Bodily Self-Disturbances across the Schizophrenia-Spectrum

By

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DEDICATION

I would like to dedicate this dissertation to my friend Todd, to the patients who participated in this research in Nashville, and to all the patients at Tewksbury Hospital with whom I had the pleasure of meeting during my internship year. I hope the studies presented in this dissertation will help fuel future research and inspire the development of novel, effective treatment options for individuals currently suffering from dissociative experiences who are at further risk for developing psychotic disorders.

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LIST OF ABBREVIATIONS

The following is a list of abbreviations utilized throughout the text of this dissertation. I hope this list might help the reader more easily follow the text:

2PT = 2 Point Discrimination Task
ACE = Adverse Childhood Events Scale
APA = American Psychiatric Association
AQ = Autism Spectrum Quotient
BODI = Brugger et al. Out-of-body and Dissociative experiences Inventory
BPD = Borderline Personality Disorder
BPRS = Brief Psychiatric Rating Scale
BS = Bodily Self Aberrations (BODI 2 Factor)
CPZ = Chlorpromazine equivalent dose
DD = Dissociative Depersonalization (BODI 2 Factor)
DID = Dissociative Identity Disorder
DSM = Diagnostic and Statistical Manual of Mental Disorders
DES = Dissociative Experiences Scale, 2nd version
HA = Hallucinatory Experiences (BODI 2 Factor)
HC = Healthy Control
IPL = Inferior Parietal Lobule
IRB = Institutional Review Board
JMP = John's Macintosh Project (statistical software)
LB = Line Bisection
OBE = Out of Body Experience
Per Ab = Perceptual Aberration Scale
PI = Pinocchio Illusion
PQ-B = Prodromal Questionnaire, Brief
PSS = Perceived Stress Scale
PTSD = Post-Traumatic Stress Disorder
RHI = Rubber Hand Illusion
SANS = Scale for the Assessment of Negative Symptoms
SAPS = Scale for the Assessment of Positive Symptoms
SCID = Structured Clinical Interview for DSM-IV Axis I Disorders
SIPS = Structured Interview for Prodromal Syndromes
SPQ = Schizotypal Personality Questionnaire
SPSS = Statistical Package for the Social Sciences
tDCS = Transcranial Direct Current Stimulation
TMS = Transcranial Magnetic Stimulation
TPJ = Temporoparietal Junction
SZ = Schizophrenia

CHAPTER I

INTRODUCTION

"I feel disconnected from myself at times."
—Park Lab Study Participant (2014)

Schizophrenia is a severe psychotic disorder characterized by positive symptoms (e.g., hallucinations, delusions), negative symptoms (e.g., anhedonia, avolition), disorganized symptoms (e.g., thought disorder, word salad), and cognitive symptoms (e.g., impaired attention, working memory deficits). Schizophrenia has a prevalence estimate of about 1% of the world's population (Murray et al., 2002) and is extremely debilitating. The World Health Organization's Global Burden of Disease study placed the acute stage of schizophrenia as the number one most debilitating condition, even above multiple sclerosis and untreated spinal cord lesions (Salomon et al., 2013). Thus, even though schizophrenia is not common in the general population, its effects are so severe that it warrants our attention and resources to try to understand the etiology, course of illness, and determinants of outcome for intervention and treatment. However, little progress has been made to elucidate the central etiology of this disorder since the times of Bleuler and Kraepelin, over 100 years ago. Schizophrenia remains a mystery.

From the beginning, disturbed sense of self was paramount to the concept of schizophrenia. For instance, Bleuler (1911) coined the term "***schizophrenia***" to indicate a basic disorder of selfhood ('*schizo*' = split, '*phrene*' = mind). Similarly, other early theorists shared the sentiment of the importance of self-disturbance in schizophrenia, including Kraepelin (1896), who emphasized the "loss of inner unity" in schizophrenia, and described the consciousness of patients with schizophrenias as an "orchestra without a conductor."

However, until recently, the importance of sense of self as a central component of the study of schizophrenia was somewhat diminished in the literature. This reduction in scientific interest in the sense of self in schizophrenia might be due to the overreliance on diagnostic criteria set forth in psychiatric manuals such as the previous version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; APA, 2000), which some researchers argue emphasized reliability over validity (e.g., Andreasen, 1998; Maj, 1998; Tucker, 1998). Nevertheless, with the advent of empirical measures designed to experimentally quantify self-disturbances (as described below), the scientific study of the sense of self in schizophrenia has begun to flourish again in the literature.

For example, a recent meta-analysis conducted by Hur and colleagues (2014) indicates a “crisis” of self-disorders in patients with schizophrenia. Specifically, these researchers found large effect sizes for body ownership disturbances and medium effect sizes for faulty sense of agency and subjective experiences of anomalous sense of self. Interestingly, the faulty sense of agency found in most of the reviewed studies was due to exaggerated rather than diminished agency, as would be expected in the context of passivity delusions (described below). Many of the traditional symptoms of schizophrenia have been hypothesized as stemming from self-disturbance, including passivity symptoms, delusions of control, and third person voices (Sass and Parnas, 2003). Interestingly, despite the growing recognition of the importance of self-disturbances in schizophrenia (e.g., Baumann, 2005; Cermolacce et al., 2007; Gallese & Ferri, 2014; Hecht, 2010; Hemsley, 1998; Kean, 2009; Lysaker et al., 2003; Lysaker & Lysaker, 2010; Moe & Docherty, 2014; Mishara, 2007; Nelson et al., 2009; Nelson et al., 2014a; Nelson et al., 2014b; Parnas & Louise, 2001; Parnas, 2003; Parnas et al., 2003; Raballo et al., 2011; Sass, 2001; Sass & Parnas, 2001; Sass, 2003; Zahavi, 2001) exemplified by the recent special issue of

Schizophrenia Research devoted to self disorders in schizophrenia (see Park and Nasrallah, 2014), the most recent Diagnostic and Statistical Manual of Mental Disorders (5^{th} ed.; DSM-5; APA, 2013) has left out criteria relating to anomalous self-experiences as being crucial for the diagnosis of the disorder. In fact, self-disturbances in schizophrenia have been notably absent from the DSM since the DSM-III (APA, 1980).

The following section describes sense of self in general, and then the next section describes the phenomenology of self-disturbances in schizophrenia most relevant to the current dissertation.

Sense of Self

The study of the sense of self has fascinated philosophers, authors, and researchers for centuries. There are many varieties of terminology to describe the sense of self in the philosophical and psychological literature. As one example, William James (1892) wrote about the distinction between the spiritual self, mental self, and physical self. The current dissertation will only touch upon definitions of self briefly before moving on to the more pressing issue at hand: the scientific study of self-disturbances and its relevance for schizophrenia-spectrum disorders. For a review of the many conceptualizations of selfhood in the literature, see Brown (2014).

The "**minimal self**" or "***ipseity***" (*ipse* = self) indicates an individual's pre-reflexive self, or the sense of self that underlies all other narrative forms of self (Gallagher, 2000). It is the part of the self that constitutes the "I" and first person perspective in one's actions and understandings in a given moment (e.g., Nelson et al., 2014). For example, my minimal self acknowledges that "I am currently typing my dissertation, that it is me that is pressing the keys on my laptop, that my body is tired and I would love another cup of coffee right about now."

This minimal sense of self is contrasted with a narrative sense of self, which describes more complex aspects of selfhood, such as "I am a mother, a wife, a daughter, a student."

Finally, and most importantly, another type of selfhood, the physical or bodily self, is that which enables individuals to have the sense of ownership and agency over one's physical body parts, in addition to having a sense of mental representation of their body. The bodily sense of self is considered to depend on intact multisensory integration and it is considered an essential component to the intact sense of self (e.g., Blanke, 2012). Without a clear bodily sense of self, one has greater difficulty distinguishing between themselves and their surrounding environment, understanding the agency or intention behind their own motor commands, and differentiating between themselves and others around them in the social world. The bodily sense of self has been hypothesized to be disturbed in the schizophrenia-spectrum (described below), and this disturbance is the focus of the current dissertation.

Sense of Self in Schizophrenia

Phenomenology

"Sometimes I think (spiritual) beings have done some things with my body."
-Park Lab Study Participant (2014)

The quote above from a patient with schizophrenia exemplifies two aspects of disturbances in sense of self that are common in schizophrenia, namely, disturbances of body ownership and faulty sense of agency. These two aspects of self-disorders in schizophrenia were found to be the most disrupted in a recent meta-analysis by Hur and colleagues (2014). The following section will describe in further detail the most relevant of the self-disturbances across the schizophrenia-spectrum. Each of these phenomenological self-disturbances were designed to be included in our new assessment, the BODI (described below in Study 2).

Body Ownership Disturbances

"This is my hand; [the rubber hand] looks like my hand."
—R.M. (Thakkar et al., 2011, p.6)

As described briefly above, body ownership disturbances were recently found to have the largest effect size in a recent meta-analysis on self-disturbances in schizophrenia (Hur et al., 2014), and disturbances in body ownership have been found across a variety of methodologies, including the classic Rubber Hand Illusion (RHI; Botvinick & Cohen, 1998). Furthermore, body ownership disturbances have been directly linked to the genesis of psychotic symptoms and out-of-body experiences (e.g., Thakkar et al., 2011).

Notably, body ownership disturbances typically do not manifest in both directions in schizophrenia; in other words, most patients with schizophrenia exhibit feelings of owning body parts that do not actually belong to one's body, as opposed to disowning parts of body. However, there has been at least one case study of a patient with schizophrenia that also exhibited symptoms of ***somatoparaphrenia***, or the feeling of disownership of one's body limb (Xavier et al., 2011; also see de Haan & Fuchs, 2010). Study 2 (described below) aims to investigate body ownership disturbances in the schizophrenia-spectrum in further detail.

Body Image Aberrations

"I was dissolving…like a sand castle with all the sand sliding away."
—Elyn Saks (2008)

Disturbances in body image in patients with schizophrenia have been discussed for decades in the literature (e.g., Angyal, 1936; Bychowski, 1943; Cancro, 1971; Chapman et al., 1978; Cleveland, 1960; Cutting, 1989; Fisher, 1966; Fishur & Seidner, 1963; Green, 1970; Koide, 1985; Koide et al., 2002; Kokonis, 1972; Priebe, & Röhricht, 2001; Rajender et al., 2009; Stanghellini et al, 2012; Traub et al., 1967). Common complaints include SZ patients feeling as if limbs are changing size or shape, or other bizarre sensations or perceptions such as feeling as though one's legs are made out of bread, ping pong balls hidden inside one's nose, and the feeling that one is bleeding from the eyes (examples from APA internship in state hospital). These feelings of body image distortions are often accompanied by blurred self-other boundaries (Quinlan & Harrow, 1974), in which one has difficulty distinguishing between themselves and those around them, which can lead to psychotic symptom development, including thought disorder (Blatt & Ritzler, 1974). For example, if one is experiencing sharp pains in the neck, but has difficulty distinguishing where their body begins and ends, they are understandably more likely to attribute the pain to an outside source, such as "the shadows are stabbing me in the neck" (example from internship) than someone who has clear body boundaries. Body image aberrations will be examined in the current dissertation in both Study 2 and Study 3 described below.

Out-of-Body Experiences (OBEs)

"Feels like we're a foot off the floor, turning in a circle"
—R.M. (Thakkar et al., 2011, p. 6)

An out-of-body experience (OBE) is an experience in which a person has the sensation of floating or flying outside of one's physical body, and sometimes, actually perceiving one's body from a different vantage point (Tyrell, 1943). Out-of-body experiences can be classified as a type depersonalization experience, and also as a type of autoscopic hallucination (in which one views their *surroundings* from a different perspective, Brugger et al., 1997), which is related to heautoscopy (in which one views *themselves* from a different perspective, Brugger et al., 1997). For a review on OBEs, heautoscopy and autoscopy, see Blanke and Mohr (2005), and for a review on polyopic heautoscopy in particular, see Brugger et al. (2006).

Patients with schizophrenia show elevated rates of out-of-body experiences (e.g., Blackmore, 1986) and previous research has linked positive schizotypal personality traits and the history of OBEs (e.g., McCreary & Claridge, 1995; 1996; 2002). Study 1, described below, aims to build on this research. Specifically, we demonstrate that individuals at risk for prodromal psychosis show elevated rates of OBEs compared to individuals at low risk for schizophrenia (McIntosh et al., in prep) using the Prodromal Questionnaire-Brief (PQ-B; Loewy et al., 2011).

Strange Face in the Mirror

"I have always had trouble looking away from my reflection, believing it to not be my own reflection."
—Park Lab Study Participant (2014)

The "Strange Face in the Mirror" is a phenomenon in which individuals feel a sense of unreality, despair or unease upon staring at themselves in the mirror. More specifically, individuals sometimes feel as though the person staring back at them is not actually their own self, but an imposter, or someone who is evil. This phenomenon is assessed in numerous self-report scales (e.g., Per Ab; Chapman et al., 1978; DES-II, Bernstein & Putnam, 1986, Carlson & Putnam, 1993; SPQ, Raine, 1991) many of which seek to quantify psychosis-proneness psychometrically. This phenomenon has also been induced experimentally in healthy individuals (Caputo, 2010a) and patients with schizophrenia (Caputo et al., 2012) using the mirror gazing test. This frightening phenomenon is included in our new scale, the BODI (Benson et al., in prep), described below in Study 2.

Agency Disturbances

"I felt like an alien that was being used to manipulate humans by other aliens. I felt like someone was looking through my eyes without my consent."
-R.M. (Thakkar et al., 2011, p. 1)

Sense of agency has been described as one component of the minimal sense of self (Gallagher, 2000) that is disrupted in schizophrenia (Hur et al., 2014). Disturbances in self-agency have been discussed in schizophrenia for some time in the literature (Bulot et al., 2007; Daprati et al., 1997; Frith, 1987; Frith, 2005; Hauser et al., 2011a; Hauser et al., 2011b; Hur et al., 2014; Jeannerod; 2009; Kircher & Leube, 2003; Lafargue & Franck, 2009; Lallart et al., 2008; Maeda et al., 2012; Metcalfe et al., 2012; Sato & Yasuda, 2005; Schimansky et al., 2010). Agency disruptions have been hypothesized to be related to traditional symptoms of schizophrenia, such as thought insertion, delusions of control, and auditory hallucinations (Frith, 1987; 2005). Furthermore, Asai and Tonno (2008) found that individuals with high levels of schizotypy displayed a weaker sense of self-agency compared to controls. Thus, disruptions in sense of self-agency appear to be a crucial and fascinating component to the etiology and phenomenology of the schizophrenia-spectrum.

Corollary Discharge. When we produce an intentional motor action, such as picking up a pen to take notes, an ***efference copy*** of this intentional motor command (van Holst, 1954) is generated in order to predict the sensory consequences, or ***corollary discharge*** (Sperry, 1950). Then, the prediction is compared with the ***re-afference***, or the actual sensory feedback created by the intentional movement.

Some patients with schizophrenia are able to tickle themselves (Blakemore et al., 2000), a novel ability that has been postulated to be a result of deficiencies in the corollary discharge system. The presence of this ability in individuals hypothesized to be at-risk for schizophrenia (i.e., prodromals) has not yet been studied. Simply asking people if they are able to tickle themselves seems like a harmless, quick and easy way to possibly screen individuals for schizophrenia risk if it turns out that prodromals also share this self-tickling ability (and thus, an underlying abnormal corollary discharge system). It would also be important to determine the specificity of this phenomenon (i.e., if other clinical disorders, such as bipolar disorder, also share this ability to tickle themselves). We sought to build on this research of this self-tickling ability in the SZ spectrum in Study 3 described below.

Measurement of Self-Disturbances in Schizophrenia

Traditional (i.e., diagnostic) symptoms of schizophrenia are often quantified by standard symptoms interviews (e.g., Structured Clinical Interview for DSM-IV Axis I Disorders [SCID-IV] First et al., 2002; Scale for the Assessment of Negative Symptoms [SANS] Andreasen, 1983; Scale for the Assessment of Positive Symptoms [SAPS] Andreasen, 1984; Positive and Negative Syndrome Scale [PANNS] Kay et al., 1987) administered by trained clinicians or researchers. Levels of schizotypy are often quantified by self-report measures in healthy populations such as the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), a widely used measure of schizotypal personality that has been shown to have excellent psychometric properties (e.g., Wuthrich & Bates, 2006; Fonseca-Pedrero et al., 2008), or the Chapman scales for psychosis-proneness (Chapman et al., 1995), which also have excellent psychometric properties (e.g., Kwapil et al., 2008; Wuthrich & Bates, 2006). Finally, level of risk for psychosis or prodromal states of schizophrenia can be quantified by using self-reports, such as the Prodromal Questionnaire-Brief (PQ-B; Loewy et al., 2011), which is used below in the current dissertation and explained in greater detail in Study 1B, or structured interviews, such as the Structured Interview for Prodromal Symptoms (SIPS; Miller et al., 2003).

The assessments outlined below will focus on those measures that seek specifically to quantify anomalous self-experiences, as opposed to more general schizophrenia-spectrum symptoms (for a review, see Lee et al., in press).

Self-Report Assessments

Current self-report measures that quantify anomalous sense of self include the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Perceptual Aberration Scale (Per Ab; Chapman et al., 1978), Self-Experience Lifetime Frequency Scale (SELF; Heering et al., 2016), and the BODI 1 and BODI 2 (Brugger et al. Out of body and Dissociative Experiences Inventory; Benson et al., in prep), which are described below in the methods section of the current studies of the dissertation.

Additionally, the **Examination of Anomalous Self-Experiences (EASE)** is a semi-structured interview that seeks to assess unusual self-experiences across the schizophrenia-spectrum. The EASE contains five domains, including (1) disturbances of cognition and stream of consciousness (2) disturbances of self-awareness and presence, (3) anomalous bodily experiences, (4) demarcation and transitivism, and (5) existential reorientation. Specific symptoms assessed in the above domains of the EASE include mirror-related phenomena (e.g., strange face in the mirror), bodily disintegration, somatic depersonalization & mimetic experiences. The EASE has yielded good psychometric properties, including adequate internal consistency (Raballo and Parnas, 2012), and inter-rater reliability (Moller et al., 2011).

Individuals with schizophrenia receive higher scores on the EASE compared to healthy controls (Raballo and Parnas, 2012), and similar results have been found with schizotypal personality disorder (Raballo and Parnas, 2012). Furthermore, scores on the EASE have been found to predict transition to psychosis in individuals who are at risk of schizophrenia (Nelson et al. 2012), and is specific to schizophrenia and not other types of psychosis (e.g., bipolar disorder; Nelson et al., 2013). Thus, the EASE is a useful measure to study anomalous self-experiences across the schizophrenia-spectrum. However, in order to learn how to administer the EASE, one must attend a 3-day training course in Denmark that is only offered once a year (Parnas et al. 2005), and hence the EASE is not readily available for clinicians and researchers without the ready means (time or funds) to attend this crucial specialized training in Europe. Thus, the need for a good measurement without such intensive training demands are necessary, and we hoped to accomplish a self-report measure that could accommodate more researchers with the development of the BODI in Study 2.

Furthermore, since many researchers have called for increased phenomenological emphasis in the study of schizophrenia (e.g., Mullen, 2011), researchers have increasingly utilized schizophrenia patients' own life stories to quantify sense of self-disturbances across the schizophrenia spectrum, by analyzing their **First Person Accounts**. For example, Fineberg and colleagues (2014) applied word-counting software to first-person accounts of patients with schizophrenia compared to patients with mood disorders. These researchers found that patients with schizophrenia used fewer first-person singular pronouns (e.g., 'I'), and more third-person plural pronouns (e.g., 'they') compared to those with mood disorders, thus providing further evidence for ipseity disturbance in schizophrenia (Fineberg et al., 2014).

As another example, Moe & Docherty (2014) tested patients with schizophrenia compared to bipolar patients by using selected scales from the **Assessment of Self Descriptions** (Blatt et al., 1992) to quantify sense of self. These researchers found that self-disturbances, specifically agency and relatedness to others, were deficient compared to bipolar patients and healthy controls. Furthermore, these results remained significant even after controlling for global functioning and symptom severity (Moe & Docherty, 2014).

Similarly, research on metacognition in patients with schizophrenia indicates self-disturbances (Mishara et al., 2014). Specifically, SZ patients are more likely to produce narratives that exhibit reductions in the binding processes that are typically necessary to create an integrated and embodied self within one's narrative life story. Moreover the authors of this study link metacognition and self-disturbances with implications for functional outcome in patients with schizophrenia (Mishara et al., 2014).

Although we did not collect first person account data in the current dissertation, we did allow individuals a space to comment on each individual item on the BODI questionnaire, and we look forward to analyzing those comments for group differences in first person singular vs. plural pronouns like has been described above in previous studies. To see a select sampling of comments on the BODI items by group, please see Appendix J.

Selective Review of Experimental Measures of Bodily Self-Disturbances

As previously mentioned, recent work on the sense of self in schizophrenia has picked up speed recently in part due to the advances in empirical measures that can be used to experimentally induce and quantify self-disturbances in healthy and clinical populations (Blanke, 2012). As one example, the **Pinocchio Illusion** (PI; Burrack & Brugger, 2005; Michael & Park, 2016) is a proprioceptive-tactile illusion that induces the feeling that one's nose is growing in susceptible individuals. This illusion is described in detail in Study 3 below. Additional experimental measures of self-disturbances include the Rubber Hand Illusion (RHI; Botvinick & Cohen, 1998), Full Body Illusion (Lenggenhager et al., 2007), Enfacement Illusion (Sforza et al., 2010; Tajadura-Jimenez et al., 2012a; Tajadura-Jimenez et al., 2012b; Tsakiris, 2008), and the Mirror Gazing Test (Caputo, 2010a; 2010b), which will all be briefly described below.

The **Rubber Hand Illusion** (RHI; Botvinick & Cohen, 1998) is a widely used experimental measure that utilizes visuotactile conflicts to induce illusions and to quantify feelings of body ownership. Specifically, individuals receive synchronous stimulation of a paintbrush touching their own hand while watching a rubber hand being brushed, compared to asynchronous stimulation of the same experimental setup. Following synchronous and asynchronous stimulation, individuals are asked to determine where in space their hand is located, as a measure of proprioceptive drift towards the rubber hand, and used as an index of perceived ownership over the rubber hand.

Patients with schizophrenia report the Rubber Hand Illusion more intensely than matched healthy controls (Peled et al., 2003; Thakkar et al., 2011), as quantified by self-reports on a standard questionnaire that accompanies the RHI experimental setup. Examples of items on this self-report questionnaire include “I felt as if the rubber hand was my hand” and “It seemed as if I were feeling the touch of the paintbrush where I saw the rubber hand.” Furthermore, patients with schizophrenia show objective signs of ownership over the rubber hand in Thakkar et al.’s (2011) RHI experiment, as quantified by increased drift in patients with schizophrenia on synchronous compared to asynchronous stimulation.

The strength of the RHI is also associated with positive symptoms in patients with schizophrenia (Thakkar et al., 2011) and positive schizotypy in healthy controls (Thakkar et al., 2011; Germine et al., 2013). Moreover, as mentioned above in the section on phenomenology, in Thakkar and colleagues’ (2011) experiment, a patient with schizophrenia actually experienced an out-of-body experience during RHI administration, demonstrating the link between body ownership and psychotic symptom genesis in schizophrenia.

The **Full Body Illusion** (Lenggenhager et al., 2007) is similar to the rubber hand illusion described above, but modified for the entire body. Specifically, a video camera is placed behind the participant and the image is projected to a display that is mounted on the participant’s head. Synchronous stroking of the back is applied while the participant watches the video, and is compared to asynchronous stroking of the same experimental set-up. Ehrsson (2007) also utilized a similar set-up but stroked the chest instead of the back to induce the out-of-body experience illusion. A self-report questionnaire and proprioceptive drift measure is obtained to determine whether or not the participant experienced the full body illusion, which, critically, is experienced more intensely in the synchronous compared to asynchronous stroking condition. Importantly, a very recent study just published the finding that individuals with schizophrenia responded the same way as controls in this paradigm (Shaqiri et al., 2017). Thus, the authors argue that while there is much evidence for disruptions in agency in SZ, their multisensory bodily self-representation may be intact, at least when tested on the Full Body Illusion.

The **Enfacement Illusion** (Sforza et al., 2010; Tajadura-Jimenez et al., 2012a; Tajadura-Jimenez et al., 2012b; Tsakiris, 2008) is an experimental procedure designed to evoke alterations in self-identification. Synchronous interpersonal multisensory stimulation between a participant's own face and another person's face causes the participant to identify with the other person's face. Importantly, these changes in self-identification do not result from asynchronous stimulation. Examples of items used in the self-report questionnaire include "I felt like the other's face was my face" and "It seemed like I was looking at my own reflection in a mirror rather than at the other's face." The enfacement illusion has been utilized in participants with mirror-touch synesthesia (Maister et al., 2013) and has been found to blur the boundary between self and others (Paladino et al., 2010). The enfacement illusion has never been utilized in the schizophrenia-spectrum and would be a useful future direction to assess ease of changes of self-identification in individuals at risk for developing schizophrenia.

