, even if it is not wholly consistent with consensual reality. This would be in line with research relating to the explanatory and meaning making aspects of the formation of delusional ideation (Maher 1992; Roberts, 1991, 1992). For example, this could represent a self-serving attributional bias by attributing negative internal states to circumstances outside of themselves (Bradley, 1978; Roesse & Olson, 2007). Thus, certain individuals may be more prone to attributing their health to outside sources as a way of reducing uncertainty. Stated another way, the persecutory beliefs held by these individuals may act as a protective factor against even more anxiety-provoking issues related to health and mortality that they feel helpless/unable to address. Interestingly, our findings suggest that *other delusions* involving delusions relating to the influence of others and somatic concerns may also follow a similar pattern as delusions relating to external experience.

*Delusions of reference* may also represent features of externalization as an individual may feel better to place beliefs on outside factors that are out of one’s control, rather than to add to potential anxiety provoking internal thoughts and processes. Additionally, this may also reflect the notion of aberrant salience. *Delusions of reference* may be viewed as self-referential as the individual may find stimuli to be particularly salient to themselves, while others may view the same stimuli as neutral (Howes & Kapur, 2009; Cicero, Docherty, Becker, Martin, & Kerns, 2015). Thus, an individual who endorses *delusions of reference* may be more prone to forming beliefs in order to explain

particularly salient and perhaps even anomalous experiences around them in order to make sense of them.

Surprisingly, *expansive* and *primary delusional ideation* were not predicted by any of the eight PCA components (cognitive emotional, health concerns, source monitoring, partner, self-biased reasoning, cognitive biases, family, friends). This suggests that subtypes of delusional beliefs involving grandiose themes may not be related to the constructs/assessments included in the PCA, at least in our current sample. It is possible that these beliefs may be influenced by different cognitive processes or aspects of symptomology or that the use of aggregate PCA variables may have obscured the possible contributions of specific processes related to expansive and primary delusions. Yet the lack of empirical relationships may actually add credence to the notion of idiopathic and individualized factors contributing to the development and maintenance of delusional ideation. For example, there is a high probability that psychological factors influence the development of grandiose beliefs. The fact that we did not identify the influential elements for these two clinically relevant delusion subtypes strongly suggests that we did not have the correct assessments, or methods, to reveal the unique characteristics associated with those specific delusional beliefs across individuals.

### **Hypothesis 3**

Our third *a priori* hypothesis predicted that sense of purpose, self-esteem, and positive affect would be predicted by delusional ideation, especially *expansive delusions*. As anticipated, expansive delusions predicted sense of purpose and improved self-esteem (with positive affect approaching significance). This is consistent with a portion of the literature examining the adaptive functions of delusional beliefs (Roberts, 1991; Jolley, et

al., 2006; Martens, 2012; Sundag, Lincoln, Hartman, & Mortiz, 2015). In fact, this particular type of delusion may serve as a protective factor against low self-esteem and negative life events (Kingdon & Turkington, 2005). The content of specific types of delusional ideation may directly influence self-esteem or possibly present an internal self-reflection of the individual (i.e., delusional content representing a kernel of truth; Kingdon & Turkington, 2005). In particular, expansive or grandiose content may act to boost self-esteem or perhaps reflect the individual's already existing high sense of self. It is also important to consider the notion that expansive and primary delusional ideation may be viewed as beliefs relating to internal processes, not due to the influence of external sources. Although, we did not find evidence for specific internal processes using our own PCA groupings.

We also found strong evidence that *delusions of reference*, *persecutory delusions*, and *simple delusions* were related to lower levels of sense of purpose and self-esteem. This may suggest that the content of the actual delusional belief is related to how an individual views themselves, with negative content being linked to negative self-cognitions (Collett, Pugh, Waite, & Freeman, 2016).

The finding that influences on self-esteem and sense of purpose depend on the content of delusional ideation may indicate a potentially important factor in the formation and maintenance of delusional beliefs. An individual's view of themselves may be reflected within the content of their delusional belief *and* delusional ideation may inform an individual's sense of self. The content of both internally (expansive, primary delusions) and externally (delusions of reference, persecutory delusions, simple delusions) based delusional ideation may also be symbolic of an evaluation or self-view

of powerlessness and a perceived lack of autonomy (Martens, 2012). Thus, individuals scoring high on these PDI scales may have generated beliefs (unverifiable by others) relating to their own existing self-view involving special powers and abilities. These inherent perceptions and interpretations of surroundings and experiences may further guide the development and maintenance of delusional ideation as the resulting beliefs serve a purpose for the individual.