The **Mirror Gazing Test** (Caputo, 2010a; 2010b) is an experimental paradigm designed to induce the phenomenon described earlier, the "**strange face in the mirror**" experience.

Specifically, participants are asked to stare at their reflected image in a large mirror while sitting in a dimly lit room for 7-10 minutes. At the end of this session, participants are asked to freely report what they saw in the mirror, and some paradigms include a standardized questionnaire asking participants if they saw specific images (e.g., Caputo et al., 2012). Examples of questions on the self-report questionnaire include “How often did you notice anything strange?” and “How often did you see another person in the mirror?” (Caputo et al., 2012).

The Mirror Gazing Test has successfully induced the strange face in the mirror in both clinical populations (e.g., patients with schizophrenia; Caputo et al., 2012) and healthy populations (e.g., Terhune & Smith, 2006). Significantly, patients with schizophrenia endorse the strange face in the mirror experience more intensely and more negatively after completing the mirror gazing test than do healthy controls (Caputo et al., 2012). Furthermore, adolescents in a non-clinical sample were found to experience the strange face in the mirror phenomenon more intensely in relation with their levels of schizotypy (Fonseca-Pedrero et al., 2015). Thus, the mirror gazing test appears to be a useful experimental procedure to induce anomalous self-experiences in schizophrenia-spectrum populations. However, future researchers should be very careful about possible suggestibility effects in the mirror gazing test (Terhune & Smith, 2006).

Etiology of Self Disturbances in Schizophrenia

Since self-disturbances have been shown to be elevated in schizophrenia (e.g., Hur et al., 2014; Raballo and Parnas, 2012), to relate to psychotic symptom development (e.g., Thakkar et al., 2011), and to predict transition from prodromal states to full blown schizophrenia (e.g., Nelson et al., 2012), it remains an important question to understand what underlies anomalous self-experiences. The following etiological possibilities outlined below are a few areas that warrant the attention of future research and are the most relevant to the current dissertation.

1. Neurological Origins

Since the sense of self has increasingly become a hot topic for research, there has understandably been an increase in neuroimaging research on the self in recent years. The current dissertation will focus on patients with schizophrenia, but for a meta-analysis on neuroimaging studies on the self in healthy populations, see Northoff et al. (2006).

Broad Parietal Abnormalities

Patients with schizophrenia exhibit significant parietal abnormalities (see Torrey, 2007 for a review) as evidenced by neuroimaging methodology (e.g., Buchanan et al., 2004; Frederikse et al., 2000; Goldstein et al., 1999; Hulshoff et al., 2001; Kubicki et al., 2002; Nierenberg et al., 2004; Niznikiewicz et al., 2000; Shapelske et al., 2002; Thakkar et al., 2014; Wilke et al., 2001; Yun et al., 2014; Zhou et al., 2007) and neuropsychological tests, such as the line bisection test (Benson & Park, 2013; Cavezian et al., 2006; He et al., 2007; Molenberghs & Sale, 2011; Mort et al., 2003; Ribolsi et al., 2012; Schenkenberg et al., 1980; Vandenberghe et al., 2005). Parietal abnormalities have been found to be associated with magical ideation (Mohr et al., 2003) and delusional ideation as quantified by the Peters et al. Delusions Inventory (Peters et al., 2004; Benson & Park, 2013), including increased levels of passivity delusions (Dankert et al., 2004; Maruff et al., 2005).

In support of the link between parietal abnormalities and sense of self disturbances, Irle and colleagues (2007) found that individuals with Borderline Personality Disorder (BPD) had increased parietal disturbances compared to healthy controls, and that these parietal abnormalities were related to increased levels of dissociative depersonalization experiences. Thus, the parietal lobe appears to be an important area for future study for not only schizophrenia in general, but also sense of self in multiple disorders, including schizophrenia, borderline personality disorder, and dissociative disorders.

In Study 3 (described below) we utilize the line bisection task to investigate possible parietal contributions to anomalous multisensory integration and the hypothesized subsequent development of disturbed sense of self in the schizophrenia-spectrum.

Specific Temporoparietal Junction (TPJ) Abnormalities

Previous research has linked out-of-body experiences (OBEs) with abnormal frontoparietal connectivity (Easton et al., 2009), and has localized the induction of OBEs to the TPJ (Blanke et al., 2004; Blanke et al., 2005). TPJ abnormalities have also been linked to positive schizotypy (Arzy et al., 2007). Furthermore, Vercammen and colleagues (2010) found that auditory hallucinations in SZ were related to reduced functional connectivity in temporo-parietal areas. Finally, at least one study has been conducted that shows promise of rTMS to the right TPJ as a potential therapeutic service for individuals suffering from Depersonalization Disorder (Christopeit et al., 2014). Thus, it appears as though TPJ abnormalities are an important neurological region for abnormal sense of self. In the studies below, we look at OBE, Temporal Lobe Scale scores, and a factor on the BODI 2 that we hypothesize represents TPJ abnormalities.

2. Sensory Abnormalities

It is important to note that many of the experimental paradigms used to induce anomalous self-experiences in the literature utilize multisensory methodology. For example, the classic rubber hand illusion (Botvinick & Cohen, 1998) is a visuotactile illusion, while the newer Pinocchio illusion (Burrack & Brugger, 2005; Michael & Park, 2016) is based on proprioceptive & tactile input.

Unisensory Deficits

Individuals on the schizophrenia-spectrum have been found to exhibit a number of unisensory deficits, including abnormalities in olfaction (Cascella et al., 2007; Cohen et al., 2012; Cumming et al., 2011; Kwapil et al., 1996; Moberg et al., 2014; Turetsky et al., 2009), tactile sensitivity (Chang & Lenzenweger, 2004; Chang & Lenzenweger, 2005; Lenzenweger, 2000), visual processing (Butler & Javitt, 2005; Levy et al., 2004; Levy et al., 2010), auditory processing (Leitman et al., 2008; Micouloaud-Franchi et al., 2011, 2012), proprioception (Arnfred et al., 2006; Arnfred et al., 2010; Feinberg, 2009; Ferri et al., 2012; Fourneret et al., 2002; Franck et al., 2001; Frith, 2005; Frith et al., 2000; Jeannerod, 2003; Michael & Park, in preparation; Shergill et al., 2005; Silverstein et al., 2012; Synofzik et al., 2010; Thakkar et al., 2011), vestibular sensation (Colbert et al., 1959; Fish & Dixon, 1978; Gordon, 1979; Levy et al., 1983; Haghgooie et al., 2009; Ornitz, 1970; Sang et al., 2006; Schilder, 1933; Pawlak-Osinska et al., 2000), and interoception (Dawson et al., 2010; Ellis & Lewis, 2001; Lewis et al., 2001; Roux et al., 2010; Williams et al., 2007).

One particularly interesting sensory deficit is that of the vestibular sense (e.g., Colbert et al., 1959), as this sense may be important in the production of out-of-body experiences (Lopez & Elziere, 2017) and sense of bodily self in general (Ferre et al., 2013, 2014). Future work should investigate the vestibular function in SZ patients in relation with self-disturbances in the future to further clarify this relationship. This will be partially addressed in Study 3 described below with the Pinocchio Illusion and healthy controls varying in their psychosis risk as determined by their scores on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011).

Unisensory deficits are important to understand for a number of reasons, but for the current purposes, these deficits are relevant because of their potential impact on multisensory abnormalities (described below). Specifically, when an individual displays a significant unisensory deficit, there is potential for other sensory systems to overcompensate as a response, which could then lead to global connectivity changes on a neural level.

Multisensory Abnormalities

Multiple researchers have found abnormal multisensory processing in schizophrenia (Ross et al., 2007; Stevenson et al., in preparation; Surguladze et al., 2001; Szycik et al., 2009; Williams et al., 2010a; Wynn et al., 2014). Moreover, at least one study found that the degree of multisensory facilitation was influenced by the presence of multimodal hallucinations in patients with schizophrenia (Williams et al., 2010a).

Intact multisensory integration is considered essential for normal aspects of self – experience, including recognition and awareness of one's body, cognitions, and emotions (Damasio, 2001; Gallagher, 2000; Postmes, 2014). Perceptual dysfunction is considered to be an essential part of the early stages of schizophrenia (Chapman, 1966; Cutting & Dunne, 1989; McGhie & Chapman, 1961). The inferior parietal lobule (IPL) normally manages the multiple sensory inputs by sorting and integrating them upon arrival all at once. In the case of an abnormal IPL, however, the person might be expected to be inundated with sensory stimuli, thus creating an overwhelming and chaotic situation in which it is extremely difficult to create a cohesive and coherent narrative of the multiple sensory inputs from the environment. As described above, the IPL has been found to be disrupted in patients with schizophrenia (see Torrey, 2007 for a review), and thus may account for the perceptual dysfunctions or "perceptual incoherence" that is often experienced by SZ patients (described below).

<u>3. Perceptual Incoherence Model</u>

Postmes and colleagues (2014) postulate that "***perceptual incoherence***", or multisensory disintegration, may underlie self-disorders in schizophrenia. These authors argue that perceptual incoherence could lead to specific anomalous self-experiences, including depersonalization and diminished agency. In this model the role of the body is extremely important. Postmes and colleagues (2014) hypothesize that SZ patients subconsciously try to restore perceptual incoherence and "seek refuge in magical ideation" (Postmes et al., 2014, p. 46) unintentionally leading to traditional psychotic symptoms, such as hallucinations and delusions. In other words, they posit that symptoms of schizophrenia are actually solutions to the underlying multisensory incoherence experienced by the patients.

More experimental research needs to be conducted on the relationship between tactile discrimination deficits in relation to proprioception dysfunction in schizotypes prone to dissociative experiences. This can be achieved through administration of the 2-point discrimination procedure (e.g., Lenzenweger, 2000) in relation to empirical paradigms such as the Pinocchio illusion (Burrack & Brugger, 2005) in individuals scoring high and low on standard schizotypy measures, such as the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), the Perceptual Aberration Scale (Chapman et al., 1978), or the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). Since pilot studies (described in Study 2 below) have shown a relationship between dissociative experiences and psychosis-proneness as quantified by the PQ-B, we decided to address this research question by utilizing the PQ-B and will be described in further detail below in Study 3.

4. Trauma

Traumatic history is an important etiological consideration for dissociation (e.g., Bremner & Marmar, 2002; Scaer, 2014; Spiegel, 1997). Furthermore, one proposed reason for the connection between dissociation and schizotypal personality is the shared history of trauma (e.g., Berenbaum, 1999). Patients with schizophrenia have been found to have high rates of trauma exposure (Gearon et al., 2003; Larsson et al, 2013; Lysaker et al., 2001; Mueser et al., 2004; Resnik et al., 2003). Furthermore, researchers have found that trauma symptoms appear to be linked with traditional symptoms of schizophrenia, such as delusions and hallucinations (Hardy et al., 2005; Lysaker et al., 2005; Lysaker & LaRocco, 2008; Ross et al., 1994; Sheffield et al., 2013). Some models of the pathogenesis of schizophrenia and psychosis in general have postulated that trauma history may be an important risk factor for the development of the illness (Bebbington et al., 2004; Janssen et al, 2004; Read et al., 2001; Spauwen et al., 2005; Whitfield et al., 2005), potentially through HPA axis disturbances (e.g., Ruby et al., 2017). Trauma history has also been associated with psychotic-like experiences, including paranoia (Campbell and Morrison, 2007; Freeman & Fowler, 2009; Gracie et al., 2007). However, there is much concern over the methods of assessing childhood trauma in schizophrenia (see Bendall et al., 2008).

One caveat is that almost all the studies on trauma in schizophrenia to date rely on retrospective accounts and given the memory impairments of schizophrenic patients, it is difficult to verify the veracity of the trauma history. However, whether these traumatic events occurred in the real world or in a patient’s imaginary world, the resulting effects on the patient are not easy to distinguish. For example, in her memoir, Lori Schiller (2008) describes in great and vivid detail the day she beat the family dog to death and the anguish that she experiences every time she recalls that day in her memory. Her memory of this traumatic event is almost photographic, but as she reveals later, this event never happened in real life. She never even had a dog. Nevertheless, she suffers from the trauma every time she recollects this event. Therefore, it matters less whether the event really occurred or not but the impact of the memory may be more important.

Although there has been much work investigating the relationship between trauma and dissociative self-experiences (e.g., Bremner & Marmar, 2002; Scaer, 2014; Spiegel, 1997), and a growing body of literature implicating the role of traumatic history on psychotic symptoms in general (e.g., Hardy et al., 2005; Lysaker et al., 2005; Lysaker & LaRocco, 2008; Ross et al., 1994), there remains a gap in the literature that focuses on the potential importance of traumatic experiences in the etiology of dissociative self-experiences in psychotic populations, with a few notable exceptions, including Holowka et al. (2003), Vogel et al. (2006), and Vogel et al. (2009). This remains an important open area for future investigations and will be explored in Study 3 described below.

Still, though trauma history appears to be important in the development of schizophrenia-spectrum symptoms, it is not present in all patients with schizophrenia, and thus cannot account for the symptoms in individuals who suffer from psychosis without a concurrent history of trauma. Some researchers (e.g., Sar et al., 2010; Ross, 2004) have proposed a subcategory of schizophrenia to account for the large comorbidity of dissociative disorders and schizophrenia in patients with trauma history. Schizophrenia is a very heterogeneous disorder and delineating subgroups based on etiology (rather than symptom profile alone) may prove to be a useful tool to help understand and treat the disorder.

Continuum of Psychosis: the Schizophrenia-Spectrum

Schizophrenia lies at the extreme end of a hypothesized continuum representing psychosis-proneness and can be quantified by levels of psychometric schizotypy (Bentall et al., 1989; Grant et al., 2015; Lenzenweger, 2010; Meehl, 1962; Meehl, 1989; Raine, 1991; Raine, 1995). Schizotypy may be conceived as a continuum of personality traits and experiences that theoretically predispose individuals for risk for schizophrenia. Similar to the three major symptom clusters in schizophrenia, there are three factors of schizotypy that map onto those positive, negative, and disorganized symptoms in schizophrenia.

For example, positive schizotypy is characterized by the presence of unusual perceptual experiences, magical thinking and referential ideation. Negative schizotypy is characterized by decreased interest in social engagement, and finally, disorganized schizotypy is characterized by odd behavior and unusual usage of language. Levels of schizotypy are elevated in first-degree relatives of patients with schizophrenia (e.g., Kremen et al., 1998), and have been found to predict psychosis up to 10 years after testing (Chapman et al., 1994).

Overlap Between Schizophrenia and Dissociative Disorders

Janet (1890) described ***dissociation*** to denote a splitting of the psyche in a similar way that Bleuler described schizophrenia to describe a splitting of the mind (Putnam, 1989). The DSM-5 (APA, 2013) lists four specific dissociative disorders, in addition to two further classifications for individuals whose dissociative experiences cannot be easily classified into any of the four concrete categories. Specifically, the classifications are (1) dissociative identity disorder, which was formerly known as multiple personality disorder; (2) dissociative amnesia; (3) dissociative fugue; and (4) depersonalization disorder. While individuals with dissociative disorders clearly exemplify anomalous sense of self, the current dissertation focuses on depersonalization experiences in particular, in addition to dissociative experiences on a more subclinical level in relationship to schizophrenia-spectrum conditions. To be clear, depersonalization experiences involve feeling separate from oneself, as if watching one's life unfold without any agency over the situation, and is often accompanied by derealization, or feelings of unreality (APA, 2013).

Relatedly, patients with schizophrenia report elevated levels of dissociative experiences compared to healthy controls and other clinical populations, including individuals with agoraphobia and substance abuse disorders (Bernstein & Putnam, 1986). Previous work has demonstrated the importance of considering dissociative experiences, particularly depersonalization, as important in predicting hallucinatory phenomena (e.g., Kilcommons and Morrison, 2005; Perona-Garcelan et al., 2008). Thus, the overlap between schizophrenia and dissociative disorders has support in the literature (e.g., Bob et al., 2010; Brunner et al., 2004; Gainer et al., 1994; Gonzalez-Torres et al., 2010; Laddis & Dell, 2012; Maginni et al., 2002; Moskowitz, 2011; Renard et al., 2012; Ross & Keyes, 2004; Ross & Keyes, 2009; Scharfetter, 2009; Spitzer et al., 1997) but is often ignored in empirical research projects. In contrast, however, there is much work on the relationship between schizotypy and subclinical dissociative experiences, particularly in university undergraduate samples.

Many studies link positive schizotypy and dissociative experiences in the literature (e.g., Allen & Coyne, 1995; Allen et al., 1996; Allen et al., 1997; Bauer & Power, 1995; Gleaves & Eberenz, 1995; Irwin, 2001; Merkelbach & Griesbrecht, 2006; Modestin et al., 1996; Moskowitz et al., 2005; Startup, 1999; Watson, 2001;) using a variety of schizotypal personality measures. Merkelbach and Giesbrecht (2006) outline three proposed reasons for this connection between schizotypy and dissociative experiences, including (1) similar item content across measures

(Watson, 2001); (2) similar higher-order personality traits, such as openness to experience (McCrae & Costa, 1997); and (3) shared trauma history between both dissociation and schizotypy (e.g., Berenbaum, 1999).

However, at least some evidence exists in the literature that discounts each of these proposed connection reasons. For example, Watson (2001) found evidence for the overlap between dissociation and schizotypy to remain strong even after correcting for the overlap in depersonalization items across self-report measures. Furthermore, in a large sample of undergraduate students using the Five-Factor Model (Costa & McCrae, 1992), neuroticism was found to be related to dissociative experiences (Kwapil et al., 2002), but surprisingly openness to experience was not. Finally, Irwin (2001) found that the link between dissociation and schizotypy remains strong even after controlling for self-reports of traumatic history in childhood.

Overview of the Dissertation

In sum, disturbed sense of self was central to early theories of schizophrenia (Kraepelin, 1896; Bleuler, 1911), but a century went by before researchers became interested in the role of self in schizophrenia, with the advent of empirical methodologies to investigate self-disturbances, such as illusions of body ownership in the rubber hand illusion (Botvinick & Cohen, 1998). It is now well established that self-disturbances are common in schizophrenia (Hur et al., 2014) and individuals at risk for schizophrenia (Parnas et al., 1998; Davidsen, 2009; Parnas et al., 2011; Stanghellini et al., 2012; Raballo & Parnas, 2012). Self-disturbances include phenomenological experiences such as body ownership disturbances (Thakkar et al., 2011), faulty sense of agency (Frith, 1987), body image aberration (Chapman et al., 1978), out-of-body experiences (Blackmore, 1986), and the terrifying phenomenon of the “strange face in the mirror” (Caputo et al., 2012), among many others (see Mishara et al., 2016).

Since there is ample evidence to support the hypothesis that self-disturbances contribute to schizophrenia pathology (e.g., Raballo & Parnas, 2012; Nelson et al., 2012; Brent et al., 2014), the next essential question is to determine sub-populations that might be greatest risk for these self-disturbances. Based on the etiological evidence previously described, in addition to the larger literature of schizophrenia research in general, it seems as though the individuals at most risk for pathological self-disturbances are those with (1) family history of schizophrenia, (2) trauma history, (3) abnormal multisensory processing, (4) parietal abnormalities, or (5) TPJ abnormalities, in no particular order. Future research needs to address how all these risk factors may be related to one another.

Proposed Diathesis-Stress Response Model: Weak Body & Dissociative Response to Stress

Schizophrenia is considered a neurodevelopmental disorder (Murray & Lewis, 1987) and a common etiological framework is Elaine Walker’s (1997) diathesis-stress model. A ***diathesis*** is an underlying vulnerability to the disorder, and ***stress*** is the trigger that begins the trajectory of psychotic symptom development. Based on the literature reviewed above, I propose a new variant of the diathesis-stress model to account for self-disturbances in schizophrenia.

Bodily-self distortions are present in patients with full-blown schizophrenia, as described in the phenomenology and etiology sections above. To summarize, here is what we know so far with respect to bodily aberrations in schizophrenia: first, patients with schizophrenia exhibit abnormal processing of their own bodily signals, which takes the form of increased pain insensitivity (Fishbain, 1982; Rosenthal et al., 1990; Dworkin, 1994; Singh et al., 2006), reduced tactile sensitivity (Lenzenweger, 2000; Chang & Lenzenweger, 2001; Chang & Lenzenweger, 2004; Chang & Lenzenweger, 2005), altered proprioception (Thakkar et al., 2011; Michael & Park, in preparation), and interoceptive deficits (Dawson et al., 2010; Lewis et al., 2001; Ellis & Lewis, 2001; Roux et al., 2010; Williams et al., 2007). Second, patients with schizophrenia exhibit explicit self-processing abnormalities, including self-face perception abnormalities (Irani et al., 2006; Jia et al., 2015) and difficulties recognizing their own voice (Johns et al., 2001). Third, patients with schizophrenia exhibit self-other boundary discrimination deficits, which are demonstrated through many experiences, including increased rates of out-of-body experiences (Blackmore, 1986; McIntosh et al., in preparation) and enhanced perspective-taking abilities (Thakkar & Park, 2010a; Thakkar & Park, 2010b).

Given these findings, it is likely that proprioception, somatosensory processing and peripersonal sense of space is altered in the schizophrenia-spectrum, and thus I hypothesize that a possible diathesis for schizophrenia is a weak sense of body. This body distortion is manifested in multiple ways across the schizophrenia-spectrum, and is not confined to patients with full-blown schizophrenia: specifically, bodily-self abnormalities are displayed in (1) early childhood (see Walker et al.'s 1994 ingenious home video study on motor abnormalities in early schizophrenia), (2) relatives of patients with schizophrenia, including pain insensitivity (Hooley & Delgado, 2001), and (3) schizotypes, including tactile discrimination deficits (Lenzenweger, 2000; Chang & Lenzenweger, 2004; Chang & Lenzenweger, 2005). Since these abnormalities are seen in at-risk individuals, and not just patients with schizophrenia, a weakened bodily self could be a risk factor for schizophrenia, but is not necessarily sufficient for the development of full-blown schizophrenia.

Stress can take many forms to trigger psychosis in vulnerable individuals, but for the current purposes of relating psychosis to dissociation, traumatic history seems to be the most relevant. Traumatic history has been linked to dissociation, both pathological (e.g., Spiegel, 1997; Bremner & Marmar, 2002; Scaer, 2014) and adaptive (Lynn, 2005; Barlow & Freyd, 2009), and often creates a form of distancing oneself from their body. This can be seen in out-of-body experiences (e.g., Briere & Runtz, 1989), or third-person-perspective memories of the traumatic event (e.g., McIsaac & Eich, 2004; Kenny & Bryant, 2007), both of which are more common in schizophrenia-spectrum populations compared to healthy controls (Blakemore, 1986; Potheegadoo et al., 2013).

This combination of a weak multisensory bodily self, in combination with a dissociative distancing of oneself from a stressful environment, is a recipe for pathological self-disturbance (see Figure 1 below), and thus a possible pathway to developing schizophrenia.

Figure 1. Proposed Diathesis-Stress Response Model for Pathological Self-Disturbance

Importantly, the new model postulates that all pieces (i.e., weak body, dissociative distancing of self in response to stress, and bodily self-disturbance) must be present in order for risk for schizophrenia to develop. For example, an individual may have a weakened sense of body, as demonstrated through bodily sensory deficits such as proprioception or tactile discrimination, but they may not develop schizophrenia if they are not exposed to significant stressors in their lifetime. Similarly, an individual may encounter a significant amount of stress, and display a form of pathological dissociative distancing from that stressful situation, but may not develop schizophrenia because they do not exhibit the diathesis of a weak body, and thus may develop a dissociative disorder or PTSD instead. Finally, one must consider a case in which an individual demonstrates dissociative distancing from a stressful situation in an adaptive, rather than pathological way. This individual may not develop a disorder at all, and may in fact be protected from developing psychopathology, by their use of dissociative distancing from their traumatic environment. The difference between whether or not this person develops a dissociative disorder or not may depend in part on protective factors, such as social support, but much research needs to be conducted on the adaptive nature of dissociation in response to traumatic stressors.

In a similar vein, it is an intriguing possibility that adaptive dissociation to stress may be a possible solution to Huxley et al.'s (1964) "schizophrenia paradox." In other words, Huxley and colleagues presented this concept in an attempt to understand the stable prevalence rate of schizophrenia in the general population despite reduced fecundity (Larson & Nyman, 1973) and increased mortality rates in schizophrenia (Brown, 1997). Since the introduction of the schizophrenia paradox concept, many researchers have posited possible solutions to the paradox, including a possible compensatory advantage that comes along with the genes associated with schizophrenia (Brune, 2004; Hasenfus, 1976; Pearlson & Folley, 2008). One such possibility is the presence of enhanced creativity in relatives of patients with schizophrenia (Nettle & Clegg, 2006; O'Reilly et al., 2001). Interestingly, dissociation is also related to creativity (e.g., Perez-Fabello & Campos, 2011), although further research is necessary on the connection, particularly in schizophrenia-spectrum populations.

I would like to propose that dissociation might also be a possibility for a solution to the schizophrenia paradox. In other words, I hypothesize that a tendency to dissociate in stressful situations is heightened among those in the schizophrenia-spectrum, and that this propensity to dissociate is adaptive in most circumstances, which keeps the trait alive in the gene pool. However, when a propensity for dissociation is combined with a weak sense of body, and that individual is exposed to a significant stressor, the possibility for developing schizophrenia is dangerously elevated. I hypothesize that the most important adaptive function of the propensity to dissociate is that the brain goes into a protective mode during periods of acute stress, which would otherwise be extremely harmful if one was not able to dissociate. Similarly, the increased pain perception associated with individuals on the SZ-spectrum is likely adaptive during times of extreme stress (e.g., combat) and perhaps related to the tendency to dissociate. If one were to have a strong sense of bodily self but still dissociate, it would not be as harmful or risky because the person would have an anchor to come back to; in other words, for most people, occasional dissociation during times of stress is helpful. For the individual at risk for psychosis who has a weakened sense of bodily self, frequent dissociations (due to increased stress and tendency to dissociate) leave the person without a stable base to rely on, and can lead to a recipe for further self-disturbances that can further create risk for psychosis. Individuals on the SZ-spectrum are also unfortunately socially isolated, which is another anchor to reality that they lack, and make dissociations from their weak bodily self even more dangerous in terms of psychosis proneness.

There is much work that needs to be done in order to test these hypotheses and expand the literature on bodily-self distortions in the schizophrenia-spectrum. First, it is important to determine how often SZ patients have dissociative experiences in response to non-traumatic stressors. In other words, in order for the above model to be a legitimate framework, patients with schizophrenia must show this pathological dissociation and distancing of self from a broader range of stressful situations as opposed to only trauma. This is due to the fact that although traumatic history appears to be important for SZ development in some patients with schizophrenia, it certainly cannot be the case for every single patient with schizophrenia (as described above), and thus, a comprehensive model of possible SZ pathogenesis must include a broader form of stress.

Second, more research needs to be conducted on the role of the TPJ in the experience of dissociation in schizophrenia-spectrum populations. This can be achieved through experimental manipulation of the TPJ through cathodal tDCS (as described above), to determine if reduced right TPJ activation could lead to less common and less distressing depersonalization experiences in individuals at risk for developing schizophrenia in a similar fashion that it helped individuals with depersonalization disorder (Christopeit et al., 2014).

Third, more experimental research needs to be conducted on the relationship between tactile discrimination deficits in relation to proprioception dysfunction in schizotypes prone to dissociative experiences. This can be achieved through administration of the 2-point discrimination procedure (e.g., Lenzenweger, 2000; Chang & Lenzenweger, 2001; 2005) in relation to empirical paradigms such as the rubber hand illusion (Botvinick & Cohen, 1998) or the Pinocchio illusion (Burrack & Brugger, 2005; Michael & Park, 2016) in individuals scoring high and low on standard schizotypy measures, such as the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), or the Perceptual Aberration Scale (Chapman et al., 1978), or high and low on prodromal psychosis risk on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011) as in Study 3 below.

Finally, it is important to understand the specificity of this model to schizophrenia. Thus, future research needs to compare rates of bodily aberrations and accompanying dissociative responses to stress in related disorders, such as bipolar disorder or other dissociative disorders. The first aim, testing prevalence of bodily aberrations, can be tested behaviorally, but unfortunately the tendency to dissociate in response to stress cannot be ethically tested experimentally in these sensitive patient populations and thus we must rely on self-report methods to obtain this missing piece of the puzzle. Self-report methods can be improved (as described above) in future studies by removing the emphasis on verbal descriptions, and adding a distress component to the measurement of dissociative experiences, as we do in Study 2 below.

The current dissertation was designed to address many of these issues and consisted of three studies aimed to 1) investigate prevalence of dissociative experiences across the schizophrenia spectrum; 2) develop and validate a new picture-based questionnaire, the "**BODI**" (**B**rugger et al. **O**ut-of-body and **D**issociative experiences **I**nventory), designed to assess unusual bodily experiences in clinical and healthy populations; and 3) investigate the relationship between anomalous self-experiences and abnormal multisensory integration across the schizophrenia-spectrum.

Specifically, Study 1 investigated self-reported levels of dissociative experiences in patients with schizophrenia and healthy controls. In Study 1A, we investigated the prevalence of OBE's in patients with schizophrenia compared with matched healthy adult controls. In Study 1B, we assessed the prevalence of OBE's in young adults with elevated psychosis risk in comparison to their lower-risk peers. Study 2 aimed to create a new measure to help quantify distress associated with dissociative self -experiences common in the schizophrenia spectrum. In Study 2A, we developed the BODI 1 to assess dissociative experiences in healthy and clinical populations and conduct a pilot study to validate it. Study 2B attempted to further develop the scale's utility in research. Study 2C compared the two versions of the BODI. Appendix K describes a case study of a female patient at a state hospital who suffers from trauma, dissociation, and psychosis, and utilizes the BODI 2 in conjunction with other validated measures of dissociation as an initial attempt to provide clarity on the scale's utility in acute psychiatric populations. Study 3 outlined the final study of the current dissertation, which was conducted with Vanderbilt undergraduates varying in degree of psychosis proneness. This study investigated the relationship between dissociative experiences and multisensory integration of proprioceptive and tactile discrimination sensitivity in psychosis-prone individuals compared to those at lower risk for psychosis.

Anomalous or weakened sense of self was central to early theories of schizophrenia, and recent empirical studies have also documented disturbances in body ownership and increased susceptibility for dissociative experiences such as the out of body experience (OBE) in patients with schizophrenia. We hope to significantly expand the literature on the importance of anomalous self-experiences in the schizophrenia-spectrum and help aid future research by publishing our newly developed assessment tool, the BODI (Benson et al., in prep) and assessing the relationship between the BODI and other self-report and experimental measures of self-disturbance in both healthy and clinical populations.

CHAPTER II

STUDY 1: DISSOCIATIVE EXPERIENCES IN THE SCHIZOPHRENIA SPECTRUM

STUDY 1A: PREVALENCE OF OBEs IN SCHIZOPHRENIA VS. HEALTHY CONTROLS

Aims

The major aim of Study 1A was to examine the prevalence of out-of-body experiences (OBEs) in healthy adults compared to patients with schizophrenia. We also aimed to investigate the relationship between the syndromes of schizophrenia-spectrum and lifetime history of OBE's and related dissociative experiences in both clinical and healthy populations.

Methods

Participants

Individuals living in the local Nashville area participated in the current study. Vanderbilt University's Institutional Review Board approved the protocol and written informed consent was obtained from each participant. All participants were compensated for their time. All participants were interviewed with the SCID (Structured Clinical Interview for DSM-IV Axis I Disorders [SCID-IV] First et al., 2002a).

Forty medicated outpatients with schizophrenia (SZ) or schizoaffective disorder (SZaff) were recruited from private psychiatric facilities in Nashville, TN. SZ patients were excluded if they had past or current alcohol and other substance abuse, brain injury, neurological disease, or any medical illness known to affect brain function. SZ patients met the diagnostic criteria for schizophrenia or schizoaffective disorder of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR; APA, 2000), based on the Structured Clinical Interview for DSM-IV Axis I disorders (SCID-IV; First et al., 2002a). All 40 SZ patients were medicated with antipsychotic medications at the time of testing. Specific medication information was collected from each SZ patient in order to calculate the chlorpromazine equivalent dose (CPZ-EQ; Andreasen et al., 2010) as a means to compare amount of neuroleptic medication across different patients. Three SZ patients were taking typical antipsychotics (e.g., Haldol, Thorazine) at time of testing administration, and the remaining 37 SZ patients were medicated with the newer atypical antipsychotics (e.g., Clozaril, Abilify, Geodon, Risperdal, Seroquel, Zyprexa).

Forty-one healthy control (HC) participants were recruited from the community (i.e., Nashville, TN). Exclusion criteria for HC were: (1) past or present DSM-IV Axis I disorder as screened through SCID-IV (First et al., 2002b); (2) family history of a psychotic disorder; (3) current or past substance use within 6 months of testing; (4) any medical illness known to affect brain function; and (5) presence of neurological disorder.

As can be seen in Table 1 below, the two groups were matched in age, sex, handedness, and Edinburgh laterality index. Handedness was assessed with the Modified Edinburgh Handedness Inventory (Oldfield, 1971), a scale that measures degree of laterality within participants. Possible Edinburgh scores range from -100 (completely left-handed) to 100 (completely right handed), with scores between -40 to 40 indicating ambidexterity among participants.

The two groups were not matched for race or years of education. We conducted Spearman's correlations analyses with our variables of interest and years of education, in addition to a chi-square analysis of race with our dissociative experiences variables, to determine whether these group demographic differences may have contributed to our overall group differences among history of OBE and dissociative experiences, although we did not predict this to be the case.

Table 1. *Study 1A Demographic Characteristics of the Patient and Control Groups*

Demographic Variable	Healthy Controls	Schizophrenia Patients	*SZ patients vs. Controls*	
	n = 41	n = 40	*Test Statistic*	*p-value*
Age	*M* = 38.68 *SD* = 9.91	*M* = 40.25 *SD* = 8.56	$t(79) = 0.76$	.449
Sex	25 males, 16 females	25 males, 15 females	$\chi^2_{(1)} = 0.02$	.888
Race	23 white, 18 not white	14 white, 26 not white	$\chi^2_{(1)} = 4.07$	.0436*
Handedness	37 right, 4 left	32 right, 8 left	$\chi^2_{(1)} = 1.684$	.1945
Edinburgh Laterality	*M* = 72.72 *SD* = 46.27	*M* = 53.63 *SD* = 59.52	$t(79) = 1.60$	.111
Years of Education	*M* = 15.02 *SD* = 2.55	*M* = 13.5 *SD* = 2.36	$t(79) = 2.78$	.0066*

$*p < .05$, $^{\dagger} p < .1$

The 12 patients with schizoaffective disorder did not differ from those with a pure schizophrenia diagnosis (n = 28) on any of these demographic variables, clinical ratings scales described below, nor were they more likely to be prescribed typical antipsychotics compared to atypical antipsychotics ($p > .1$). Further, the 3 patients on typical antipsychotics were not different than those on atypical antipsychotics for any of these variables either ($p > .1$).

Measures

All participants completed the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993) and a new measure designed to assess history and frequency of out-of-body experiences and related dream imagery phenomena. All healthy control participants completed the Schizotypal Personality Questionnaire (SPQ; Raine, 1991). Patients with schizophrenia were interviewed by a clinical graduate student or trained research assistant to document the severity of their clinical symptoms with the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), the Scale for the Assessment of Positive Symptoms (SAPS, Andreasen, 1984), and the Scale for the Assessment of Negative Symptoms (SANS, Andreasen, 1983). Medication information was obtained from each patient to calculate the CPZ equivalent score (Andreasen et al., 2010).

Patients with schizophrenia and healthy controls recruited from the community completed a SCID (Structured Clinical Interview for DSM-IV Axis I Disorders [SCID-IV] First et al., 2002a) during initial screening evaluation with the Park Lab. Detailed information on each of the measures mentioned above is described below.

Dissociative Experiences Scale (DES-II)

The current gold standard measure for assessing dissociative experiences in both clinical and healthy populations is the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993). The DES-II is a self-report measure indexing abnormal experiences including depersonalization and abnormal perceptual experiences related to the sense of self. Consisting of 28 questions divided into three factors, the DES-II has shown adequate reliability and validity in a variety of populations (e.g., van Ijzendoorn & Schuengel, 1996). The three factors of the DES-II include (1) Dissociative Amnesia (e.g., "Some people find evidence that they have done things that they do not remember doing."); (2) Dissociative Absorption (e.g., "Some people sometimes find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them."); and (3) Depersonalization (e.g., "Some people sometimes have the experience of feeling that their body does not belong to them."). Patients with schizophrenia report elevated scores on all three factors compared to adults without a psychiatric diagnosis (Bernstein & Putnam, 1986).

In addition to the useful 3-factor model of the DES-II, eight of the twenty-eight items of the DES-II are considered to be the "pathological 8" items, thus indicating that if an individual endorses these items highly, that person is likely more at risk for a pathological dissociative disorder (Dissociative Experiences Scale Taxon [DES-T]; Waller et al., 1996; Waller & Ross, 1997). Examples of the items in the DES-T include "Some people have the experience of finding themselves in a place and having no idea how they got there" and "Some people sometimes have the experience of feeling that their body does not belong to them." However, some researchers find that the DES-T is not useful in practice (e.g., Leavitt, 1999), and that the DES-T is only useful in distinguishing among those with the most severe psychopathologies.

Still, the DES-II has demonstrated good psychometric properties in the literature (e.g., Carlson et al., 1995; Ross et al., 1988), and thus, the DES-II currently remains the gold standard in the study of quantifying frequency of dissociative experiences in both clinical and healthy populations. However, one critique of the scale is that it does not assess degree of distress that accompanies the dissociative experiences. Consequently, one suggestion for future research is to create an assessment with distress level quantification, which was addressed in Study 2 below.

Dream Questionnaire

To assess dream imagery and out-of-body experiences (OBEs), all participants completed a short survey (based on Blackmore, 1987) consisting of the following three questions: (1) Dream Imagery – Frequency "How often do you remember your dreams?"; (2) Dream Imagery – Perspective Taking: "In dreams, rate how often you see yourself from an outside vs. 1st person perspective."; (3) OBEs: "Have you ever had the experience of being separated from your body (during wake time)?" Possible response options included (1) Never; (2) Once; (3) 2-5 times; (4) 6-10 times; (5) More than 10 times. Responses were also coded as either presence of history of OBEs as indicated by the participant choosing any of the options other than "never." Please see Appendix A for the full version of the lab-created Dream Questionnaire, along with extended OBE questions to be utilized in subsequent studies (i.e., Study 2 and Study 3).

Schizotypal Personality Questionnaire (SPQ)

The Schizotypal Personality Questionnaire (SPQ; Raine, 1991) is a 74-item true/false questionnaire designed to assess schizotypal personality traits based on DSM-III schizotypal personality disorder criteria (APA, 1980). The SPQ is a widely used measure of schizotypal personality that has been shown to have excellent psychometric properties (e.g., Wuthrich & Bates, 2006; Fonseca-Pedrero et al., 2008). Example items include "I am an odd, unusual person" and "Do you sometimes feel that other people are watching you?" Items fall into one of three factors, which map onto the three major symptom clusters of full-blown schizophrenia. Specifically, the three factors of the SPQ are the Cognitive-Perceptual Factor (mapping onto positive symptoms in schizophrenia), Interpersonal Factor (mapping onto negative symptoms in schizophrenia), and the Disorganized Factor (mapping onto disorganized symptoms in schizophrenia). The Cognitive-Perceptual (positive) Factor consists of four subscales: (1) ideas of reference; (2) odd beliefs/magical thinking; (3) unusual perceptual experiences; and (4) paranoid ideation. The Interpersonal (negative) Factor consists of four subscales: (1) social anxiety; (2) no close friends; (3) constricted affect; and (4) paranoid ideation (which is also included in the Cognitive-Perceptual Factor as described above). Finally, the Disorganized Factor consists of two subscales: the (1) odd behavior and (2) odd speech.

Scores over 42 on the SPQ are considered "high" and scores under 12 are considered "low". Healthy controls' SPQ scores were used as subclinical analogs of symptom severity in HC in order to evaluate congruence of relationships between the different vulnerability markers and psychopathology in both SZ and HC. Please see Table 2 below for descriptive statistics of SPQ results in current sample of healthy participants.

Table 2. *Schizotypal Personality Questionnaire Scores in Study 1A Sample of Controls*

SPQ Variable	Mean	Standard Deviation	Range
Total	11.21	36.57	56
Cognitive Perceptual Factor (+)	4.26	4.66	27
Interpersonal Factor (-)	4.60	4.02	28
Disorganized Factor	3.39	3.61	15

Brief Psychiatric Rating Scale (BPRS)

The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962) is a clinical rating scale designed to quantify levels of a broad range of psychiatric symptoms, including depression, anxiety, mania, and psychosis. Scores on the BPRS range from 24-144. Either an advanced clinical graduate student or a trained research assistant who has demonstrated adequate inter-rater reliability administered the BPRS to SZ patients.

Scale for the Assessment of Positive Symptoms (SAPS)

The SAPS (Andreasen, 1984) is a clinical rating scale designed to quantify levels of positive symptom severity in patients with schizophrenia. Positive symptoms that are assessed in the SAPS include auditory hallucinations, olfactory hallucinations, persecutory delusions, delusions of grandeur, and thought insertion. Scores on the SAPS range from 0-173. Either an advanced clinical graduate student or a trained research assistant who has demonstrated adequate inter-rater reliability administered the SAPS to SZ patients.

Scale for the Assessment of Negative Symptoms (SANS)

The SANS (Andreasen, 1983) is a clinical rating scale designed to quantify levels of negative symptoms in patients with schizophrenia. Negative symptoms assessed in the SANS include alogia, anhedonia, and blunted affect. Scores on the SANS range from 0-129. The SANS was administered to SZ patients by either an advanced clinical graduate student or a trained research assistant who has demonstrated adequate inter-rater reliability.

Table 3. *Clinical Characteristics of Study 1A Sample of Patients with Schizophrenia*

Clinical Variable	Mean	Standard Deviation	Range
BPRS	15.8	7.9	39
SAPS	18.0	14.27	64
SANS	25.33	16.43	64
CPZ-EQ	389.24	260.52	1223
# Hospitalizations	10.52	21.47	100
Duration of Illness	20.95	9.29	41

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-IV)

The SCID-IV (First et al., 2002a; First et al., 2002b) is a diagnostic interview designed to screen individuals for possible DSM-IV-TR Axis I diagnoses, including, but not limited to, Major Depressive Disorder, Bipolar Disorder, Post Traumatic Stress Disorder, and Obsessive Compulsive Disorder. The SCID-IV does not screen for Axis II disorders, including personality disorders such as Borderline Personality Disorder or Schizotypal Personality Disorder. Either an advanced clinical graduate student or a trained research assistant who demonstrated adequate inter-rater reliability administered the SCID-IV to participants.

Hypotheses & Predictions

Based on the hypothesis that patients with schizophrenia exhibit anomalous self-experiences, we predicted that SZ patients would report more OBE history, and greater levels of dissociative experiences in general, compared to healthy controls. Further, we predicted that SZ patients would report greater OBE frequency compared to healthy controls.

Previous research has linked positive syndrome of schizotypal personality and the history of OBEs (e.g., McCreary & Claridge, 1995; 1996; 2002). Accordingly, we predicted that individuals with OBE history would exhibit greater positive symptoms in SZ patients and greater levels of positive schizotypy in healthy controls.

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All tests were two-tailed unless explicitly indicated otherwise.

Prior to analysis, the distribution of each variable was visually scanned to check for the presence of a non-normal distribution, which was predicted in most cases. Furthermore, descriptive statistics were outlined to determine skewness and kurtosis of each variable (see Table 4 below). If variables had skewness or kurtosis values greater than +/- 2, they were considered not normal (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). Tests of normality (Shapiro-Wilks tests) were conducted on variables in question to make the final decision whether to conclude if a variable had a normal distribution. Since some of variables utilized in the current study were considered non-normal (i.e., SZ symptoms scales), and because of the small sample sizes, nonparametric tests were utilized in favor of parametric tests. Finally, since we did not know the population distribution for many variables (e.g., OBE), we thought nonparametric statistical methods would be the most appropriate to use whenever possible, similar to Bernstein & Putnam (1986).

Chi-square analyses were conducted to test the prediction that SZ patients would report greater prevalence of OBEs compared to healthy controls. Mann Whitney U tests were conducted to examine the relationship between clinical symptoms scores and OBE history in SZ patients. Mann-Whitney U tests were also conducted to examine the relationship between schizotypal personality traits and OBE history in healthy controls.

Effect sizes (r) were calculated after conducting Mann-Whitney U tests using the formula [$Z / \sqrt{N}$], where Z represents the converted U value from the Mann-Whitney U test from SPSS.

Receiver operating characteristic (ROC) curves were generated and areas under the curve (AUCs) were calculated in SPSS to determine levels of sensitivity and specificity for the various dissociative experiences variables in their diagnostic decision making value for risk of psychosis.

Results

Descriptive Statistics

Table 4. *Descriptive Statistics of Study 1A Variables for SZ Patients and Healthy Controls*

Variable	Range	Min	Max	Median	Mean (SE)	Std. Dev.	Variance	Skewness (SE)	Kurtosis (SE)	Normal?
BPRS	39	3	42	15	15.8 (1.3)	7.98	63.75	.83 (.38)	1.7 (.74)	Normal
SAPS	64	0	64	24	18.1 (2.3)	14.3	203.6	1.27 (.38)	2.1 (.74)	Not Normal
SANS	64	0	64	16	18.1 (2.3)	14.2	203.6	1.27 (.38)	2.09 (.74)	Not Normal
CPZ Equivalent	1223	0	1223	361.3	389.2 (41.2)	260	67870	.889 (.37)	1.27 (.73)	Normal
Number of Hospitalizations	100	0	100	5	19.52 (4.68)	21.4	461.06	3.97 (.5)	16.9 (.97)	Not Normal
Years of SZ Illness	41	7	48	19	20.95 (1.98)	9.29	86.331	1.16 (.5)	2.03 (.95)	Normal
DES-II Total	73	0	73	21.42	24.72 (2.73)	18.3	336.65	.802 (.35)	-.050 (.69)	Normal
Amnesia Factor	63	0	63	11	15.25 (2.28)	16	256.06	1.14 (.34)	.53 (.66)	Normal
Depersonalization Factor	42	0	42	5	8.74 (1.56)	10.9	119.53	1.53 (.34)	1.94 (.66)	Normal
Absorption Factor	72	0	72	23	25.77 (2.67)	18.7	351.38	.533 (.34)	-.51 (.66)	Normal
SPQ Total	56	0	56	15	17.6 (2.06)	15.3	234.22	1.11 (.32)	.56 (.63)	Normal
CP Factor (+)	27	0	27	3	7.07 (.99)	7.74	54.96	1.16 (.32)	.53 (.63)	Normal
Interpersonal Factor (-)	28	0	28	6	8.07 (1.04)	7.74	59.96	1.2 (.322)	.77 (.63)	Normal
Disorganized Factor	15	0	15	3	4.53 (.585)	4.33	18.8	.798 (.32)	-.527 (.63)	Normal

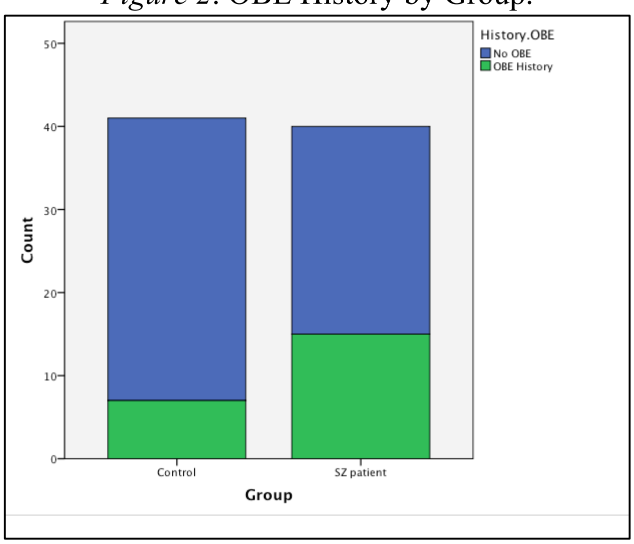
As described above, given that our two groups were not matched for race or education, we conducted preliminary analyses with these demographic variables to determine whether or not differences in our variables of interest (e.g., OBE history) would be related to race or education. This was performed to rule out that these group demographic differences may have contributed to our overall group differences among history of OBE and dissociative experiences, although we did not predict this to be the case. Accordingly, both SZ patients and healthy controls did not differ in terms of race on whether or not they endorsed OBE history ($p > .1$), OBE frequency ($p > .1$), or levels of dissociative experiences on the DES-II ($p > .1$). Finally, education was not correlated with levels of dissociative experiences in either group either ($p > .1$).