### **Research Question 1: Exploratory**

As our Research Question 1 is exploratory in nature, we did not make any directional predictions relating to relationships amongst our variables of interest and normative beliefs (religiosity, spirituality, personal beliefs, and community involvement beliefs). We found mixed results in regards to normative beliefs and delusional ideation. Spirituality contributed to the prediction of both *overall delusional ideation* and *delusions of reference*, while the cognitive-emotional component was no longer significant. This may be because elements of spirituality may be a more salient predictor of these types of delusions than the cognitive-emotional component. *Delusions of control* were predicted by both spirituality and the cognitive-emotional component. This is an intriguing finding that includes the internal characteristics of the individual (i.e., scores on the cognitive-emotional variables) as well as their openness to the influence of factors “greater than” the self. The common theme may be a fear of loss of control or autonomy. The individual may find these delusional beliefs regarding loss of control as both beneficial and relieving as responsibility may be designated to factors outside of the self, but also anxiety provoking as the individual may feel that their experiences do not line up with their existing spiritual beliefs.

Interestingly, *persecutory delusions* were not predicted by normative beliefs and were still only significantly predicted by health concerns as described with Hypothesis 2. *Expansive* and *primary delusions* were both predicted by spirituality, and were not predicted by any of the eight PCA components similar to Hypothesis 2. This is in line with the nature of both of these delusional beliefs as they typically involve positive aspects directed towards special powers or abilities and having a purpose from a power greater than themselves. It may be possible that in endorsing spirituality, individuals may inherently possess a belief that they are an important participant in a transcendent spiritual process, which is reflected with a heightened view of themselves. This may allow for any grandiose-related beliefs to be more readily acceptable.

*Other* and *simple delusions* (i.e., beliefs based on guilt, depersonalization, hypochondriasis) were positively predicted by spirituality, but negatively predicted by religiosity. Surprisingly, this may suggest a distinct difference between the nature of spiritual and religious beliefs amongst college students where those who endorse higher levels of religiosity do not have many beliefs relating to guilt, sins, and somatic concerns. One way to view these finding is that those with religious beliefs may be more inclined to view their experiences (health concerns, stressors) as divine providence, and take comfort in common religious practices such as confession or repentance. Thus, these cultural elements might, in some ways, reduce concerns that might underlie certain types of delusional ideation for some individuals. Conversely, those who do not hold religious beliefs may view their experiences in a different framework (e.g., internal locus of control; Rotter, 1966), and as a result may experience greater guilt, depersonalization, and bodily concern as a way to reduce uncertainty (Martens, 2012) as they may not

subscribe to the cultural elements described above and may not attribute their experiences to divine providence.

Delusions relating to thought reading and broadcasting were positively predicted by spirituality and negatively predicted by the number and satisfaction of friends.

Interestingly, this suggests that those who endorse spiritual beliefs may be more inclined to endorse that their own thoughts are being shared without their permission to those around them. These individuals may not be open to social corrective feedback relating to their thoughts. Alternately, this may suggest that these individuals do not have a trusted and satisfying group of friends that they feel comfortable in sharing their thoughts with. Therefore, they may not have the opportunity to receive any social feedback relating to their thoughts and beliefs. In contrast, those with more friends and satisfaction with these relationships may be more responsive to social corrective feedback dissuading notions that their thoughts are being broadcasted without their permission.

Both personal beliefs and civic responsibility did not contribute to the prediction of delusional ideation. This may be because both of these may be viewed as abstract concepts for individuals within our sample. Additionally, as previously mentioned individuals may be still in the process of developing beliefs relating to personal aspects and civic engagement (Arnett, 1997; Arnett, 2000) whereas religious or spiritual beliefs may be somewhat more so imparted to them at a younger age. Only three of the eight PCA components formed significant relationships with the prediction of delusional ideation for this exploratory research question.



## **Overall Impressions of Findings and Larger Implications**

The results from this study provided evidence for important processes that might influence delusional ideation. However, upon reflection, there are still many unanswered questions that our findings do not fully clarify. For example, we still cannot say why some people develop delusional beliefs (let alone specific delusional beliefs) while others do not. One barrier to discovering the idiopathic pathways to delusion development may involve the statistics we (as a field) employ. While gathering and reporting aggregate and average data is viewed as key within the research world, understanding the nuances of symptomology through more qualitative methodology may yield richer information in a clinical sense, especially with complex symptomology such as delusional beliefs. We did collect some limited qualitative data when administering the PDI-40 online, but the systematic examination of this data is outside the timeframe/scope of the current project. We do have a wealth of quantitative data that, if examined in a non-traditional way, may be useful in illustrating the variance of beliefs and symptomology across individuals (vs. averages). For example, when we examined the scores from our symptom and belief measures in the three highest scoring PDI-40 scorers, we saw wide degree of variability. These individual differences may have been fundamental in understanding the specific delusional ideation endorsed. This could highlight the importance of qualitative methodology in researching beliefs as quantitative results only provide a certain depth of information and understanding of this highly intricate phenomenon. The importance of using mixed methods research may assist in providing both the strength of quantitative research and the nuance and richness of qualitative data that can provide additional

information regarding concepts of idiopathic factors, multifinality, and equifinality (Cicchetti & Rogosch, 1996).