We also looked at the relationship between demographics and OBE history in general to see if there were any confounding relationships. Individuals with OBE history had lower Edinburgh laterality scores (U = 425, p = .016), and OBE frequency was inversely related to Edinburgh scores (ρ = -0.221, p = 0.047), and thus we controlled for laterality when possible when analyzing OBE history data. Education (in years) was inversely related to negative symptoms in SZ patients (ρ = -0.380, p = 0.017) and negative schizotypal traits in healthy controls (ρ = -0.293, p = 0.03), perhaps having something to do with attention difficulties or lack of motivation. Nevertheless, we tried to control for years of education when necessary to account for this unexpected relationship.

Out of Body Experiences (OBEs)

As predicted, patients with schizophrenia were significantly more likely to report OBE history (38%) compared to healthy controls (17%), as can be seen visually below ($\chi^2_{(1)}$=4.27, p=0.039). Furthermore, SZ patients reported significantly more OBEs during their lifetime compared to healthy controls (U = 650.5, p = 0.041, r = 0.23).

Figure 2. OBE History by Group.



Dissociative Experiences

SZ patients were more likely to score in the pathological range (i.e., over 30) on the dissociative experiences scale ($\chi^2_{(1)}$=6.4, *p*=0.01) compared to healthy controls. Indeed, as predicted, SZ patients scored significantly higher on total scores of the DES-II than healthy controls, as can be seen in Table 5 below. Furthermore, SZ patients scored significantly higher on the Depersonalization Factor of the DES-II and Absorption Factor of the DES-II, but not the DES-II Amnesia Factor, in which SZ patients were only trending in the higher direction on those DES-II items assessing dissociative amnesia that is common in dissociative identity disorder and dissociative fugue (Bernstein & Putnam, 1986). Healthy controls with OBE history scored higher on total scores of the DES-II than those without OBE history (U = 11, p = 0.04, r = 0.45).

Table 5. *Study 1A Medians and Group Differences Between SZ Patients and Controls*

Variable		**Healthy Controls**	**SZ Patients**	***SZ patients vs. Controls***		
				U	***p***	***r***
Dream	Recall	3	3	758.5	.66	.048
	Perspective	4	3.5	706.5	.47	.08
DES-II	Total	13.2	27.1	107	.001*	.49
	Amnesia	4	15	201.5	.061 †	.27
	Depersonalization	1	11.5	165.5	.008*	.38
	Absorption	16	27.5	196	.048*	.28

**p < .05; † p<.1*

Schizophrenia-Spectrum Symptoms

A Mann-Whitney U test (U = 111.5, p = 0.04, r = 0.32) indicated that SZ patients reporting OBE history demonstrated elevated positive symptoms (i.e., SAPS) scores (*Median* = 18) compared with SZ patients without OBE history (*Median* = 13.5). There was also a trend-level difference in mean rank SANS scores (U = 120, p = 0.086, r = 0.28) among SZ patients with OBE history (*Median* = 18*)* and SZ patients without OBE history (*Median* = 30.5) on negative symptom severity scores (i.e., SANS), with those reporting OBE history scoring lower on the negative symptom severity interview. However, there was no statistical difference (U = 164.0, p = 0.658, r = 0.07) in overall psychiatric symptom severity as quantified by the BPRS among SZ patients with OBE history (*Median* = 15) and SZ patients without OBE history (*Median* = 15). Furthermore, there were no differences among OBE groups in the level of antipsychotic medication at the time of testing (U = 175.0, p = 0.740, r = 0.11).

For healthy controls, total SPQ scores were greater (U = 415.50, p = 0.04, r = 0.41) among those with OBE history (*Median* = 14) compared to those without OBE history (*Median* = 8.5). Also as predicted, there was a significant difference (U = 374.50, p = 0.013, r = 0.56) among healthy controls with OBE history on the SPQ Cognitive-Perceptual (positive symptom) factor (*Median* = 10) compared to those without OBE history (*Median* = 2). There was no difference in the interpersonal (negative symptom) schizotypy factor (U = 467.5, p = 0.130, r = 0.05) or the disorganized schizotypy factor (U = 494.5, p = 0.217, r = 0.08) among healthy controls with OBE history compared to those without OBE history.

Sensitivity & Specificity

After conducting Binary Logistic Regression analyses in SPSS, ROC curve analyses were generated and analyzed in SPSS to determine levels of sensitivity and specificity for the dissociative experiences variables in their diagnostic decision making value for psychosis. The best measure for determining SZ patient status in the current sample with the current variables was overall level of DES-II scores (see Figure 3 below), followed by DES-II Depersonalization Factor scores, DES-II Absorption Factor scores, DES-II Amnesia Factor scores, and OBE frequency (see Table 6 below for details).

Figure 3. ROC Curve Showing Dissociative Experiences Scores Determining SZ patient Status

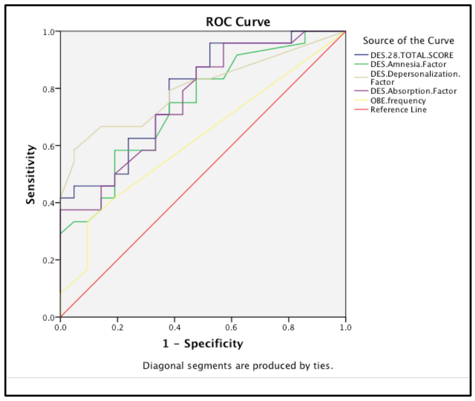


Table 6. *Study 1A ROC Curve Data Determining SZ Patient Status*

Variable	Area Under the Curve	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
DES-II Total	.788	.067	.001*	.657	.918
DES-II Amnesia	.657	.078	.062 †	.505	.809
DES-II Depersonalization	.719	.073	.009*	.576	.861
DES-II Absorption	.667	.077	.048*	.516	.818
OBE Frequency	.594	.042	.019*	.511	.677

**p < .05; † p<.1; Note: not corrected for multiple comparisons*

For patients with schizophrenia, current level of positive symptoms yielded significant area under the curve for predicting lifetime OBE history, but level of overall psychiatric symptoms and negative symptoms did not show significant area under the curve to predict history of OBE in SZ patients.

Table 7. *ROC Curve Data Determining OBE History in All Study 1A Subjects*

Variable	Area Under the Curve	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
DES-II Total	.753	.077	.007*	.602	.905
DES-II Amnesia	.741	.073	.008*	.598	.885
DES-II Depersonalization	.761	.071	.004*	.623	.899
DES-II Absorption	.731	.079	.010*	.576	.887
BPRS	.544	.094	.644	.361	.728
SAPS	.690	.087	.048*	.520	.860
SANS	.333	.091	.083 †	.156	.511

**p < .05; † p<.1; Note: not corrected for multiple comparisons*

Agreement between dissociative experiences variables and SZ-spectrum classification was used to assess concurrent validity by generating receiver operating characteristic (ROC) curves and calculating areas under the curve (AUCs) described above. Values for sensitivity, specificity, positive predictive value, negative predictive value, and likelihood ratios were computed in SPSS and described below in Table 8.

Table 8. *Classification Accuracy of Dissociative Experiences versus SZ Group Status*

Cutoff Scores	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**LR**	$\chi^2_{(1)}$	***Fisher's Exact Test***
DES-II Total ≥ 20	71%	65%	71%	65%	5.8	5.7 (p = .017*)	p = .032*
DES-II Amnesia ≥ 10	68%	63%	71%	60%	4.3	4.3 (p = .04*)	p = .06 †
DES-II Depersonal.≥ 6	71%	65%	71%	65%	5.8	5.7 (p = .017*)	p = .032*
DES-II Absorption ≥ 25	100%	50%	17%	100%	5.2	3.7 (p = .056 †)	p = .114
OBE Frequency ≥ 3	67%	55%	25%	88%	2.23	2.2 (p = .14)	p = .162
OBE History	68%	58%	38%	83%	4.3	4.3 (p = .04*)	p = .048*

**p < .05;* † *p<.1; Note: PPV = positive predictive value; NPV = negative predictive value; LR= likelihood ratio*

Based on the findings presented above in Table 8, it appears as though the DES-II total cutoff score of 20, or the DES-II Depersonalization Factor cutoff of 6 might be the most helpful in classifying SZ status in the current sample, and thus we will use these cutoffs in future studies to see if they are also useful in different samples. Further, it is helpful to know that OBE history has a positive predictive value of 83% with a negative predictive value of 83% in predicting SZ status in this sample, but OBE frequency does not appear as helpful in distinguishing diagnoses here. We will continue to examine the predictive value of OBE history and dissociative experiences in general in the remaining studies of the current dissertation.

STUDY 1B: PREVALENCE OF DISSOCIATIVE EXPERIENCES IN THE GENERAL POPULATION

Aims

The major aim of Study 1B was to investigate the relationship between psychosis-proneness and prevalence of OBEs and related dissociative experiences in healthy populations. A secondary aim of the current study was to replicate previous findings and help clarify the prevalence of OBEs in healthy populations.

Methods

Participants

350 Vanderbilt University undergraduate students participated in the current study. The Vanderbilt Institutional Review Board approved the protocol and written informed consent was obtained from each participant. Students received partial course credit for their participation.

The demographic information for the students is described below in Table 9. Participants in the OBE group compared to those without OBE history were matched for sex, age, years of education, race, handedness, and Edinburgh laterality index.

Table 9. *Study 1B Demographic Information*

Demographic Variable	**Total Sample**	**NO OBE History**	**OBE History**	***OBE History VS. No OBE***	
N	350	277 (79%)	73 (21%)	**Test Statistic**	***p*-value**
Sex	72% Female	75% Female	64% Female	$\chi^2_{(2)} = 2.06$	.151
Age	*M* = 19.46 *SD* = 1.26	*M* = 19.58 *SD* = 1.59	*M* = 19.71 *SD* = 2.26	$t(349) = 0.53$	.595
Education (Years)	*M* = 13.4 *SD* = 1.2	*M* =13.41 *SD* = 1.3	*M* =13.43 *SD* = 1.19	$t(349) = 0.07$	.939
Handedness	92% Right	92% Right	95% Right	$\chi^2_{(2)} = 0.477$	.490
Edinburgh Laterality Index	*M* = 69 *SD* = 42	*M* = 68.5 *SD*= 43.3	*M* = 67.6 *SD* = 39.0	$t(349) = -0.11$	.905
Race	66% White	68% White	60% White	$\chi^2_{(2)} = 0.922$	.337

$^*p < .05$; $^\dagger\ p<.1$

Measures

Participants completed a lab-designed questionnaire assessing OBE history and frequency as well as dreaming habits (see Appendix A), the Schizotypal Personality Questionnaire (SPQ; Raine, 1991) and the Dissociative Experiences Scale (DES-II; Bernstein and Putnam 1986; Carlson & Putnam, 1993), which are all described in greater detail above in Study 1A. Participants also completed the Prodromal Questionnaire Brief (PQ-B; Loewy, 2010), which is described in detail below. Please see Table 10 below to see how many participants completed each questionnaire, since different participants came from different studies and did not complete everything described here; however, all participants in this study completed the dream questionnaire.

Table 10. *Numbers of Participants per Questionnaire in Study 1B*

Questionnaire	**N**
Dream Questionnaire	350
Prodromal Questionnaire Brief (PQ-B)	245
Dissociative Experiences Scale (DES-II)	283
Schizotypal Personality Questionnaire (SPQ)	339

Prodromal Questionnaire Brief (PQ-B)

The Prodromal Questionnaire Brief (PQ-B; Lowey et al., 2011) is a 21-item questionnaire designed to assess prodromal psychosis symptoms. Scores on the PQ-B have been demonstrated to be reliable with diagnoses based on the gold standard of prodromal assessment, the Structured Interview for Prodromal Syndromes (SIPS; Miller et al., 2003). Total scores on the PQ-B range from 0 – 210. Endorsement totals range from 0 – 21, Occurrence totals range from 0 – 84, and Distress totals range from 0 – 105.

Examples of items on the PQ-B include “Have you felt that you are not in control of your own ideas or thoughts?” and “Have you ever felt that you don’t exist, the world does not exist, or that you are dead?” Participants were asked to answer about their experiences in the previous month, and were instructed to only comment on sober experiences (i.e., not while under the influences of drugs, alcohol, or medications not prescribed to them).

Twenty-three out of 245 participants qualified to be in the "High" PQ-B group, by totaling over six distressing endorsements on the scale of prodromal psychosis symptomatology. Fifty out of 245 participants were classified as the "Mid" PQ-B group by scoring between 3-5 distressing endorsements on the scale, and 172 out of 245 participants were classified as the "Low" PQ-B group by scoring between 0-2 distressing endorsements on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). The cutoff score of six distressing endorsements on the PQ-B was shown to exhibit 88% sensitivity and 68% specificity in previous studies (Loewy et al., 2011).

Hypotheses & Predictions

Previous research has linked positive schizotypal personality traits and the history of OBEs (e.g., Study 1A described above; McCreary & Claridge, 1995; 1996; 2002). Thus, we predicted OBE history to be associated with increased positive syndrome of schizotypal personality in the healthy population. We also predicted that participants at greater risk of psychosis (as quantified by 6 or higher scores with distress on the PQ-B) would be more likely to report OBE history than those with lower psychosis risk. Similarly, we predicted that those with high risk for psychosis would have greater levels of DES-II scores than those without high risk for psychosis. Finally, we predicted that schizotypal personality traits would be highly positively correlated with levels of dissociative experiences, replicating previous literature (e.g., Irwin, 2001; Merkelbach & Griesbrecht, 2006; Startup, 1999; Watson, 2001).

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All tests were two-tailed unless explicitly indicated otherwise.

Prior to analysis, the distribution of each variable was visually scanned to check for presence of a non-normal distribution, which was predicted in most cases. Additionally, descriptive statistics were outlined to determine skewness and kurtosis of each variable (see Table 11 below). If variables had skewness or kurtosis values greater than +/- 2, they were considered not normal (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). Finally, tests of normality (Shapiro-Wilks tests) were conducted on variables in question to make the final decision whether to conclude if a variable had a normal distribution. Since most of the variables utilized in the current study were considered non-normal (i.e., DES-II, PQ-B), and because of the small sample sizes, nonparametric tests were utilized in favor of parametric tests. Furthermore, since we did not know the population distribution for many variables (e.g., OBE), we thought nonparametric statistical methods would be the most appropriate to use whenever possible, similar to Bernstein & Putnam (1986).

Chi-square analyses were conducted to test the prediction that students at high risk for psychosis were more likely to endorse OBE history than those at lower risk for psychosis. Mann-Whitney U tests were conducted to test whether those with OBE history had higher SPQ scores than those without OBE history. Mann-Whitney U tests were also conducted to test whether those at risk for psychosis had higher DES-II scores than those at lower risk for psychosis. Effect sizes (r) were calculated after conducting Mann-Whitney U tests using the formula [$Z / \sqrt{N}$], where Z represents the converted U value from the Mann-Whitney U test in SPSS.

Spearman's rank correlations were conducted to examine the relationship between dissociative experiences and schizotypal personality traits.

Receiver operating characteristic (ROC) curves were generated and areas under the curve (AUCs) were calculated to determine levels of sensitivity and specificity for the various dissociative experiences variables in their diagnostic decision making value for risk of psychosis.

Results

Descriptive Statistics

Table 11. *Descriptive Statistics of Study 1B Variables*

Variable		Range	Min	Max	Median	Mean (SE)	Std. Dev.	Variance	Skewness (SE)	Kurtosis (SE)	Normal?
PQ-B	Total	133	0	133	14	24.7 (1.7)	26.5	701.5	1.51 (.16)	1.8 (.31)	Normal
	Endorsements	21	0	21	5	5.83 (.29)	4.65	21.69	.868 (.16)	.328 (.31)	Normal
	End. with Distress	15	0	15	1	2.07 (.18)	2.79	7.833	1.77 (.16)	3.20 (.316)	Not Normal
	Occurrence	58	0	58	6	8.91 (.58)	9.08	82.53	2.07 (.15)	6.041 (.31)	Not Normal
	Distress	96	0	96	12	17.9 (1.1)	17.4	302.51	1.28 (.16)	1.603 (.31)	Normal
DES-II	Total	49	0	49	10.71	12.6 (.53)	8.96	80.35	1.45 (.15)	2.33 (.289)	Not Normal
	Amnesia	43	0	43	3	5.17 (.38)	6.41	41.12	2.44 (.15)	7.62 (.289)	Not Normal
	Depersonalization	59	0	59	2	4.92 (.52)	8.66	75.093	2.97 (.15)	10.6 (.289)	Not Normal
	Absorption	70	0	70	12	15.8 (.79)	13.2	174.26	1.14 (.15)	1.30 (.289)	Normal
	Pathological 8 Taxon	34	0	34	3	4.67 (.35)	5.30	28.109	2.3 (.159)	7.84 (.316)	Not Normal
SPQ	Total	57	0	57	16	19.4 (.67)	12.3	150.99	.77 (.132)	.113 (.264)	Normal
	CP Factor (+)	28	0	28	5	7.15 (.33)	6.01	36.132	1.1 (.133)	.851 (.265)	Normal
	Interpersonal Factor (-)	28	0	28	7	8.75 (.34)	6.33	40.147	.83 (.133)	.013 (.265)	Normal
	Disorganized Factor	15	0	15	4	5.31 (.21)	3.91	15.306	.51 (.133)	-.561 (.265)	Normal

Table 12. *Questionnaire Results by OBE History Groups in Healthy Controls (Medians)*

Questionnaires		No OBE	OBE
Prodromal Questionnaire Brief (PQ-B)	**Total**	11	35
	Endorsements	4	7
	Endorsements with Distress	1	1
	Occurrence	6	9
	Distress	10.5	22
Schizotypal Personality Questionnaire (SPQ)	**Total**	14	20
	Cognitive Perceptual Factor (+)	4	10
	Interpersonal (-)	6	10
	Disorganized	4	6
Dissociative Experiences Scale (DES-II)	**Total**	10	12.5
	Taxon (8 critical items)	3	4
	Amnesia Factor	3	4
	Depersonalization Factor	1	2
	Absorption Factor	11	17

Out of Body Experiences (OBEs)

Twenty-one percent of students reported having at least one OBE in their lifetime. After splitting students into three groups by PQ-B distress scores (as described above), we found that OBE history is significantly greater in students at risk for psychosis (44% OBE history) compared to "mid" PQ-B participants (14% OBE history) and "low" PQ-B participants (13% OBE history) ($\chi^2_{(2)}$=13.96, p=0.0009). Individuals in the High PQ-B distress group reported greater frequency of OBEs in their lifetime compared to individuals in the Low PQ-B distress group (U = 1238.5, p = 0.001, r = 0.24).

Dissociative Experiences

Individuals in the high PQ-B distress group were more likely to score in the pathological range on the DES-II (i.e., over 30) compared to their lower risk peers ($\chi^2_{(2)}$= 15.80, p =0.0004). In fact, 29% of high psychosis risk students were in the high dissociative disorders risk range, compared to 11% of mid psychosis risk students and 4% of the low psychosis risk students in the dissociative disorders risk range.

Table 13. *Medians of Dissociative Experiences Scale (DES-II) results by PQ-B distress group*

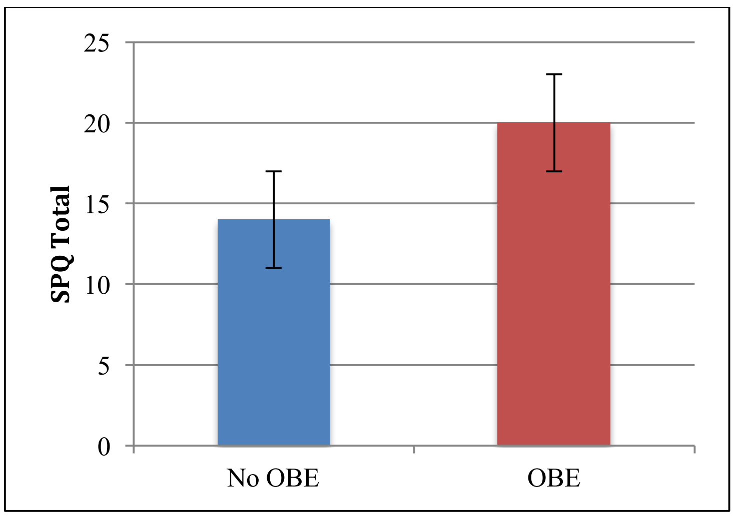
Dissociative Experiences Scale (DES-II)	"Low" PQ-B Median	"Mid" PQ-B Median	"High" PQ-B Median
Total	9.2	15.4	18.3
Taxon (8 critical items)	2	5	8
Amnesia Factor	3	4	9
Depersonalization Factor	1	4.5	5
Absorption Factor	8	15	27

As predicted, students at risk for psychosis scored higher on total scores of the DES-II compared to those in the low risk group (U = 510, p <.0001, r = 0.36). Students with OBE history had significantly greater levels of dissociative experiences (U = 5653.0, p = 0.029, r = 0.13) than students without OBE history.

Schizophrenia-Spectrum Symptoms

Students with OBE history had significantly greater levels of schizotypal personality traits ($U = 6383.0$, $p <.0001$, $r = 0.38$) in general, in addition to positive schizotypal traits, ($U = 6300.0$, $p<.0001$, $r = 0.34$), negative schizotypal traits ($U = 6974.0$, $p = 0.0002$, $r = 0.24$), and disorganized schizotypal traits ($U = 7352.0$, $p = 0.009$, $r = 0.32$). Indeed, individuals with OBE history were more likely to be classified as a "schizotype" or someone at risk for schizotypal personality disorder, by scoring over 42 on the SPQ; 12% OBE history compared to 5% without OBE history ($\chi^2_{(2)} = 4.89$, $p = 0.0269$).

Figure 4. Median SPQ scores for controls with OBE history vs. without OBE history



Students' total SPQ scores were positively correlated with total scores on the dissociative experiences scale ($\rho = 0.53$, $p <.0001$). Similarly, the cognitive-perceptual factor of the SPQ was also positively correlated with total scores on the DES-II ($\rho = 0.48$, $p <.0001$), in addition to the interpersonal factor of the SPQ and the DES-II ($\rho = 0.36$, $p = 0.0005$), and also the disorganized factor of the SPQ and DES-II total score ($\rho = 0.4545$, $p <.0001$), which were still significant after correcting for multiple comparisons using Bonferroni's adjustment.

Furthermore, when looking at all participants who have completed the dream questionnaire so far in Study 1, including Study 1A, we created three groups based on risk: (1) healthy controls; (2) individuals at risk for psychosis, due to high PQ-B scores, high SPQ scores, or family history; or (3) confirmed schizophrenia or schizoaffective disorder diagnosis. There was a significant difference among risk group for those reporting OBE history ($\chi^2_{(2)} = 15.59$, $p = 0.0004$), with SZ patients reporting the greatest percentage of OBE history (40%), followed by those at risk for psychosis (28%), which was followed by healthy controls (19%).

<u>Sensitivity & Specificity</u>

After conducting Binary Logistic Regression analyses in SPSS, ROC curves were generated and analyzed in SPSS to determine levels of sensitivity and specificity for the various dissociative experiences variables in their diagnostic decision making value for high PQ-B distress group status. The best measure for determining high psychosis risk status in the current sample with the current measures was scores on the DES-II taxon (pathological 8 factor) as can be seen in Figure 5 below, followed by overall level of DES-II scores, DES-II Absorption Factor scores, DES-II Amnesia Factor scores, DES-II Depersonalization Factor scores, and OBE frequency (see Table 14 below for details).

Figure 5. ROC Curve Showing DES-II "Taxon" Scores Determining High PQ-B Status

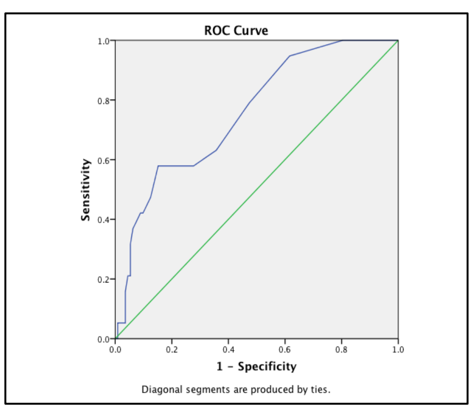


Table 14. *ROC Curve Data Determining High PQ-B Distress Group Status*

Variable	Area Under the Curve	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
DES-II Total	.754	.063	<.0001*	.629	.878
DES-II Amnesia	.723	.065	.001*	.596	.849
DES-II Depersonalization	.666	.058	.014*	.553	.780
DES-II Absorption	.741	.053	<.0001*	.638	.844
DES-II Taxon (8 items)	.755	.057	<.0001*	.643	.866
OBE Frequency	.640	.068	.031*	.507	.773

**p < .05; † p<.1; Note: not corrected for multiple comparisons*

Study 1 Discussion

Study 1A

The major aim of Study 1A was to examine the prevalence of out-of-body experiences (OBEs) in healthy adults compared to clinical populations, specifically those with schizophrenia. SZ patients were more likely than healthy controls to have experienced an OBE in their lifetime. Further, SZ patients reported more OBE frequency than healthy controls. Thus, the current study replicated previous findings (e.g., Blackmore, 1986) that SZ patients are significantly more likely to have a history of OBE than individuals with no psychiatric diagnosis.

A secondary aim of this study was to investigate the relationship between the syndromes of schizophrenia-spectrum and lifetime history of OBEs and related dissociative experiences in both clinical and healthy populations. OBE history was associated with current cognitive and perceptual abnormalities in both healthy controls (Positive SPQ) and schizophrenia patients (SAPS total), providing support for the conceptualization of OBE as a positive psychotic-like phenomenon.

SZ patients scored in the pathological range of level of dissociative experiences that are typical of individuals with a dissociative disorder diagnosis. Specifically, SZ patients scored higher than controls on the DES-II Depersonalization Factor and the Absorption Factor, but not the Amnesia Factor, which, importantly, is the factor that is most closely associated with dissociative identity disorder and dissociative fugue (Bernstein & Putnam, 1986). Thus, the current results support the notion that SZ patients exhibit elevated levels of dissociative experiences compared to healthy controls, but do not necessarily share the same symptoms as people with dissociative identity disorder, as is unfortunately often misconceived in pop culture.

Elevated levels of dissociative experiences in general (DES-II total score ≥ 20) appears promising as a cutoff score for predicting whether or not one can accurately classify a participant into the SZ-spectrum group in the current sample, and thus we will use this cutoff in future studies to see if it is also useful in different samples of patients. Further, it is helpful to know that OBE history has a positive predictive value of 83% with a negative predictive value of 83% in predicting SZ status in this sample, but OBE frequency does not appear as helpful in distinguishing diagnoses here. We will continue to examine the prediction value of OBE history and dissociative experiences in the remaining studies of the current dissertation.

Study 1B

The major aim of Study 1B was to investigate the relationship between psychosis-proneness and prevalence of OBEs and related dissociative experiences in healthy populations. A secondary aim of Study 1B was to replicate previous findings and help clarify the prevalence of OBEs in healthy populations.

Results from 350 undergraduate students indicate that approximately 1 in 5 adults report at least one OBE in their lifetime. OBE history was more common in individuals with elevated psychometric risk for psychosis, and OBE frequency was greater than lower risk controls. Undergraduates at risk for psychosis reported greater levels of dissociative experiences, and were more likely to score in the pathological range of the DES-II. Students with OBE history had greater levels of schizotypal personality traits and were more likely to be classified as someone at risk for schizotypal personality disorder. OBE history was related to increased levels of positive, negative, and disorganized factors of schizotypal traits, in contrast with the finding in Study 1A, which only found positive schizotypal traits related to OBE in healthy controls. All factors of schizotypal traits were strongly positively correlated with DES-II total scores.

Comparing OBE history across SZ patients, healthy controls, and individuals at risk for psychosis, we found significant differences in OBE history classification by SZ-spectrum risk group status, with SZ patients having the highest proportion of OBE history (40%), followed by individuals at risk for psychosis (28%), which was followed by healthy controls at low risk for psychosis (19%). The current results support the hypothesis that OBE history and levels of dissociative experiences in general appear to be useful at predicting whether or not one will be classified correctly in the SZ-spectrum.

Limitations & Future Directions

Results of the current study should be considered in light of several potential limitations. First, the SCID-IV does not screen for Dissociative Disorders or Axis II disorders, including personality disorders such as Borderline Personality Disorder or Schizotypal Personality Disorder. It is possible that some of our SZ patient sample may have met criteria for a formal dissociative disorder in addition to schizophrenia or schizoaffective disorder. Further, we do not know whether our healthy controls might have met criteria for a dissociative disorder or personality disorder either, as neither of these were formally assessed in the current sample, with the important exception of the SPQ, which can be used as a screening tool for Schizotypal Personality Disorder. Moreover, the healthy controls recruited from the Vanderbilt Undergraduate SONA system in Study 1B were not screened with the SCID (First et al., 2002b).

Thus, it is unknown whether or not these individuals may have been suffering from a DSM Axis 1 disorder at the time of testing. However, their mean DES-II, SPQ and PQ-B scores were well within the normal range, and they responded "No" when asked if there were psychological problems in themselves. Nevertheless, it would be helpful in future studies to administer the SCID-D (Structured Clinical Interview for DSM-IV Dissociative Disorders; APA, 1995) to formally screen for dissociative disorders in SZ patients and matched healthy controls when specifically aiming to understand the complex relationship between SZ and dissociation, so as to avoid possibly adding to the confusion by inadvertently including patients with comorbid diagnoses among the SZ patients, or HC with unknown Dissociative Disorder or Personality Disorder diagnosis, such as Borderline Personality Disorder in which dissociation is common (e.g., Brodsky et al., 1995). One suggestion might be to administer the SNAP (Schedule for Nonadaptive and Adaptive Personality; Clark, 1993) to screen for personality disorders if time allows for this lengthy assessment. Finally, it would also be wise to assess for trauma history (e.g., Adverse Childhood Experiences Scale; Anda et al., 2010), to test the hypothesis that severity of traumatic history mediates the relationship between psychosis proneness and dissociative experiences, which we will attempt to begin to address below in Study 3 with individuals who vary in terms of psychosis-proneness.

Another possible limitation of the current study is the fact that we did not collect drug and alcohol information regarding when individuals had these dissociative experiences. Previous research indicates that out-of-body experiences often occur while individuals are under the influence alcohol or certain drugs such as ketamine (e.g., Ohayon, 2000), and it is unclear if substance-induced OBEs differ in their etiologies than other OBEs, or in their potential relative risk for psychosis-proneness. Thus, we will need to explicitly ask participants to specify whether or not they engaged in substance use during their OBEs in future studies. This point will be addressed in Study 2 below.

Part of the problem with relying on self-report measures with this population is that many patients with schizophrenia demonstrate difficulty verbalizing their internal states (e.g., van't Wout et al., 2007). Thus, one future direction is to create and validate a self-report measure that utilizes images to describe self-disturbances. Another suggestion for future research is to create an assessment that seeks to quantify levels of distress associated with anomalous self-experiences. These two points will be addressed in Study 2 below.

In terms of significance, it is important to know whether or not these experiences are distressing to the individual for several reasons. For clinical purposes, the DSM-5 requires functional impairment for a condition to be considered a disorder (APA, 2013). Secondly, some theorists posit that certain dissociative experiences may actually be adaptive in certain circumstances, as opposed to being purely pathological all the time (e.g., Lynn, 2005; Barlow & Freyd, 2009). Furthermore, some of these experiences have been found to be nearly the opposite of distressing to individuals, as in the case of one participant who willingly induced OBEs in herself and found them quite pleasant (Smith & Messier, 2014). Finally, for research purposes, it would be an important future direction to compare those individuals who have pleasant anomalous self-experiences compared to those who find them distressing to determine whether or not their etiologies are different, and for future therapeutic options to help people cope with potentially distressing dissociative experiences.

Conclusions

In sum, previous research indicates that sense of self is weakened or disturbed in patients with schizophrenia-spectrum disorders. In Study 1, we replicated and extended previous research demonstrating the increased prevalence of OBEs and dissociative experiences in schizophrenia and those at risk for schizophrenia. Specifically, we investigated the prevalence of dissociative experiences across the schizophrenia spectrum, particularly across three levels of risk: low risk, high risk, and actual diagnosis of a psychotic disorder. OBE history and frequency increased with SZ-spectrum risk level. We found prediction value for OBE history and positive SZ-spectrum symptoms in Study 1A, but did not find relationship between OBE and negative symptoms in Study 1A. In contrast, we found prediction value for OBE history for both positive and negative SZ-spectrum symptoms in Study 1B. This question of the specificity of the relationship between dissociative experiences and SZ-spectrum symptoms (positive vs. negative or both) needs to be addressed in a separate sample.

We aimed to build on this work in Study 2 by developing a new tool, the BODI, to help quantify these anomalous self-experiences and the distress associated with them.

CHAPTER III:

STUDY 2A: DEVELOPMENT OF BODI

Aims

The major aim of the second study was to develop and pilot a new, structured self-report inventory designed to quantify out-of-body experiences (OBEs) and related anomalous bodily-self experiences in both clinical and healthy populations.

Methods

Participants

One hundred nine participants from the Nashville, TN community participated in the initial pilot study of the development of the BODI 1. Twenty-six of those participants were medicated outpatients with schizophrenia, 17 of those participants were healthy adult controls (i.e., completed the SCID-IV screen prior to participation, as described above in Study 1A), and 66 participants were Vanderbilt undergraduates. Vanderbilt's Institutional Review Board (IRB) approved the current protocol. Written informed consent was obtained from all participants. Non-student participants were paid for their time and students received partial course credit.

The SZ patients and healthy controls were matched for age, sex, race, handedness and Edinburgh laterality index. The Vanderbilt undergraduates were not matched with the SZ group. Please refer to Table 15 below for details on the patients with schizophrenia and matched healthy controls for the current study, and Table 16 below for details on the Vanderbilt undergraduates.

Table 15. *Demographic Characteristics of the Study 2A SZ Patient and Control Groups*

Demographic Variable	**Healthy Controls (n = 17)**	**Schizophrenia Patients (n = 26)**	***SZ patients vs. Controls***	
			Test Statistic	***p-value***
Sex	35% Female	42% Female	$\chi^2_{(1)} = 0.17$	.68
Age	$M = 44.70$ $SD = 7.71$	$M = 44.56$ $SD = 9.37$	$t(42) = 0.05$	.96
Years of Education	$M = 15.76$ $SD = 2.46$	$M = 13.36$ $SD = 2.21$	$t(42) = 3.15$	.0035*
Race	63% White	37% White	$\chi^2_{(1)} = 2.54$	.11
Handedness	82% Right	86% Right	$\chi^2_{(1)} = 0.12$	.73
Edinburgh Laterality Index	$M = 64$ $SD = 65$	$M = 70$ $SD = 43$	$t(42) = 0.32$	.74

*$p < .05$, $^{+}$ $p<.1$

Table 16. *SONA Participant Demographic Information*

Demographic Variable	**SONA Students (n = 66)**
Sex	77% Female
Age	$M = 20$ ($SD = 2$)
Years of Education	$M = 14$ ($SD = 2$)
Race	65% White
Handedness	90% Right
Edinburgh Laterality	$M = 58$ ($SD = 51$)

Measures

Participants completed the first version of the BODI (Benson et al., in prep), Perceptual Aberration Scale (Per Ab; Chapman et al., 1978), Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), and Dream Questionnaire (McIntosh et al., in prep). Healthy participants also completed the Schizotypal Personality Questionnaire (SPQ; Raine, 1991) and the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). Please refer to Table 17 for details on how many participants completed each questionnaire.

Table 17. *Number of Participants per Questionnaire in Study 2A*

Questionnaire	N
BODI 1	109
Dissociative Experiences Scale (DES-II)	90
Perceptual Aberration Scale (Per Ab)	61
Prodromal Questionnaire Brief (PQ-B)	63
Schizotypal Personality Questionnaire (SPQ)	73
Dream Questionnaire	109

All patients with schizophrenia completed clinical interview rating scales with a clinical graduate student or research assistant, including the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984), and Scale for the Assessment of Negative Symptoms (SANS, Andreasen, 1983), and were asked to report medication information for the sake of calculating their CPZ equivalent (Andreasen et al., 2010). Please see Table 18 below for clinical characteristics of the SZ patients.

Table 18. *Clinical Characteristics of the SZ Patient Group*

Clinical Variable	Mean	S.D.	Range
BPRS	20.13	13.92	58
SAPS	39.54	16.93	55
SANS	18.86	16.85	58
CPZ-EQ	473.39	469.87	1831.21
Number of Hospitalizations	11.5	20.62	99
Duration of Illness	25.43	9.64	41

Patients with schizophrenia and healthy controls recruited from the community completed a Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-IV; First et al., 2002a; First et al., 2002b) during initial screening evaluation with the Park Lab, but the Vanderbilt undergraduates were not screened with the SCID-IV.

Detailed information on each of the new measures (i.e., not utilized in Study 1) are described below, and please see Study 1A for detailed information on the following: DES-II (Bernstein & Putnam, 1986; Carlson & Putnam, 1986), Dream Questionnaire (McIntosh et al., in prep), SPQ (Raine, 1991), PQ-B (Loewy et al., 2011), SAPS (Andreasen, 1984), SANS (Andreasen, 1983), BPRS (Overall & & Gorham, 1962), CPZ equivalent (Andreasen et al., 2010), and SCID-IV (First et al., 2002a; First et al., 2002b).

Brugger et al. Out-of-body and Dissociative experiences Inventory (BODI 1)

The BODI 1 (Benson et al., in prep) is a new imagery-based questionnaire designed to quantify out-of-body experiences (OBEs) and related anomalous bodily-self experiences in both clinical and healthy populations. Participants were explicitly instructed to answer all questions without referring to times when they were under the influence of various substances. The BODI 1 was administered to participants online through Redcap software, but was also available in paper format in the event that participants were unable to use the computer in the lab (e.g., due to technical issues). Please see Appendix N at the end of this document for the full paper version of the first version of the BODI, and Table 19 below to view the verbal description of each of the items.

The original pictures from the first version of the BODI were administered in Dr. Peter Brugger's neurology clinic in Switzerland. Patients with a variety of disorders were informally tested on the presentation of these pictures in Dr. Brugger's clinic, including patients with neglect syndrome and body identity integration disorder. We decided to utilize these pictures to create a unique imagery-based questionnaire of anomalous bodily experiences since we have found that many of these experiences are difficult for participants to describe verbally, particularly for some patients with schizophrenia.

In the initial lab pilot testing of the original 21 pictures, however, it became clear that we needed to anchor these pictures with verbal captions to standardize and clarify the experience assessed in each item. Information on the source of each caption can be found in Appendix B.

Table 19. *BODI Verbal Captions*

Item #	Item Caption
BODI 1	*I feel unsure of who I am at times.*
BODI 2	*My soul sometimes leaves my body.*
BODI 3	*I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.*
BODI 4	*Sometimes when falling asleep or when waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings.*
BODI 5	*Do you ever find that your experience of time changes dramatically?*
BODI 6	*Have you ever had the feeling of the presence of another being, even if you know that no one is there?*
BODI 7	*I have had experiences when I felt as if I were someone else.*
BODI 8	*I have had experiences (not related to drugs) where I felt as though I was floating through the air or being transported through time.*
BODI 9	*Have you ever experienced or seen your "doppelganger" or "double"?*
BODI 10	*Have you ever felt that you looked unreal when you looked at yourself in the mirror?*
BODI 11	*I have been visited by Spiritual Beings.*
BODI 12	*I have had an "out of the body" experience during which my mind seems to or actually has, left my body.*
BODI 13	*Have you ever felt like you could see multiple duplicates of yourself (or someone else)?*
BODI 14	*Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?*
BODI 15	*Do you ever find the appearance of things or people seems to change in a puzzling way, e.g., distorted shapes or sizes or color?*
BODI 16	*I've had the momentary feeling that I might not be human.*
BODI 17	*I have heard an inner voice call my name.*
BODI 18	*Do you ever have the sensation that your body, or a part of it, is changing or has changed shape?*
BODI 19	*At times I have felt as if I were coming apart.*
BODI 20	*On occasions I have seen a person's face in front of me when no one was in fact there.*
BODI 21	*Have you ever felt that thoughts were being put inside your head by some outside force?*

After adding true/false item captions to each of the 21 pictures, we also added a frequency question to assess how often in the past month participants had experienced each item. The specific wording of the frequency question came from the original version of the PQ-B (Loewy et al., 2011). This frequency item addition allows us to use the BODI 1 as both a state measure of anomalous bodily experiences that might fluctuate over time, in addition to a lifetime history measure that would likely remain stable over repeated testing (i.e., the true/false aspect of the item represents lifetime history of the experience, while the current aspect of the item represents the current state of functioning for the individual).

After the frequency question, we asked participants if each experience had caused them any concern or distress. The exact wording for this distress question also came from the PQ-B (Loewy et al., 2011). The addition of the distress component to the BODI 1 addresses the potential limitation concern from Study 1 in the current dissertation, namely, that we need to know if someone experiences distress with OBE in order to understand the etiology and subsequent risk associated with it.

We also modified the original vividness of imagery recall question from Dr. Peter Brugger's clinic, based on initial lab pilot confusion concerns. Finally, each item ends with a text box for participants to comment on the experience if they would like, although this is optional. However, the previous four questions associated with each item are required, even if participants respond "false" to the first question. If participants respond false to the first question then all remaining questions for that item were not counted in the item total score.

Each BODI 1 item is scored as (1) a nominal response for lifetime history categorical classification, and (2) an item total. Each of the 21 items can receive a possible 15 points. Hence, the total possible value for the total sum variable of the BODI 1 equals 315.

Each **endorsement** ("True" response) receives one point, and thus the endorsement sum variable ranges from 0 – 21. For the **frequency** item, individuals are asked how often they have had the item described experience in the past month. Participants choose between "Never" (0), "1-2 times in the past month" (1), "once per week" (2), "a few times per week" (3), to Daily (4), and the frequency variable ranges from 0 – 105. For the **distress** item, individuals choose between "Not Applicable" (0), and "Strongly Disagree" (1), "Disagree" (2), "Neutral" (3), "Agree" (4), or "Strongly Agree" (5), and thus the distress sum variable ranges from 0 – 105. The "**Endorsement with Distress**" variable refers to items in which an individual reports "True" to the True/False portion of the item and then scores either “Agree” or “Strongly Agree” to the Distress item (“When this happens, I feel frightened, concerned, or it causes problems for me”). Finally, participants are asked “How vividly do you recall the image of this experience?” and are given the options “0% (not at all)” (1), “25%” (2), “50%” (3), “75%” (4), and “100% (very)” (5), so that the **vividness sum** variable ranges from 0 – 105. Full scoring information is also visually presented in Appendix C.

One limitation of Study 1 was that we did not assess whether individuals were under the influence of a substance or medication when the OBE occurred. Further, we did not quantify whether or not the individual felt distress with the OBE. Thus, the BODI 1 aims to address these issues and specifically asks about distress associated with OBEs (and the other 20 experiences assessed), and also explicitly participants to only endorse experiences that they have had while sober. Thus, we are able to compare differences in prevalence rates in different populations on 1) OBE compared to Sober OBE, and 2) Distressing OBE vs. Not Distressing OBE, in a way that we were unable to accomplish by using just the single item on the dream questionnaire.

For many of the individual BODI 1 items, we predicted that SZ would endorse significantly more often in terms of prevalence rates, and also score higher on each individual item total, as a result of having these experiences more often (contributing to the frequency score), feeling as if they were stressful (contributing to the distress score), and imagining them more vividly (e.g., based on enhanced imagery in SZ patients; Benson & Park, 2013) contributing to the vividness score. The same hypothesis and predictions were held for individuals at risk compared to those at lower risk.

Perceptual Aberration Scale (Per Ab)

The Perceptual Aberration Scale (Per Ab; Chapman et al., 1978) is a 35-item true/false self-report scale seeking to assess levels of perceptual aberrations in both clinical and healthy populations. The scale was originally titled the "Body Image Aberration Scale" and consisted of 28 items specifically about body image disturbances. During initial analyses of the psychometric properties of the Body Image Aberration Scale items, however, the authors concluded that these 28 items were so closely related to seven other perceptual aberration items (e.g., "Sometimes people whom I know well begin to look like strangers") that Chapman et al. (1978) decided to include all 35 items together in one larger Perceptual Aberration Scale, which is often used as a facet of psychosis-proneness in non-clinical populations (e.g., Germine et al., 2013). Patients with schizophrenia score higher on the Perceptual Aberration Scale compared to healthy controls and non-psychotic clinical controls (e.g., Chapman et al., 1978).

The five kinds of deviant bodily experiences that are assessed in the Perceptual Aberration Scale include (1) unclear body boundaries ("Sometimes I have had the feeling that I am united with an object near me"); (2) feelings of unreality or estrangement of body parts ("I have sometimes felt that some part of my body no longer belongs to me"); (3) feelings of deterioration of one's body parts ("I have sometimes had the feeling that my body is decaying inside"); (4) perceptions of the change of size of one's body parts ("My hands or feet have never seemed far away" which is reverse-scored); and (5) changes in the appearance of the body ("Occasionally it has seemed as if my body had taken on the appearance of another person's body" Chapman et al., 1978, p. 401).

The Perceptual Aberration Scale is often administered with other scales, such as the Magical Ideation Scale (Eckblad & Chapman, 1983), in addition to infrequency items that serve as a validity check (Chapman & Chapman, unpublished). Examples of infrequency items include "I go at least once every two years to visit either northern Scotland or some part of Scandinavia" and "I find that I often walk with a limp, which is the result of a skydiving accident." The Per Ab was administered with the infrequency items in the current study in addition to Study 2B and 3 described below. Participants were excluded from analyses if they endorsed more than 2 of the 11 infrequency items.

Scores on the Perceptual Aberration Scale range from 0-35. A high score on the Per Ab has been denoted as scoring above 19 for both males and females (Kwapil, 2002). There were eight overlapping items found between the Perceptual Aberration Scale and the BODI 1 (e.g., "Now and then, when I look in the mirror, my face seems quite different than usual") that were removed for convergent validity analyses.

Hypotheses & Predictions

Based on the hypothesis that patients with schizophrenia exhibit elevated dissociative symptoms and anomalous self-experiences, we predicted that our sample of SZ patients would score higher on the BODI 1 than healthy controls. Similarly, we predicted that in the undergraduate sample, those with higher levels of psychometric psychosis-proneness would score higher on the BODI 1 than those with lower levels of psychosis-proneness. Finally, we predicted that BODI 1 scores would be correlated with other measures of dissociative experiences (e.g., the Dissociative Experiences Scale [DES-II]; Bernstein & Putnam, 1986; Carlson & Putnam, 1993) and schizophrenia-spectrum symptoms measures, including the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), Perceptual Aberration Scale (Chapman et al., 1978), and Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). We did not predict a relationship between BODI 1 scores and negative symptoms scores for patients with schizophrenia as quantified by scores on the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1983). We also did not predict a relationship between BODI 1 scores and medication (i.e., CPZ equivalent scores) in patients with schizophrenia because we hypothesize that bodily self-disturbances are present prior to the psychotic break, and may not necessarily be adequately treated or diminished by antipsychotic medication.

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All tests were two-tailed unless explicitly indicated otherwise.

Prior to analysis, the distribution of each variable was visually scanned to check for presence of a non-normal distribution, which was predicted in most cases. Furthermore, descriptive statistics were outlined to determine skewness and kurtosis of each variable (see Table 20 below). If variables had skewness or kurtosis values greater than +/- 2, they were considered not normal (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). Finally, tests of normality (Shapiro-Wilks tests) were conducted on variables in question to make the final decision whether to conclude if a variable had a normal distribution. Since most of the variables utilized in the current study were considered non-normal (i.e., BODI 1 variables [see Figure 6 below], PQ-B, perceptual aberration scale scores, and dissociative experience scale scores), with the BODI 1 skewed heavily towards zero, as expected, nonparametric tests were utilized in favor of parametric tests. Furthermore, since we do not know the population distribution for many variables (e.g., BODI 1), we thought nonparametric statistical methods would be the most appropriate to use whenever possible, similar to Bernstein & Putnam (1986).

Cronbach's coefficient alpha (α) was used to examine internal consistency of the BODI 1, and split-half reliability analyses were conducted in SPSS, as described below. Spearman's correlations were used to examine the relationship between BODI 1 scores and the DES-II (Bernstein & Putnam, 1986; Carlson & Putnam, 1993) and the schizophrenia-spectrum measures listed above. Further analyses conducted spearman's correlations when overlapping item content among questionnaires was removed to ensure that correlations among related measures were not merely a result of overlapping items, but rather that the measures were similar in constructs.

Kruskal-Wallis tests were used to compare data between three groups (i.e., low risk, risk and SZ status). Mann-Whitney U-tests were used to compare the data between two groups (i.e., SZ compared to HC, and high risk compared with low risk). Effect sizes (*r*) were calculated after conducting Mann-Whitney U tests using the formula [Z / √ N], where Z represents the converted U value from the Mann-Whitney U test in SPSS. The low risk and risk groups were determined by one of two ways: healthy controls or SONA undergraduates either (1) scored over 6 distressing endorsements on the PQ-B, or (2) scored over six endorsements on the PQ-B, no matter how distressing, which showed 31% sensitivity and 100% specificity in a previous study (Loewy et al., 2011). Only four individuals scored over 6 distressing endorsements on the PQ-B, and the remaining 25 subjects scored over six endorsements on the PQ-B.