### **Additional Clinical Implications**

The consideration of the content, function, and meaning of beliefs may help guide potential interventions. Shaping potentially maladaptive or mildly distorted beliefs before they become systematized, and subsequently reinforced/maintained, may be key to successful preventive interventions. By addressing potential underlying aspects such as the intolerance of uncertainty, and the desire to impose an explanation on uncomfortable experiences, an individual could be taught how to assess the accuracy and logic of their own thoughts and beliefs. This might be especially important in those with risk-indicators or a family history of serious mental health disorders. It is also important to consider the interaction between delusional ideation, and an individual's sense of purpose, self-esteem, and positive affect. Without fully understanding this relationship we may be treating beliefs that act to maintain an individual's self-view without providing any potential buffers. This might have unintended negative consequences. For example, someone with grandiose beliefs about unique abilities or characteristics that they possess may experience an increase in distress and other factors such as depression if this grandiose belief was not present due to implications of treatment.

### **Limitations**

There were a number of limitations in the present study. Participants in this study were a part of a convenience sample, with a majority being male and Caucasian. This may impact the generalizability of any findings. Additionally, all data collected was based on self-report provided by participants. The length of the administration of this

study may have caused some participants to experience fatigue. Similarly, there were a large number of variables present in this study, which may be related to statistical artifacts (e.g., multicollinearity; alpha inflation with multiple comparisons). On the other hand, we recognize that the development of beliefs is extremely nuanced and we may not have had enough of the “right” measures to adequately capture these processes. Although a majority of the measures used in this study have reliable psychometric properties, there were some measures such as the PDI-40 and the CBQ-P in which internal consistency by Cronbach’s alpha were lower than recommended values. However, the authors of the PDI-40 have stated that this may not be a strong limitation as it allows for the nuances of delusional ideation within sub-types to exist. Additionally, we may be assessing points in a sub-clinical population where beliefs may be developing, but we are unable to develop exact timelines of this. In regards to the PCA, despite gaining meaningful groupings of our variables, we may have also lost information regarding the contributions of the variables that comprised each of the eight resulting components. Finally, due to the nature of our study variables, elements of social desirability in disclosing information regarding mental health and other factors may have been present. Despite these limitations, findings from this study contribute to the current literature.

### **Future Research**

Future research should seek to expand and clarify on the idiosyncratic factors that may contribute to the formation and maintenance of delusional ideation. Further understanding of the possible factors that influence this phenomenon may strongly influence future treatment interactions and interventions. In order for this to occur, research would need to elaborate on both beneficial and maladaptive associations with

delusional ideation in order to highlight their multifaceted influence. Future research should also look to establishing longitudinal studies of delusion formation and maintenance in a variety of samples such as sub-clinical, clinical high risk, first episode, and chronic populations. As stated above, mixed methods research of beliefs and delusional ideation is extremely important to increase our understanding on both universal and idiopathic factors that may contribute to the formation and maintenance of delusional beliefs.

## **Conclusions**

The present study provides some further support for the potential idiopathic and specific pathways by which delusional ideation is formed and maintained. Elements of cognitive processes, mood, symptomology, social interactions and satisfaction, and at times certain normative beliefs appeared to be present and predictive of certain types of delusional ideation. Additionally, potential positive and maladaptive influences of delusional ideation were also examined and suggested that the content of delusional beliefs may also be reflective of an individual's own self view. Delusional ideation may therefore form in part due to an intolerance of uncertainty, beliefs reflecting one's self-view, and relationships between concurrent health and social supports in order to provide a sense of relief from any distress or tension.

Additionally, some of the elements examined, including self-view and social supports, may also form corrective reality-based feedback that is protective against the formation of delusional beliefs. Examining sub-clinical symptomology in the pathways to the formation and maintenance of beliefs, including delusional ideation, may further assist in providing support for developmental pathways and treatment outcomes for

individuals with delusional ideation. This study helps to move the field forward in understanding these pathways and how the formation and maintenance of delusional ideation and belief systems are highly individualized, intricate, nuanced, and complex.

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