Agreement between BODI 1 variables and SZ-spectrum classification was used to assess concurrent validity by generating receiver operating characteristic (ROC) curves and calculating areas under the curve (AUCs).

Results

Descriptive Statistics

Figure 6. BODI 1 Total Scores

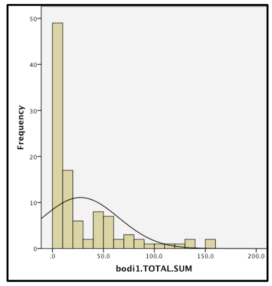


Table 20. *Descriptive Statistics of Study 2A Variables Using Data from both SZ Patients and Healthy Controls*

Variable	Range	Min	Max	Median	Mean (SE)	Std. Dev.	Variance	Skewness (SE)	Kurtosis (SE)	Normal?
BODI 1 Total	155	0	155	12	27.5 (3.7)	37.5	1402.8	1.7 (.24)	2.7 (.47)	Not Normal
Endorsements	16	0	16	2	3.2 (.38)	3.87	15.01	1.32 (.24)	.99 (.47)	Normal
Endorsements With Distress	12	0	12	0	1.5 (.24)	2.48	6.153	2.171 (.24)	4.8 (.47)	Not Normal
Frequency	41	0	41	1	4.16 (.75)	7.63	58.22	2.725 (.24)	8.2 (.47)	Not Normal
Distress	55	0	55	4	10.0 (1.3)	13.2	172.83	1.59 (.24)	1.9 (.47)	Normal
Vividness	80	0	80	4	10.0 (1.4)	14.6	213.59	2.25 (.24)	6.1 (.47)	Not Normal
DES-II Total	71.43	1.42	72.8	11.43	17.7 (1.6)	15.4	236.49	1.486 (.26)	1.96 (.5)	Normal
Amnesia Factor	63	0	63	4	9.84 (1.4)	12.9	165.39	1.876 (.25)	3.5 (.5)	Not Normal
Depersonalization Factor	72	0	72	16.5	20.7 (1.7)	15.9	255.33	1.083 (.25)	.74 (.5)	Normal
Absorption Factor	42	0	42	1	5.71 (.97)	9.21	84.86	2.052 (.25)	3.94 (.5)	Not Normal
Pathological 8 Taxon	52	0	52	3.5	8.25 (1.3)	11.2	125.52	2.136 (.28)	4.83 (.5)	Not Normal
DES-II Total No Overlap	50.4	0	50.4	10.8	13.6 (1.5)	11.0	121.99	1.524 (.32)	2.1 (.62)	Normal
Perceptual Aberration Scale	27	0	27	3	5.3 (.71)	5.54	30.711	1.87 (.31)	4.43 (.6)	Not Normal
PerAb Total No Overlap	20	0	20	2.5	3.7 (.55)	4.23	17.94	1.94 (.31)	4.36 (.6)	Not Normal
PQ-B Total	131	0	131	6	9.5 (2.3)	18.0	324.38	5.59 (.30)	35.3 (.6)	Not Normal
Endorsements	21	0	21	6	6.9 (.67)	5.36	28.82	.671 (.30)	.031 (.6)	Normal
Endorsements with Distress	15	0	15	1	2.16 (.36)	2.69	7.25	2.39 (.32)	8.58 (.6)	Not Normal
Occurrence	58	0	58	8	10.4 (1.3)	10.4	107.82	2.12 (.30)	6.53 (.6)	Not Normal
Distress	96	0	96	18	23.5 (2.7)	21.2	447.93	1.25 (.30)	1.66 (.6)	Normal
PQ-B End. - No Overlap	19	0	19	6	6.6 (.6)	4.47	20.06	.486 (.32)	-.30 (.6)	Normal
SPQ Total	49	0	49	14	19.4 (1.5)	13.2	173.22	.697 (.28)	-.37(.55)	Normal
CP Factor (+)	27	0	27	4	6.18 (.72)	6.08	37.08	1.35 (.28)	1.6 (.56)	Normal
Interpersonal Factor (-)	28	0	28	5.5	7.9 (.82)	6.96	48.45	1.05 (.28)	.35 (.56)	Normal
Disorganized Factor	13	0	13	5	4.93 (.48)	4.08	16.65	.392 (.28)	-.99(.56)	Normal
SPQ Total No Overlap	47	0	47	18	18.5 (1.8)	13.2	172.95	.49 (.327)	-.81(.64)	Normal

Reliability

An internal consistency analysis was conducted in SPSS for the 21 items of the BODI 1 using data from all 109 initial subjects (i.e., SZ patients, healthy community controls, and SONA undergraduate participants). Results indicated that Cronbach's Alpha coefficient ($\alpha = .891$) for BODI 1 would be classified as belonging to the "good" range, and bordering on "excellent", according to George and Mallery's (2003) rules. Please see Appendix E for details.

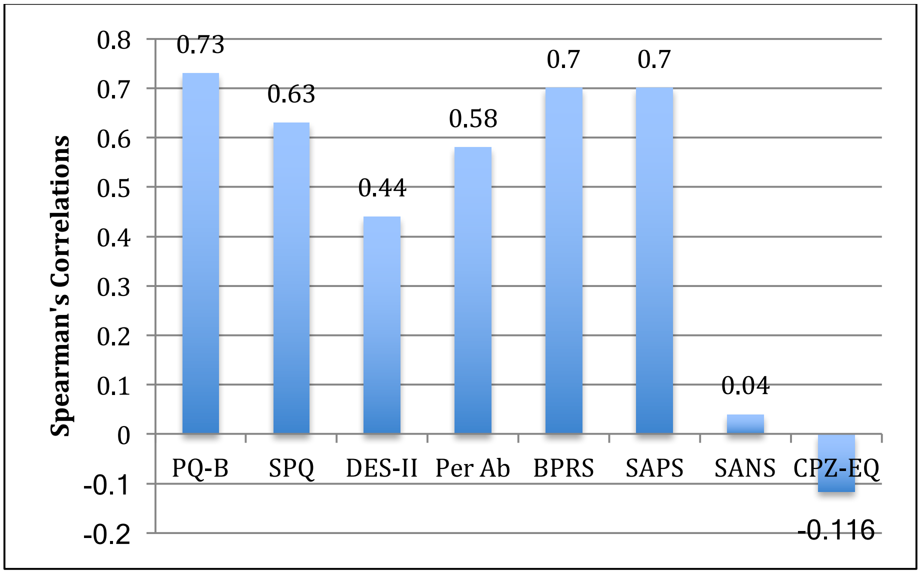
Furthermore, a split-reliability analysis was also performed in SPSS. The BODI 1 was split into two halves, the first with 11 items (Cronbach's α = .807) and the second half with 10 items (Cronbach's α = .796). The correlation between forms was .821, the Spearman-Brown Coefficient was .901, and the Guttman Split-Half Coefficient was .889.

Spearman's Correlations with Other Measures: Validity Analysis

Spearman's rank correlations were conducted to assess convergent validity with related measures. As can be seen in Appendix E below and Figure 7 below, total BODI 1 scores were positively correlated with total PQ-B scores, SPQ scores, DES-II scores, and Perceptual Aberration Scale scores, even after correcting for multiple comparisons ($p < .05$). Further, BODI 1 and BPRS scores were positively related in SZ patients ($\rho = 0.70$, p<.0001), and SAPS scores in SZ patients ($\rho = 0.70$, p<.001), but not SANS scores in SZ patients ($\rho = 0.04$, p=0.86). Unexpectedly, there was a positive correlation between BODI 1 total and SPQ interpersonal factor in healthy controls ($\rho = 0.47$, p<.001). Finally, as predicted, there was no relationship between CPZ-EQ (antipsychotic medication measure) with BODI 1 total scores ($\rho = -0.116$, p=0.62).

After removing overlapping items from multiple questionnaires (see Appendix D) we conducted the same correlations as above. Without the overlapping items, total BODI 1 scores were still positively correlated with total DES-II scores, Perceptual Aberration Scale score, SPQ total scores, and PQ-B scores, even after correcting for multiple comparisons with Bonferroni's calculation ($p < .05$). More details on these correlations can be found in Appendix E below. Please also see Appendix E below for item correlations with other scales for further evidence of individual item convergent validity with established scales currently being utilized in the literature.

Figure 7. Spearman's Correlations with BODI 1 Total Scores



<u>Group Differences</u>

Table 21. *BODI 1 Medians by Group*

BODI 1 VARIABLE	Total N	Healthy Control	Low Risk	High Risk	SZ Patient
Total Sum	12	5	4.5	24	47
Endorsements	2	1	.5	4	5
Distressing End.	0	0	0	1	2
Distress	1	0	0	2	8
Frequency	4	2	1	9	17
Vividness	4	1	.5	7	23

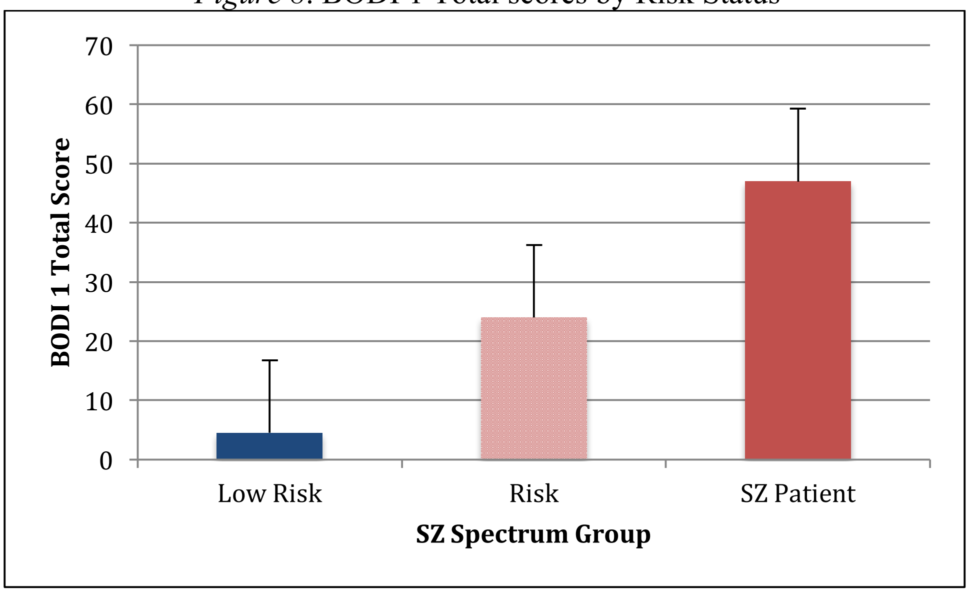
As predicted, patients with schizophrenia scored higher than controls on total BODI 1 scores ($U = 83.5$, $p = 0.007$, $r = 0.43$). SZ patients also scored significantly higher on total DES-II scores ($U = 45$, $p = 0.001$, $p = 0.49$), replicating Study 1A. Please see Appendix E for further details.

As predicted, when comparing healthy participants divided into low risk and elevated risk, we saw BODI 1 scores greater in individuals at risk compared to individuals at lower risk

(U = 202, p <.0001, r = 0.56), indicating a medium effect size of individuals at higher psychosis risk exhibiting more levels of self-disturbances. Please see Appendix E for further details.

Finally, total BODI 1 scores differentiated psychosis risk status group ($\chi^2_{(2)}$ = 28.9, p <.0001) as can be seen in Figure 8 below, with SZ patients demonstrating highest scores on the BODI 1 (*Median* = 47) followed by the risk group (*Median* = 24) , and then the low risk group (*Median* = 4.5). Please see Appendix E for further details on the differences between these groups on the different BODI 1 variables.

Figure 8. BODI 1 Total scores by Risk Status



Analyses of Select Individual Items of Interest

Item #4 (Sleep Paralysis)

SZ patients were not significantly more likely to report sleep paralysis (39%) than healthy controls (23%), and individuals at risk for psychosis (32%) were equally likely to report sleep paralysis as healthy controls (23%) in the current sample using the BODI 1 item and picture (p > .1) using Chi Square tests in SPSS.

Item #12 (Sober OBE)

We looked at the convergent reliability between the OBE item on the dream questionnaire and scores on item #12 of the BODI 1, that assesses OBE while sober. Endorsement of lifetime OBE history on the dream questionnaire was a useful predictor of how individuals would endorse the OBE item on the BODI 1 ($\chi^2_{(1)} = 27.44$, $p < .0001$, Fisher's Exact Test $p < .0001$) with a likelihood ratio of 18.98, 68% sensitivity, 95% specificity, 64% positive predictive value and 95% negative predictive value when looking at from all subjects (both HC and SZ).

Comparing SZ and HC on the sober OBE of the BODI 1 did not yield significant differences in endorsement percentages as predicted ($\chi^2_{(1)} = 2.3$, $p = 0.129$, Fisher's Exact Test $p = 0.156$) or as we saw in Study 1A. Similarly, the same analysis with the OBE Item on the Dream Questionnaire also did not yield significant differences as would be expected based on results from Study 1A above and other relevant findings in the literature ($\chi^2_{(1)} = 2.72$, $p = 0.097$, Fisher's Exact Test $p = 0.145$). Thus, it is possible that this difference could be related to the current sample instead of a difference between the two questionnaire items.

When comparing three groups of SZ-spectrum risk on the Dream Questionnaire OBE item in the current sample, we replicated results of Study 1 by finding that the three groups also differed on OBE history ($\chi^2_{(2)} = 11$, p=0.0041) with SZ patients being more likely to report OBE history compared to those at risk and lower risk for psychosis. However, doing the exact same analysis with the exact same participants but using the sober OBE item on the BODI 1, we did not find the same difference between the 3 groups ($\chi^2_{(1)} = 4.0$, $p = 0.133$).

Sensitivity & Specificity

After conducting Binary Logistic Regression analyses in SPSS, ROC curve analyses were conducted in SPSS to determine levels of sensitivity and specificity BODI 1 scores in determining SZ status, Risk status, High PQ-B status, High SPQ status, and High DES-II status (see Table 22 below for details). BODI 1 total scores were also useful in determining Low PQ-B status when the direction was turned in the opposite direction (area under the curve = .825, *p*<.0001), and similarly for Low SPQ status (area under the curve = .839, *p*<.0001).

Table 22. *ROC Curve Data for BODI 1 Total Scores to Determine Various Status Outcomes*

Status Outcome	**AUC**	**Std. Error**	**Asymptotic Sig.**	**Asymptotic 95% Confidence Interval**	
				Lower	**Upper Bound**
BODI 1: SZ Status	.734	.069	.001*	.598	.87
BODI 1: Risk Status	.662	.058	.013*	.548	.775
BODI 1: High PQ-B	.865	.109	.016*	.652	1.00
BODI 1: High SPQ	.918	.040	.005*	.839	.996
BODI 1: High DES-II	.731	.082	.006*	.571	.891

**p < .05; † p<.1; Note: AUC = Area Under the Curve*

Discussion

The major aim of the second study was to develop and pilot a new, structured self-report inventory designed to quantify out-of-body experiences (OBEs) and related anomalous bodily-self experiences in both clinical and healthy populations.

Reliability and Validity

The BODI 1 showed adequate internal consistency and split-half reliability. Further, BODI 1 scores were significantly correlated with scales that have already been established in the literature, including the dissociative experiences scale (DES-II) and the perceptual aberration scale (Per Ab), providing evidence for convergent validity.

Moreover, the BODI 1 scores were significantly related to indices of schizophrenia-spectrum symptoms in both clinical populations and healthy populations, including Schizotypal Personality Questionnaire (SPQ), Prodromal-Questionnaire Brief (PQ-B), Brief Psychiatric Rating Scale (BPRS), and Scale for the Assessment of Positive Symptoms (SAPS).

Group Differences

Group comparison analyses suggest that the BODI 1 accurately captures bodily self-aberrations in both patients with schizophrenia and healthy controls. Furthermore, the BODI 1 is useful in distinguishing individuals with psychosis-spectrum liability from controls. These results provide partial evidence for the hypothesis that weakened sense of self may be central to the prodromal stage of schizophrenia, and dissociative experiences may be a latent risk factor for psychosis.

OBE Item

Chi square analyses indicated that endorsement of lifetime OBE history on the dream questionnaire was a useful predictor of how individuals would endorse the (sober) OBE item on the BODI 1. This strong relationship among measures indicates 1) evidence of convergent validity among measures, and 2) that the sober OBE instruction specification may not make significant differences in the prevalence data. However, after comparing rates of sober OBE in SZ and HC, we did not see the same significant difference between groups that we saw on the dream questionnaire. Specifically, in Study 1A, we found that SZ endorsed OBE history 38% compared to HC at 17%. On the sober OBE item of BODI 1, we see SZ patients report OBE history 22% compared to HC at 10%, which was not significantly different from each other. Thus, although scores on the OBE history item of the dream questionnaire are useful in predicting whether one will endorse the sober OBE item on the BODI 1, it is still important to realize that we are finding a much different result on the BODI 1. This could be due to a number of reasons. First, this discrepancy could reflect the fact that both SZ patients and HC were reporting OBE while under the influence in the Dream Questionnaire OBE item, which is why both numbers dropped when asked to eliminate such experiences from consideration when answering the sober OBE BODI 1 item. A second possibility is that the wording of the item is so different that the meaning has changed for many individuals. We decided to change the verbal description of the dream questionnaire OBE item for the sober OBE item on the BODI 1 since we knew that we would be administering both items to participants, and we did not want to ask the exact same question twice. However, it would have been ideal to have this data so we could compare whether this change in prevalence rates might have been due to the addition of the picture, rather than a change in the verbal description. The two verbal descriptions are contrasted below in Table 23. Finally, another possibility is that the picture associated with the BODI 1 item limited the agreement that people had with the verbal item. In other words, perhaps participants had a broader understanding of the OBE item on the dream questionnaire, and thus responded in a way that reflected a broader array of experiences other than the specific OBE that we were trying to assess. If this is the case, then this is good news for the BODI 1 OBE item, as it will make OBE history classification more specific in its classification of what we are aiming to study. Since we had to change all the individual picture items for the BODI 2 (described next), we will get a chance to see if the individual picture change had significant influence on the BODI sober OBE item in the next sample of participants.

Table 23. *Comparing OBE items between Dream Questionnaire and BODI 1*

Questionnaire	**Item**
Dream Questionnaire	Have you ever had the experience of being separated from your body (during wake time)?
BODI 1 (instructions specify not to endorse for experiences that have only occurred while under the influence of substances or medications)	I have had an “out of the body” experience during which my mind seems to or actually has, left my body.

Sleep Paralysis

Since one proposed etiological consideration in the connection between schizotypy and dissociation is the similar relationship between the two and unusual sleep experiences (e.g., Watson, 2001), and one type of unusual sleep experience, sleep paralysis, is closely linked with hallucinatory phenomena, we were curious to test if SZ patients reported sleep paralysis more than HC, and if individuals at risk for psychosis were more likely to endorse sleep paralysis than those at lower risk. Specifically, many individuals who experience sleep paralysis, or the experience of being temporarily unable to move upon waking, also experience an accompanying hypnopompic ('upon awakening') hallucination (Cheyne et al., 1999; Girard & Cheyne, 2004). Interestingly, in a fascinating set of studies, McNally and colleagues found that many individuals who reportedly had been abducted by aliens were actually sufferers of sleep paralysis with accompanying hallucinations. Furthermore, these researchers also found that individuals reporting childhood sexual abuse were also more likely to suffer from sleep paralysis (see McNally and Clancy, 2005). However, contrary to predictions, we did not find a difference in either comparison. This proposed connection between positive schizotypy, dissociative experiences and traumatic history remains an important open question for further research, however, and this relationship can be explored further with the data in Study 3 at a later time (i.e., not here).

Limitations & Future Directions

Results of the current study should be considered in light of several potential limitations. One major limitation of the current study is the lack of measures to assess discriminant validity of the BODI. The validation of the BODI will also require many more participants, particularly adults from the general population (and not just Vanderbilt undergraduates). These limitations are addressed in Study 2B (described below).

Only four of the undergraduates in the current study met criteria for the official "high PQ-B" distress risk group in the current status, which is why we made an effort to recruit more of these individuals for Study 2B and Study 3, as described below, so we didn't have to rely on other measures of high risk group status, such as simply endorsements of PQ-B items alone. Further, it would also be good to validate the prodromal status of the individuals at risk for psychosis by administering the Structured Interview for Prodromal Symptoms (SIPS; Miller et al., 2003).

Conclusions

The first study to use the BODI 1 suggests that the BODI accurately captures bodily self-aberrations in both patients with schizophrenia and healthy controls. The BODI 1 showed adequate internal consistency and split-half reliability. Further, BODI 1 scores were significantly correlated with scales that have already been established in the literature, including the dissociative experiences scale (DES-II) and the perceptual aberration scale (Per Ab), providing evidence for convergent validity. Moreover, the BODI 1 scores were significantly related to indices of schizophrenia-spectrum symptoms in both clinical populations and healthy populations, including Schizotypal Personality Questionnaire (SPQ), Prodromal-Questionnaire Brief (PQ-B), Brief Psychiatric Rating Scale (BPRS), and Scale for the Assessment of Positive Symptoms (SAPS), but not negative symptoms. Group comparison analyses suggest that the BODI 1 accurately captures bodily self-aberrations in both patients with schizophrenia and healthy controls. Furthermore, the BODI 1 is useful in distinguishing individuals with psychosis-spectrum liability from controls. These results provide partial evidence for the hypothesis that weakened sense of self may be central to the prodromal stage of schizophrenia, and dissociative experiences may be a latent risk factor for psychosis.

Finally, the 3 groups (SZ, Risk, Low Risk) also differed on OBE history with SZ patients being more likely to report OBE history compared to those at risk and lower risk for psychosis, replicating results from Study 1, but only when using the same questionnaire as Study 1, and not when looking at OBEs only when sober, which is specified on the new BODI 1 scale. When we added the sober instructions, the difference between groups dropped so that they were now equal rates of prevalence of OBE history. This has implications for how we should be thinking about whether or not we should be concerned with maximizing sensitivity vs. specificity with our items, and what this means for assessing the importance of anomalous self-experience in individuals at risk for the schizophrenia spectrum.

CHAPTER IV:

STUDY 2B: VALIDATION OF BODI

Aims

The major aim of Study 2B was to further develop a self-report inventory designed to quantify out-of-body experiences (OBEs) and related anomalous bodily-self experiences in both clinical and healthy populations (the BODI 2).

Methods

Participants

We recruited groups of participants to further validate the BODI, including patients with schizophrenia, healthy matched controls, Vanderbilt undergraduates, and adults from the general population. Informed consent was obtained and protocol approved by Vanderbilt's IRB. Participants were compensated and students received partial course credit for their time.

We collected BODI 2 data from 377 participants by the time of this dissertation, but 70 participants were excluded before final analysis. 119 of the individuals in the general adult population completed the BODI 2 with a modified response option, which included a "not sure" option for the true/false component of each of the BODI 2 items. Of those 119 participants, 53 people chose "Not sure" to at least one of the BODI 2 items, and were thus excluded from the current analyses as the majority of the sample filled out the earlier true/false version of the BODI 2, and we didn't want to potentially confound the current results by including theses scores. We excluded a total of seven subjects (4 SZ patients and 3 healthy adults) due to invalid scores on the control BODI 2 scale (i.e., if one individual did not endorse any of the "normal" BODI 2 control items, such as headache, stomachache, etc.). Furthermore, 10 of the 90 subjects from Study 3 were excluded for various reasons (described below), and were excluded from the BODI

2 analyses as well. Thus, 277 participants' data were included in final BODI 2 analyses (19 SZ, 28 HC, and 231 General Adults (i.e., adults from the community that are not demographically matched with SZ; mostly Vanderbilt undergraduates). Please see Table 41 in Chapter 6 below for an outline of how many individuals participated in the different versions of the BODI questionnaire that are currently being included in the current dissertation.

Patients with schizophrenia were not significantly different from healthy controls on the following demographic variables: sex, premorbid intellectual functioning (National Adult Reading Test [NART]; Nelson, 1982), race, handedness, and Edinburgh laterality index (Oldfield, 1971). The groups were not matched for age or education. We conducted Spearman's correlations of our variables of interest with age and years of education to rule out that these group demographic differences may have contributed to our overall group differences among BODI 2 scores although we did not predict this to be the case. Please see Table 24 for details on demographic information on the SZ and HC groups, and Table 25 for demographics for the entire general adult sample.

Table 24. *Demographic Characteristics of the 2B Patient and Control Groups*

Demographic Variable	**Healthy Controls (n = 28)**	**Schizophrenia Patients (n = 19)**	***SZ patients vs. Controls***	
			Test Statistic	***p-value***
Sex	45% Females	69% Females	$\chi^2_{(1)} = 2.19$	.14
Age	*M* = 36.50 *SD* = 12.30	*M* = 47.46 *SD* = 10.27	$t(51) = 2.66$	.0122*
Years of Education	*M* = 15.24 *SD* = 2.53	*M* = 13.52 *SD* = 2.34	$t(51) = 3.96$	.0001*
Premorbid IQ (NART)	*M* = 108.24 *SD* = 7.36	*M* = 103.04 *SD* = 8.91	$t(51) = 1.89$	.066†
Race	46% White	31% White	$\chi^2_{(1)} = 3.77$	.0521†
Handedness	90% Right	93% Right	$\chi^2_{(1)} = 0.07$	.78
Edinburgh Laterality Index	*M* = 81.15 *SD* = 40.10	*M* = 72.58 *SD* = 33.55	$t(51) = 0.67$	.51

*$p < .05$, † $p < .1$

Table 25. *Study 2B "General Adult" Participant Demographic Information*

Demographic Variable	**"General Adults" (n = 231)**
Sex	70% Female
Age	*M* = 19.4 (*SD* = 1.5)
Years of Education	*M* = 13.4 (*SD* = 1.2)
Race	59% White
Handedness	88% Right
Edinburgh Laterality Index	*M* = 67 (*SD* = 39)

A subset of participants forming the "general adult" population were grouped into three psychosis risk groups if they completed the PQ-B. 16 out of 80 participants qualified to be in the "High" PQ-B group, by totaling over six distressing endorsements on the scale of prodromal psychosis symptomatology. Twenty out of 80 participants were classified as the "Mid" PQ-B group by scoring between 3-5 distressing endorsements on the scale, and 43 out of 80 participants were classified as the "Low" PQ-B group by scoring between 0-2 distressing endorsements on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). There were no significant differences among demographic variables across the three PQ-B risk groups as can be seen in Table 26 below. Specifically, there was no difference in sex, age, handedness, Edinburgh laterality, race, or years of education.

Table 26. *Study 2B "General Adult" Participant Demographic Information by PQ-B Group*

Demographic Variable	**"Low" PQ-B group (0-2 w/ dis.)**	**"Mid" PQ-B group (3-5 w/ dis.)**	**"High" PQ-B group (6+ w/ dis.)**	***Low vs. Mid vs. High PQ-B group***	
n	43	20	16	$\chi^2_{(2)}$	***p***
Sex	63% Female	65% Female	63% Female	0.03	.98
Age	*M* = 19 *SD* = 1	*M* = 19.5 *SD* = 1	*M* =19 *SD* = 1	1.32	.52
Education (Years)	*M* = 13 *SD* = 1	*M* =13 *SD* = 1	*M* =13 *SD* = 1	0.75	.69
Handedness	88% Right	100% right	88% Right	2.62	.27
Edinburgh Laterality Index	*M* = 66 *SD* = 43	*M* = 75 *SD* = 16	*M* = 58 *SD*= 51	0.84	.66
Race	57% White	53% White	44% White	0.84	.66

**p* < .05, † *p* < .1

Measures

As can be seen in Table 27 below, Study 2B participants completed a variety of self-report measures as part of a variety of different studies, including the BODI 2 (Benson et al., in prep), Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011), Perceptual Aberration Scale (Per Ab; Chapman et al., 1978), Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Dream Questionnaire and extended Dream Questionnaire items (McIntosh et al., in prep), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), Physical Anhedonia Scale (Chapman et al., 1976), Hypomanic Personality Scale (Eckblad & Chapman, 1986), Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001), Temporal Lobe Scale (Persinger, 1984), SELF scale (Heering et al., 2016), and Chapman Infrequency Scale (Chapman & Chapman, unpublished). All participants completed also basic demographic and handedness questionnaires (e.g., Edinburgh Laterality Index; Oldfield, 1971).

Table 27. *Participants per Questionnaire in Study 2B*

Questionnaire	**N**
BODI 2	277
Dissociative Experiences Scale (DES-II)	80
Prodromal Questionnaire Brief (PQ-B)	80
Schizotypal Personality Questionnaire (SPQ)	80
Perceptual Aberration Scale	80
Temporal Lobe Scale (TLS)	80
Physical Anhedonia	80
Hypomanic Personality	80
Autism Spectrum Quotient (AQ)	80
Dream Questionnaire	80
Extended Dream Questionnaire Items	80
SELF Total	27

All patients with schizophrenia completed clinical interview rating scales with a clinical graduate student or research assistant, including the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984), and Scale for the Assessment of Negative Symptoms (SANS, Andreasen, 1983), and were asked to report medication information for the sake of calculating their CPZ equivalent (Andreasen et al., 2010). Please see Table 28 below for details on the SZ patients' clinical characteristics.

Table 28. *Clinical Characteristics of the SZ Patient Group*

Clinical Variable	Mean	S.D.	Range
BPRS	15.25	7.89	32
SAPS	12.5	10.11	30
SANS	32.25	17.45	67
CPZ-EQ	473.73	413.25	1484
# of Hospitalizations	11	9	18
Duration of Illness	32.33	4.73	9

Patients with schizophrenia and healthy controls recruited from the community completed a Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-IV; First et al., 2002a; First et al., 2002b) during initial screening evaluation with the Park Lab, but the Vanderbilt undergraduates and general population adults were screened on the SCID. The general population adults are included from other studies in the lab (e.g., synesthesia).

Detailed information on each of the new measures (i.e., not utilized in Study 1) are described below, and please see Study 1 and Study 2A for detailed information on the PQ-B (Loewy et al., 2011), SPQ (Raine, 1991), DES-II (Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Dream Questionnaire (McIntosh et al., in prep), Perceptual Aberration Scale (Chapman et al., 1978), SAPS (Andreasen, 1984), SANS (Andreasen, 1983), BPRS (Overall & Gorham, 1962), and SCID-IV (First et al., 2002a; First et al., 2002b).

Brugger et al. Out-of-body and Dissociative Experiences Inventory (BODI 2)

The current study in this dissertation utilized the second version of the BODI, which will now be referred to as "BODI 2". The second version of the BODI, BODI 2, used updated pictures of the original images from Dr. Peter Brugger's neurology clinic and also added four new pictures of “normal” bodily experiences that most participants experience (based on lab pilot data; see Appendix F for the four new normal body items). Scoring of the BODI 2 was identical to the first version of the BODI (see Study 2A and Appendix C). However, we also began calculating two new variables called “**Current endorsements**”, which is the sum of endorsements which participants report have occurred in the past month, and “**Current distressing endorsements**”, which is the sum of endorsements participants report in the past month that they also rate as distressing, by choosing “Agree” or “Strongly Agree” to the distress question.

The four new items on the second version of the BODI were not counted in the total BODI 2 score and instead served as a form of validity check (i.e., if participants do not endorse at least one of these items, then their total score was suspected to be invalid). The BODI 2 was primarily administered online through Redcap, but was also available to administer to participants on paper. The BODI 2 took approximately 15 minutes to complete in the general adult population, but took slightly longer for some SZ patients, although time to complete the questionnaire was not officially quantified during data collection. Chapter 6 and Appendix I outlines the similarities and differences between the two versions of the BODI, and see Appendix O at the very end of this paper to see each of the two versions of the BODI scale.

Self-Experience Lifetime Frequency Scale (SELF)

The Self-Experience Lifetime Frequency Scale (SELF; Heering et al., 2016) is a self-report measure used to quantify self-disturbances in psychotic patients. Examples of items include “Have you felt that common sense of the world around you had been lost?” and “Have you felt like you were in a dream or just going through the motions?” Participants are asked to indicate how often they have had each experience in their lifetime (0 (Never) to 4 (All the time), and check how distressed they were by each experience, from 0 (Never) to 4 (Severely Distressed). Conceptually, many of the SELF items were very similar to the BODI 2 items, in that both scales were created to quantify aspects of self-disturbances that are common in schizophrenia-spectrum populations. However, the SELF measures more cognitive aspects of the self, while we are seeking to quantify bodily self-disturbances and concurrent dissociative experiences and perceptual aberrations. Thus, while similar, there were no explicit overlapping items to remove for convergent validity analyses.

Temporal Lobe Scale (TLS)

The Temporal Lobe Scale (TLS; Persinger, 1984) is a 30 true/false self-report questionnaire designed to quantify temporal lobe lability signs that are common in temporal lobe epilepsy (Persinger & Makarec, 1993) and correspond to EEG alpha activity in the temporal lobe, but not the occipital lobe (Makarec & Persinger, 1990). Examples of items include "I often feel as if things are not real" and "Sometimes an event will occur that has special significance for me only." Since one of the BODI 2 captions was originally based on a TLS item (i.e., "I have heard an inner voice call my name") this item was removed for Spearman's correlations for convergent validity analyses below. The TLS was utilized for analyses of convergent validity here and also to help determine possible temporal lobe etiological factors associated with bodily self-disturbances in the schizophrenia spectrum in Study 3.

Physical Anhedonia Scale

The physical anhedonia scale (Chapman et al., 1976) is a 61-item true/false questionnaire designed to assess levels of physical anhedonia symptoms. Example items of the physical anhedonia scale include "I have had very little desire to try new kinds of foods" and "The beauty of sunsets is greatly overrated." The physical anhedonia scale was utilized in conjunction with

BODI 2 data collection in order to establish a form of discriminant validity. The physical anhedonia scale has been previously used in both healthy and clinical populations (e.g., Katsanis et al., 1990), including patients with schizophrenia. A score over 20 is considered to be in the "high" range for females, and a score over 28 is considered to be in the "high" range for males (Kwapi, 2002).

Hypomanic Personality Scale

The hypomanic personality scale (Eckblad & Chapman, 1986) is a 48-item true/false questionnaire designed to quantify level of hypomanic personality traits. Example items include "I am frequently so 'hyper' that my friends kiddingly ask me what drug I'm taking," and "I am frequently in such high spirits that I can't concentrate on any one thing for too long." The hypomanic personality scale was utilized in conjunction with BODI 2 data collection in order to test whether or not these anomalous bodily self-experiences are specific to the psychosis-proneness relevant to the schizophrenia spectrum, or if they are also common in psychosis-proneness in mood disorders as well. A score over 38 is considered to be in the "high" range for females, and a score over 37 is considered to be in the "high" range for males (Kwapil, 2002).

Autism Spectrum Quotient (AQ)

The autism spectrum quotient (AQ; Baron-Cohen et al., 2001) is a 50-item self-report questionnaire designed to assess for autism spectrum traits. Example items of the AQ include "I like to collect information about categories of things (e.g., types of cars, types of birds, types of trains, types of plants, etc.)" and "When I speak on the phone, I'm not sure when it's my turn to speak." The AQ was utilized in conjunction with BODI 2 data collection in order to test whether or not these anomalous bodily self-experiences are specific to the schizophrenia spectrum or if they are also common in the autism spectrum as well. An individual's score will place them in the “High AQ” category if they score over 32, indicating possible diagnostic level of autism spectrum symptoms that were formerly characterized as Asperger Syndrome (Woodbury-Smith et al., 2005). The AQ consists of several subscales including the social skill subscale, attention switching subscale, attention to detail subscale, communication subscale, and imagination subscale.

Hypotheses & Predictions

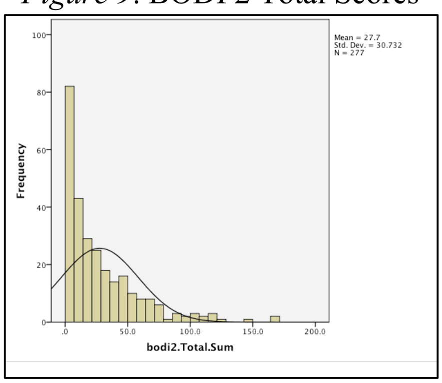
Similar to Study 2A, we predicted that patients with schizophrenia would continue to demonstrate higher scores on the new version of the BODI 2 compared with non-clinical controls. We also predicted that BODI 2 scores would be positively correlated with other measures of anomalous self-experiences (i.e., DES-II, Perceptual Aberration Scale, SELF), as well as measures of positive schizophrenia-spectrum symptoms (i.e., SAPS, SPQ, PQ-B). We predicted that BODI 2 scores would not be correlated with measures of negative schizophrenia-spectrum symptoms (i.e., SANS, Physical Anhedonia). Finally, we hypothesized that anomalous self-experiences are specific to schizophrenia-spectrum symptoms (and not related types of psychoses or autism), and thus we predicted that BODI 2 scores would not be correlated with hypomanic personality symptoms or autism spectrum traits. We predicted no relationship between BODI 2 scores and medication dosage (i.e., CPZ equivalent score) in patients with schizophrenia. Finally, we predicted that BODI 2 scores would be positively correlated with the TLS, implicating temporal lobe lability in bodily self-disturbances.

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All tests were two-tailed unless explicitly indicated otherwise.

Prior to analysis, the distribution of each variable was visually scanned to check for presence of a non-normal distribution, which was predicted in most cases. Furthermore, descriptive statistics were outlined to determine skewness and kurtosis of each variable (see Table 29 below). If variables had skewness or kurtosis values greater than +/- 2, they were considered not normal (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). Finally, tests of normality (Shapiro-Wilks tests) were conducted on variables in question to make the final decision whether to conclude if a variable had a normal distribution. Since many the variables utilized in the current study were considered non-normal (i.e., BODI 2 variables, perceptual aberration scale scores, DES-II scores, and SELF scores), and because of the small sample sizes, nonparametric tests were utilized in favor of parametric tests. Furthermore, since we do not know the population distribution for many variables (e.g., BODI 2), we thought nonparametric statistical methods would be the most appropriate to use whenever possible, similar to Bernstein & Putnam (1986).

Figure 9. BODI 2 Total Scores



Mann-Whitney U-tests were used to compare the data between two groups (i.e., SZ compared to HC, and high risk compared with low risk) and Kruskal-Wallis tests were used to compare data between three groups (i.e., low risk, high risk and SZ status). If Kruskal-Wallis tests were significant between three groups, we conducted further Mann-Whitney U tests between two groups, accounting for multiple comparisons with Bonferroni's corrections.

Effect sizes (*r*) were calculated after conducting Mann-Whitney U tests using the formula [Z / √ N], where Z represents the converted U value from the Mann-Whitney U test in SPSS.

Spearman's rank correlations were conducted to test the predictions of convergent and discriminant validity. Spearman's rank correlations were also used to conduct test-retest reliability of the BODI 2 in 11 participants (4 controls and 7 SZ patients). Cronbach's coefficient α was used to examine internal consistency of the BODI 2, and split-half reliability analyses were conducted in SPSS, as described below. Agreement between BODI 2 variables and High PQ-B classification was used to assess concurrent validity by generating receiver operating characteristic (ROC) curves and calculating areas under the curve (AUC's). Values for sensitivity, specificity, positive predictive value, negative predictive value, and likelihood ratios were computed in SPSS.

Results

Descriptive Statistics

As described above, since SZ patients and healthy controls were not matched for age or years of education, we conducted Spearman's correlations of our variables of interest with age and years of education, to rule out that these group demographic differences may have contributed to our overall group differences among BODI 2 scores, although we did not predict this to be the case. As expected, BODI 2 total scores were not related to age or years of education ($p > .1$). In contrast, and much to our surprise, BODI 2 scores were significantly related to race ($U = 3397$, $p < .0001$). Specifically, when analyzing data from all participants, we found that individuals who were classified as "white" scored significantly lower (*Median* = 21) on BODI 2 total scores than individuals who classified themselves as being part of a different racial group (*Median* = 32). The reasons for this will be explored in the discussion section below.

Nevertheless, we tried to control for race whenever possible when analyzing BODI 2 scores in this sample although this proved to be challenging since we mostly used Mann-Whitney U tests to compare BODI 2 scores between groups.

BODI 2 total scores (ρ = -.261, p = 0.004), SPQ Disorganized scores (ρ = -.278, p = 0.014), and PQ-B occurrence scores (ρ = -.292, p = 0.010) were all negatively related to Edinburgh laterality index scores in the current sample, indicating that greater mixed handedness is related to both bodily self-disturbance and schizophrenia-spectrum symptoms. This is an interesting finding, with implications for etiology and lateralization of self-disturbances and schizophrenia-spectrum risk and we will discuss this more in the discussion below.

Table 29. *Descriptive Statistics of Study 2B Variables in both SZ Patients and Healthy Controls*

Variable		Range	Min	Max	Median	Mean (SE)	Std. Dev.	Variance	Skewness (SE)	Kurtosis (SE)	Normal?
BODI 2	Total	171	0	171	18	27.7 (1.9)	30.7	945.26	1.78 (.15)	3.8 (.29)	Not Normal
	Endorsements Sum	18	0	18	2	3.46 (.21)	3.54	12.53	1.58 (.15)	2.7 (.29)	Not Normal
	#Endorsements With Distress	9	0	9	1	1.38 (.12)	1.95	3.79	1.77 (.15)	2.9 (.29)	Not Normal
	#Current Endorsements	17	0	17	2	2.6 (.17)	2.90	8.42	1.63 (.15)	3.2 (.29)	Not Normal
	#Currently Distressing End.	8	0	8	0	.92 (.09)	1.47	2.175	2.06 (.15)	4.6 (.29)	Not Normal
	Frequency Sum	32	0	32	2	3.7 (.29)	4.75	22.63	2.7 (.15)	11.0 (.29)	Not Normal
	Distress Sum	63	0	63	7	10.5 (.72)	11.9	143.34	1.72 (.15)	3.23 (.29)	Not Normal
	Vividness Sum	67	0	67	6	10.1 (.71)	11.8	140.45	1.97 (.15)	4.6 (.29)	Not Normal
	Control Scale Sum	3	1	4	4	3.69 (.04)	.679	.461	-2.26 (.15)	4.4 (.29)	Not Normal
DES-II	Total	43.6	0	43.6	11.43	13.2 (1.0)	8.98	80.66	1.08 (.27)	1.07 (.54)	Normal
	Amnesia Factor	29	0	29	3	4.96 (.59)	5.24	27.52	1.85 (.27)	5.06 (.54)	Not Normal
	Depersonalization Factor	23	0	23	0	2.01 (.46)	4.07	16.56	3.46 (.27)	13.5 (.54)	Not Normal
	Absorption Factor	54	0	54	16	19.6 (1.5)	13.6	186.16	.918 (.27)	.049 (.54)	Normal
	Pathological 8 Taxon	23	0	34	2.5	4.3 (.57)	5.02	25.18	1.88 (.27)	3.8 (.54)	Not Normal
	DES-II Total No Overlap	44.23	0	44.2	11.3	13.9 (1.1)	9.36	87.6	1.0 (.27)	.78 (.54)	Normal
PQ-B	Total	111	0	111	35	43.2 (3.5)	31.2	971.6	.48 (.27)	-.86 (.54)	Normal
	Endorsements	19	0	19	7	7.3 (.55)	4.9	23.8	.44 (.27)	-.66 (.54)	Normal
	Endorsements with Distress	12	0	12	2	3.11 (.37)	3.34	11.18	.95 (.27)	-.19 (.54)	Normal
	Occurrence	44	0	44	9	11.7 (1.2)	10.4	107.6	1.2 (.27)	1.01 (.54)	Normal
	Distress	68	0	68	22	24.3 (2.0)	18.2	331.93	.52 (.27)	-.81 (.54)	Normal
	PQ-B End. No Overlap	15	0	15	6	6.1 (.46)	4.1	16.7	.46 (.27)	-.64 (.54)	Normal
SPQ	Total	55	2	57	21	23 (1.6)	14.4	207.95	.51 (.27)	-.68 (.54)	Normal
	CP Factor (+)	28	0	28	6	8.2 (.77)	6.87	47.24	.88 (.27)	-.01 (.54)	Normal
	Interpersonal Factor (-)	27	0	27	10	10.7 (.84)	7.44	55.40	.34 (.27)	-1.01 (.54)	Normal
	Disorganized Factor	15	0	15	6	6.4 (.50)	4.43	19.70	.32 (.27)	-1.01 (.54)	Normal
	SPQ Total No Overlap	55	2	57	21	22.6 (1.6)	14.2	200.1	.52 (.27)	-.66 (.54)	Normal
Perceptual Aberration Scale		26	0	26	3	4.2 (.52)	4.6	21.03	2.22 (.27)	6.24 (.54)	Not Normal
	PerAb Total No Overlap	18	0	18	2	2.7 (.37)	3.3	10.83	2.3 (.27)	6.04 (.54)	Not Normal
TLS	Total	22	0	22	9	9.2 (.51)	4.5	20.6	.84 (.27)	.93 (.54)	Normal
	TLS Total – No Overlap	22	0	22	9	9.1 (.50)	4.4	19.6	.86 (.27)	1.03 (.54)	Normal
SELF Total		29	0	29	2	5.9 (1.5)	8.0	64.0	1.83 (.43)	2.54 (.85)	Not Normal
Physical Anhedonia		31	1	32	11	11.6 (.62)	5.50	30.3	.97 (.27)	1.6 (.54)	Normal
Hypomanic Personality		39	0	39	18	19.9 (1.0)	9.2	84.5	.17 (.27)	-.58 (.54)	Normal
AQ Total		31	6	37	17	17.1 (.78)	6.94	48.19	.55 (.27)	-.251 (.54)	Normal

Table 30. *Percentage of Endorsements of Individual BODI 2 Items by Group*

BODI 2 ITEM (T/F)	**Total N**	**General Adults**	**Healthy Control**	**Low PQ-B**	**Mid PQ-B**	**High PQ-B**	**SZ Patient**
#1: unsure of who I am	40%	44%	20%	30%	45%	75%	47%
#2: soul leaves body	7%	6%	7%	2%	5%	25%	16%
#3: bodily disconnection	10%	9%	10%	2%	25%	31%	16%
#4: sleep paralysis	32%	32%	24%	20%	35%	50%	47%
#5: time perception	43%	50%	20%	33%	50%	75%	21%
CONTROL #1: Headache	93%	93%	100%	88%	95%	100%	84%
#6: feeling of presence	36%	38%	25%	25%	55%	56%	37%
#7: felt like somebody else	18%	20%	10%	10%	20%	56%	16%
#8: floating through air	10%	10%	10%	0%	10%	31%	21%
#9: doppelganger	10%	9%	10%	14%	10%	13%	16%
#10: strange face in mirror	29%	33%	7%	19%	40%	56%	26%
CONTROL #2: Itch	92%	95%	90%	98%	90%	100%	68%
#11: spiritual being	11%	10%	4%	9%	20%	13%	37%
#12: OBE	18%	18%	7%	14%	10%	25%	26%
#13: polyopic heautoscopy	4%	4%	4%	2%	0%	19%	0%
#14: bodily disconnection	7%	7%	7%	2%	10%	32%	21%
#15: perceptual aberration	16%	17%	7%	16%	15%	32%	21%
CONTROL #3: Butterflies	91%	95%	97%	98%	90%	94%	63%
#16: feeling like animal	7%	6%	7%	2%	5%	13%	16%
#17: inner voice	17%	15%	14%	14%	25%	32%	53%
#18: bodily transformation	16%	17%	10%	16%	25%	25%	21%
#19: body coming apart	15%	14%	14%	12%	10%	7%	26%
#20: human hallucination	7%	6%	7%	2%	10%	13%	16%
#21: thought insertion	14%	13%	10%	9%	15%	13%	37%
CONTROL #4: Tickle	92%	93%	93%	91%	90%	94%	68%

Briefly, for all subjects, the five most commonly endorsed items were #5 (time perception), #1 (unsure of who I am), #6 (feeling of presence), #4 (sleep paralysis), and #10 (strange face in mirror), after the control items. For healthy controls, the five most commonly endorsed items were #6 (feeling of presence), #4 (sleep paralysis), #5 (time perception), #1 (unsure of who I am), and #17 (inner voice). For SZ patients, the five most commonly endorsed items were #17 (inner voice), #4 (sleep paralysis), #1 (unsure of who I am), #6 (feeling of presence), and #21 (thought insertion).

Please also see Appendix G for an in-depth examination of the performance of each BODI 2 item in different groups, and Chapter 6 to examine these items in comparison to BODI 1 items.

Table 31. *BODI 2 Results by Group (Means and Standard Deviations)*

BODI 2 VARIABLE	**Total N** Mean (S.D.)	**General Adults** Mean (S.D.)	**Healthy Control** Mean (S.D.)	**Low PQ-B** Mean (S.D.)	**Mid PQ-B** Mean (S.D.)	**High PQ-B** Mean (S.D.)	**SZ Patient** Mean (S.D.)
Total Sum	27.7 (30.7)	32.06 (31.12)	17.03 (24.94)	18.79 (18.6)	36.0 (25.7)	61.93 (44.55)	47.84 (49.32)
Endorsements	3.46 (3.54)	3.84 (3.86)	2.41 (3.34)	2.5 (2.6)	4.4 (3.29)	6.87 (4.81)	5.37 (5.05)
Endorsements with Distress	1.38 (1.95)	1.35 (1.87)	0.827 (1.53)	0.79 (1.18)	1.95 (1.60)	4.37 (3.32)	2.30 (2.67)
# Current Endorsements	2.6 (2.9)	2.73 (2.86)	1.11 (1.96)	2.33 (2.66)	2.59 (2.82)	5.0 (4.24)	3.37 (3.89)
Currently Distressing	0.92 (1.47)	0.95 (1.5)	0.36 (0.87)	0.73 (1.26)	0.86 (1.37)	2.6 (2.39)	1.42 (2.06)
Distress	10.5 (11.9)	12.42 (12.93)	6.51 (10.17)	6.53 (6.89)	14.1 (9.74)	25.18 (17.89)	17.68 (17.37)
Frequency	3.7 (4.75)	4.20 (4.73)	1.44 (2.50)	2.01 (2.4)	4.85 (3.97)	8.12 (7.57)	6.53 (8.09)
Vividness	10.1 (11.8)	11.58 (11.70)	6.65 (9.54)	7.62 (7.93)	12.65 (9.84)	21.75 (16.36)	18.26 (19.55)
Control Sum	3.69 (0.68)	3.78 (0.55)	3.79 (0.55)	3.8 (0.39)	3.7 (0.73)	3.87 (0.34)	2.84 (1.11)

Reliability

An internal consistency analysis was conducted in SPSS for the total scores of the 25 items of the BODI 2 using data from all participants (i.e., SZ patients, healthy community controls, and SONA undergraduate participants). Results indicated that Cronbach's α = .867 for BODI 2 would be classified as belonging to the "good" range, and almost nearly bordering on "excellent", according to George and Mallery's (2003) rules. Please see Appendix G for details.

Furthermore, a split-reliability analysis was also performed in SPSS. The BODI 2 was split into two halves, the first with 13 items (Cronbach's α = .759) and the second half with 12 items (Cronbach's α = .759). The correlation between forms was .751, the Spearman-Brown Coefficient was .858, and the Guttman Split-Half Coefficient was .844.

Test-retest reliability was calculated using spearman correlations from the data of 11 participants (seven patients with schizophrenia and four Vanderbilt undergraduates), with an average span of eight weeks between test administrations. Two of the undergraduates were in the low risk group, and two were in the high risk group. Four of the seven SZ patients were in the high range of negative symptoms (after conducting median split on the Z scores of the SANS), and the remaining three SZ patients were in the high range of positive symptoms (via z score median split of the SAPS). Table 32 below details the test-retest reliability calculation for these subjects, and shows how we reached acceptable reliability with this small sample of individuals. Note that the spearman's correlation analysis was conducted on all 11 participants spanning both groups, which is far from ideal, but necessary considering the tiny sample size. We will address this in the discussion section below and improve upon this procedure in future studies of the reliability of the BODI 2.

Table 32. *Test-Retest Reliability for BODI 2 Total Scores in 11 Participants*

Subject ID	Group	Group Specifier	Total (Time 1)	Total (Time 2)	Test – Retest Reliability:
BB43035	SONA	Low Risk	5	0	ρ = .7314 p = .0105*
BB43039	SONA	Risk	6	37	
BB43049	SONA	Risk	78	115	
BB43060	SONA	Low Risk	5	0	
102	SZ	Negative (-)	0	25	
110	SZ	Negative (-)	0	0	
125	SZ	Positive (+)	41	65	
178	SZ	Positive (+)	108	171	
192	SZ	Negative (-)	76	13	
194	SZ	Positive (+)	47	80	
199	SZ	Negative (-)	13	0	

Factor Structure

We decided to divide the BODI 2 items into factors to understand the data better. The first factor analysis is conceptual. We grouped the items based on hypothesized similarity between the constructs that each item represented. The **Dissociative Depersonalization** factor (which will now be called "**BODI 2 DD**" factor) is made up of 7 items: 2, 4, 5, 8, 10, 12, and 21, and yielded Cronbach's α = .73. The **Bodily Self Aberrations** factor (which will now be called "**BODI 2 BS**" factor) is made up of 7 items: 1, 3, 7, 14, 16, 18, and 19, and yielded Cronbach's α = .64. The **Hallucinatory Experiences** factor (which will now be called "**BODI 2 HA**" factor) is made up of 7 items: 6, 9, 11, 13, 15, 17, and 20, and yielded Cronbach's α = .65. The **BODI 2**

Brief, which is made up of the 2 factors BODI 2 DD and BODI 2 BS, yielded Cronbach's α = .814. We combined these two factors together because we think the Hallucinatory Experiences factor is so overlapping with psychotic symptoms that we didn't want to potentially confound analyses between self-disturbances and schizophrenia symptoms (e.g., in our analysis in Study 3), so we designed a brief form of the BODI 2 that didn't contain those items in the event that one might want to parse these factors apart for specific analyses.

Table 33. *BODI 2 Item Score Spearman Correlations (using all BODI 2 subjects N)*

BODI Item	**Total Sum**	**DD Factor**	**BS Factor**	**HA Factor**	**Proposed Factor**
#1: unsure of who I am	.58***	.37***	**.76***	.34***	BS
#2: soul leaves body	.39***	**.42***	.36***	.35***	DD
#3: bodily disconnection	.37***	.31***	**.39***	.35***	BS
# 4: sleep paralysis	.47***	**.58***	.29***	.31***	DD
# 5: time perception	.64***	**.69***	.44***	.39***	DD
CONTROL #1: Headache	.42***	.36***	.33***	.32***	Control
#6: feeling of presence	.63***	.49***	.37***	**.78***	HA
#7: felt like somebody else	.45***	.33***	**.57***	.29***	BS
#8: floating through air	.37***	**.44***	.29***	.27***	DD
#9: doppelganger	.18***	.11	.18	**.32***	HA
#10: strange face in mirror	.54***	**.62***	.35***	.35***	DD
CONTROL #2: Itch	.36***	.34***	.25***	.27***	Control
#11: spiritual being	.38***	.32***	.31***	**.46***	HA
#12: OBE	.46***	**.55***	.27***	.37***	DD
#13: polyopic heautoscopy	.18***	.11	.18	**.23***	HA
#14: bodily disconnection	.36***	.33***	**.38***	.37***	BS
#15: perceptual aberration	.47***	.41***	.31***	**.51***	HA
CONTROL #3: Butterflies	.45***	.41***	.41***	.33***	Control
#16: feeling like animal	.34***	.29***	**.36***	.24***	BS
#17: inner voice	.42***	.33***	.35***	**.57***	HA
#18: bodily transformation	.42***	.32***	**.48***	.26***	BS
#19: body coming apart	.41***	.33***	**.48***	.24***	BS
#20: human hallucination	.31***	.23***	.27***	**.39***	HA
#21: thought insertion	.49***	**.48***	.48***	.43***	DD
CONTROL #4: Tickle	.33***	.23***	.26***	.21	Control
Dissociative Depersonalization (DD)	.88***	--	.57***	.57***	Items 2, 4, 5, 8, 10, 12, 21
Bodily Self Aberrations (BS)	.82***	.57***	--	.49***	Items 1, 3, 7, 14, 16,18,19
Hallucinatory Experiences (BODI 2 HA Factor)	.76***	.57***	.49***	--	Items 6, 9, 11, 13, 15, 17, 20
BODI 2 BRIEF (DD & BS)	.96***	.91***	.85***	.58***	Items 1, 2, 3, 4, 5, 7, 8, 10, 12, 14, 16, 18, 19, 21

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: bolded correlations to show proposed factor;*
Note: each item variable represents total sum of endorsement, frequency, distress, and vividness;
Note: not corrected for multiple comparisons

Please see Table 33 above for Spearman's correlations of the items with the factors and the total scores that helped in the development of these factors, and Table 35 and Appendix G below for Spearman's correlations with these factors and other scales for convergent validity analysis. The factors described above were conceptually created rather that statistically developed. Thus, we decided that a fruitful future direction would be to perform an official factor analysis with this data set to explore potential factors driven by the data and not our hypothesized relationships between the items. In the future, we will do a confirmatory factor analysis with future samples to test the strength of all these proposed factors.

Principal Axis Factor Analysis

We utilized data from all participants for the factor analysis, including SZ patients and healthy controls, since we would like the BODI 2 to be able to be utilized for both clinical and healthy populations. First, a total score per item was calculated by adding the frequency, distress, and vividness scores for each item endorsed, which is comparable to both the EASE ratings (Parnas et al., 2005) and the SELF ratings (Heering et al., 2016). Second, we used SPSS 22.0 to perform an exploratory principal axis factor analysis (PAF) on item total scores of the 21 items (excluding control items) of the BODI 2. We used PAF due to the skewed distribution of the data (Heering et al., 2016; Costello et al., 2005; also see Table 29 and Figure 9 above). Components were only determined to be valid if they had an eigenvalue over one.

Results from our SPSS principal axis factor analysis yielded a Kaiser-Meyer-Oklin value of 0.834 and Bartlett's test of sphericity reached statistical significance ($p < 0.001$), thus providing support for the use of this technique on the correlation matrix of the BODI 2 items. The principal axis factor analysis yielded six factors with eigenvalues over 1, but we will only be discussing the three that best fit the data conceptually. The first factor's eigenvalue was 5.58, explaining 26.6% of the variance. The second factor's eigenvalue was 1.43, explaining 6.8% of the variance. The third factor's eigenvalue was 1.11, explaining 5.2% of the variance. The scree plot below in Figure 10 showed the presence of one larger factor with smaller factors. In order to assist with the interpretation of the proposed factors, oblimin rotation was performed. Table 34 outlines the item factor loadings per factor.

Figure 10. Scree Plot for Principal Axis Factor Analysis of the BODI 2 Items

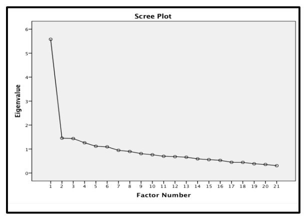


Table 34. *Principal Axis Factor Analysis (using both SZ and HC)*

	Factor 1	Factor 2	Factor 3	Proposed Factor	Conceptual Proposed Factor (described above)
Eigenvalue	5.58	1.43	1.11		
% variance accounted for	26.57	6.8	5.2		
Cronbach's α	.74	.69	.705		
#1: unsure of who I am	**0.362**	**0.518**	0.264	2	BS
#2: soul leaves body	0.293	0.26	**0.369**	3	DD
#3: bodily disconnection	0.276	0.125	**0.521**	3	BS
#4: sleep paralysis	0.191	0.209	0.191	2	DD
#5: time perception	0.322	**0.455**	0.312	2	DD
#6: feeling of presence	0.242	**0.416**	**0.353**	2	HA
#7: felt like somebody else	0.265	**0.576**	0.203	2	BS
#8: floating through air	**0.406**	0.147	0.337	1	DD
#9: doppelganger	0.294	0.067	**0.329**	3	HA
#10: strange face in mirror	0.195	**0.581**	0.263	2	DD
#11: spiritual being	**0.57**	0.181	**0.417**	1	HA
#12: (Sober) OBE	**0.304**	0.237	0.293	1	DD
#13: polyopic heautoscopy	0.165	0.123	0.137	1	HA
#14: bodily disconnection	0.283	0.194	**0.689**	3	BS
#15: perceptual aberration	**0.543**	0.319	0.345	1	HA
#16: feeling like animal	0.156	**0.46**	0.186	2	BS
#17: inner voice	**0.497**	0.252	**0.655**	3	HA
#18: bodily transformation	**0.382**	0.267	0.281	1	BS
#19: body coming apart	**0.6**	0.187	0.182	1	BS
#20: human hallucination	0.199	0.255	**0.594**	3	HA
#21: thought insertion	**0.704**	**0.442**	**0.373**	1	DD

Note: items in bold when loadings over .35

The first factor ("**<u>BODI 2 Factor 1</u>**") is made up of eight items, including items 8 (floating through the air), 11 (spiritual being), 12 (sober OBE), 13 (polyopic heautoscopy), 15 (perceptual aberration), 18 (bodily transformation), 19 (body coming apart), and 21 (thought insertion), representing experiences that are common to individuals who have TPJ abnormalities.

The second factor ("**<u>BODI 2 Factor 2</u>**") is made up of seven items, including items 1 (unsure of who I am), 4 (sleep paralysis), 5 (time perception), 6 (feeling of presence), 7 (felt like somebody else), 10 (strange face in mirror), and 16 (feeling like an animal), representing disturbances in the sense of self, particularly abnormalities in the constant and stable experience of the self, and thus might be best described as "Unstable Self Experiences."

The third factor ("**<u>BODI 2 Factor 3</u>**") is made up of six items, including number 2 (soul leaves the body), 3 (bodily disconnection), 9 (doppelganger), 14 (bodily disconnection), 17 (inner voice), and 20 (human hallucination), representing disturbances in the bodily sense of self and possibly depersonalization experiences that may border on the psychotic edge of reality.

The three factors of the BODI 2 revealed acceptable internal consistency: Cronbach's α = 0.74 for Factor 1, 0.69 for Factor 2, and 0.705 for Factor 3, with a positive correlation between Factor 1 and Factor 2 ($\rho = 0.634$, $p < .0001$), a positive correlation between Factor 1 and Factor 3 ($\rho = 0.462$, $p < .0001$), and a positive correlation between Factor 2 and Factor 3 ($\rho = 0.41$, $p < .0001$). These factors will be evaluated for their convergent and discriminant validity in the sections below. Please see Table 35 below for spearman's correlations between all the proposed factors and brief form of the BODI 2. As one can see, all the proposed factors have very strong relationships with each other, with the Factor 2 and Brief having the strongest, and Factor 2 and Factor 3 having the weakest relationship.

Table 35. *Spearman's Correlations among Conceptual and PAF Factors of the BODI 2*

	DD Factor	BS Factor	HA Factor	Brief (BS, DD)	Factor 1	Factor 2	Factor 3
DD Factor							
BS Factor	.56***						
HA Factor	.57***	.47***					
Brief (BS + DD)	.89***	.84***	.57***				
Factor 1	.61***	.64***	.54***	.71***			
Factor 2	.85***	.77***	.66***	.93***	.63***		
Factor 3	.56***	.46***	.67***	.55***	.46***	.41***	

*** $p<.001$; ** $p < .01$; * $p < .05$; † $p < .1$; *Note: not corrected for multiple comparisons*

BODI 2 Spearman's Correlations with Other Measures: Validity Analysis

BODI 2 scores were strongly positively correlated with many other measures of schizophrenia-spectrum symptoms and dissociative experiences, in addition to scales that have had overlapping item content removed for this analysis not to be biased, as can be seen in Figure 11 below and in further detail in Appendix G.

For SZ patients, total BODI 2 scores were positively correlated with positive symptoms (SAPS scores; $\rho = 0.67$, $p < .01$) and inversely correlated with negative symptoms (SANS scores; $\rho = -0.59$, $p < .05$). Antipsychotic dosage was unrelated to any of the BODI 2 variables ($p > .1$).

For healthy adults, BODI 2 total scores were strongly correlated with prodromal risk in the undergraduate sample. BODI 2 total scores were also positively correlated with total scores on the Schizotypal Personality Questionnaire, Dissociative Experiences Scale-II, Temporal Lobe Scale, Perceptual Aberration Scale, Hypomanic Personality scale, and SELF scale (p <.05). These significant relationships remained after using Bonferroni's correction for multiple comparisons, with the exception of the Hypomanic Personality Scale. BODI 2 total scores were unrelated to scores on the Physical Anhedonia Scale.

Figure 11. Spearman's Correlations with BODI 2 Total Sum

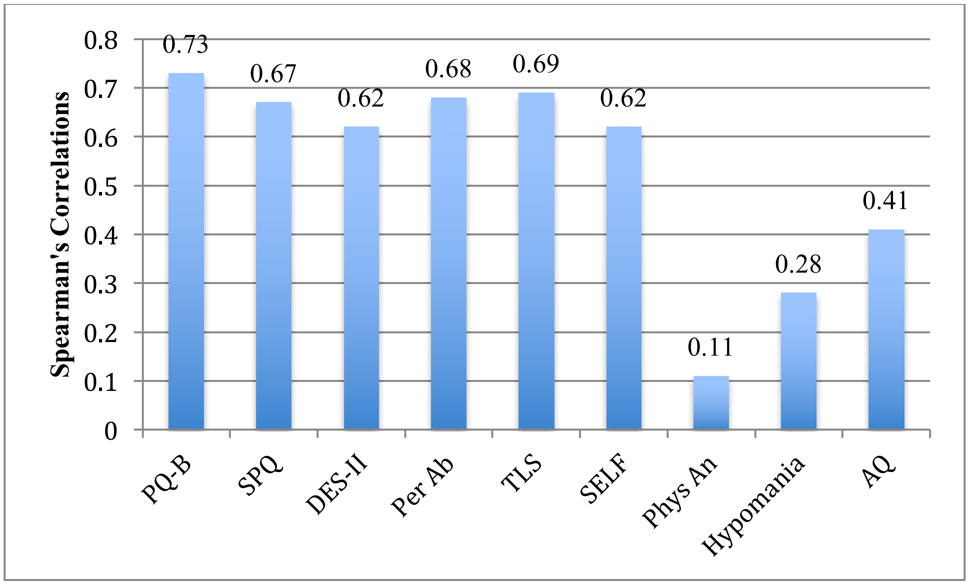
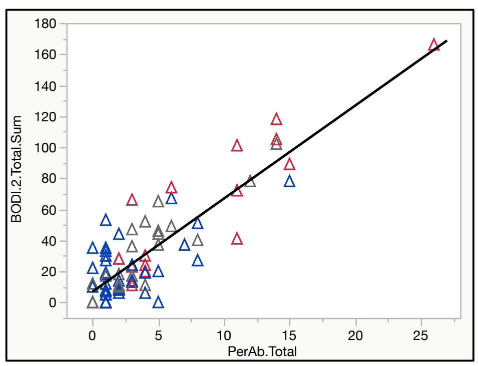


Figure 12. Perceptual Aberration Total Scores and BODI 2 Total Scores



Note: significant relationship remained after outlier removed;
Blue triangles = Low PQ-B Distress group;
Gray triangles = Mid PQ-B;
Red triangles =High PQ-B Distress Group

Unexpectedly, total BODI 2 scores were positively correlated with total AQ scores. However, this relationship between AQ and BODI 2 diminished after controlling for SPQ (Pearson partial correlation r = -0.074, p = 0.52), which has been found to be related to AQ scores in the literature (e.g., Aaron et al., 2015, among many others). It should also be noted that only two participants scored high enough on the AQ (over 32) to qualify as a "high AQ" subject.

The findings above for the BODI 2 Total variable were relatively similar to all the other BODI 2 variables, as can be seen in Appendix G. The BODI 2 control scale was not significantly related to any of the convergent validity scales ($p > .05$), but approached trending significant positive relationship with the DES-II total scale and DES-II Absorption scale ($p < .1$), which did not survive multiple comparisons correction.

In Appendix G below please also find the convergence validity correlation analyses between the individual items and the other measures to get a sense for how these items are related to distinct but similar measures commonly used in this area of research. Many items are positively correlated with our measures of convergent validity. Some items are very weakly related to any of the other measures, including #4 sleep paralysis, #9 doppelganger, #12 OBE, #13 polyopic heautoscopy, #16 feeling like an animal, and #19 body coming apart. It should also be noted that many of the control items were positively related to our measures of convergent validity as well (e.g., headache and PQ-B, SPQ, Perceptual Aberration, DES-II, TLS; $p < .05$), which was unpredicted and will be discussed below.

Finally, the correlations between the proposed factors and measures of convergent validity are outlined below in Appendix G. It looks like our six proposed factors are strongly positively correlating with the measures we expect them to be related to, with a few exceptions, including not as many correlations with the SELF, which may be yielding lower values due to decreased power since the SELF was completed by far fewer participants than the other measures. Further, our factors were unrelated to our measures of divergent validity, including the physical anhedonia scale, or at least less strongly related to these measures than the convergent validity measures (such as the DES-II).

Group Differences

Please see Table 36 below for the medians of all the BODI 2 variables in all populations sampled in the current study. The data showed a lot of zeros for individual item medians.

Table 36. *BODI 2 Medians by Group*

BODI 2 VARIABLE	Total N	General Adults	Healthy Control	Low PQ-B	Mid PQ-B	High PQ-B	SZ Patient
#1: unsure of who I am	0	0	0	0	0	10.5	0
#2: soul leaves body	0	0	0	0	0	0	0
#3: bodily disconnection	0	0	0	0	0	0	0
#4: sleep paralysis	0	0	0	0	0	4	0
#5: time perception	0	0	0	0	3	8	0
Control #1: Headache	8	8	5	7	9	11	10
#6: feeling of presence	0	0	0	0	6.5	7	0
#7: felt like somebody else	0	0	0	0	0	6.5	0
#8: floating through air	0	0	0	0	0	0	0
#9: doppelganger	0	0	0	0	0	0	0
#10: strange face in mirror	0	0	0	0	0	6.5	0
Control #2: Itch	7	8	6	7	8.5	10.5	7
#11: spiritual being	0	0	0	0	0	0	0
#12: OBE	0	0	0	0	0	0	0
#13: polyopic heautoscopy	0	0	0	0	0	0	0
#14: bodily disconnection	0	0	0	0	0	0	0
#15: perceptual aberration	0	0	0	0	0	0	0
Control #3: Butterflies	8	8	6	7	8.5	9	6
#16: feeling like animal	0	0	0	0	0	0	0
#17: inner voice	0	0	0	0	0	0	1
#18: bodily transformation	0	0	0	0	0	0	0
#19: body coming apart	0	0	0	0	0	0	0
#20: human hallucination	0	0	0	0	0	0	0
#21: thought insertion	0	0	0	0	0	8	0
Control #4: Itch	0	7	5	7	6	7	5
Total Sum	18	19	4	13	36.5	53.5	25
Endorsements	2	3	1	2	4	5.5	3
Distressing End.	1	1	0	0	2	5	1
# Current End.	2	2	0	1	3	4.5	2
Currently Dis.	0	0	0	0	1	3	1
Distress	7	7	1	1	5	5	10
Frequency	2	2	0	1	13	23	3
Vividness	6	6	1	5	10.5	17	9
Control Sum	4	4	4	4	4	4	3
DD Factor	8	8	.5	6	11.5	20.5	10
BS Factor	6	7	0	4	9	20.5	11
HA Factor	4	4	0	3	10	10	9
Brief: DD+BS	14	15	1.5	11	19.5	28.5	20
Factor 1	0	0	0	0	4	7.5	7
Factor 2	13	14	2	9	18	34.5	17
Factor 3	0	0	0	0	0	9.5	9

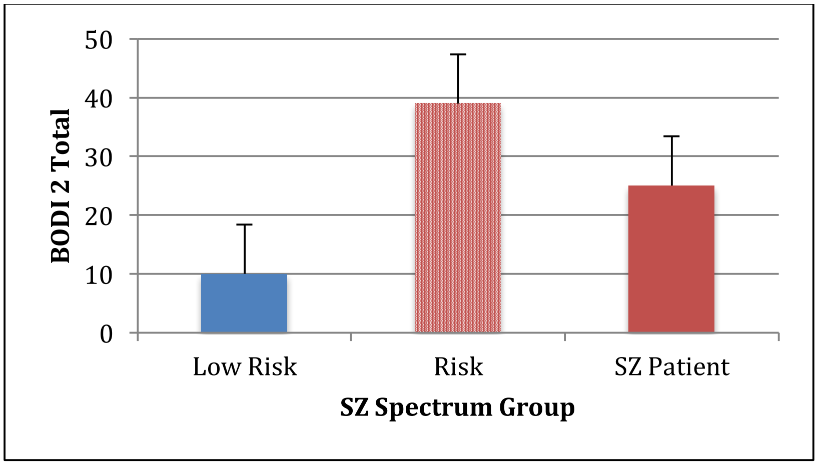
As predicted, patients with schizophrenia scored higher than controls on total BODI 2 scores ($U = 134$, $p = 0.004$, $r = 0.44$). SZ patients endorsed more BODI 2 items than HC, reported greater frequency of the BODI 2 items, more distress associated with the BODI 2 items, and more vivid recollection of the BODI 2 item experiences ($p < .05$). Also as predicted, patients with schizophrenia had higher levels of distressing BODI 2 experiences than healthy controls in general, more current levels of BODI 2 experiences, and more currently distressing BODI 2 experiences than healthy controls ($p < .05$). Unexpectedly, healthy controls scored higher on the BODI 2 control items that consisted of normal bodily sensations such as headaches, itching, tickling, and butterflies in the stomach ($U = 141$, $p = 0.001$, $r = 0.28$). Please see Appendix G for further details of the group differences between SZ and HC on the BODI 2 items and subscales.

Psychosis Risk Groups

Individuals in the High PQ-B distress group scored significantly higher than those in the Low PQ-B distress group on total scores of the BODI 2 ($U = 108$, $p <.0001$, $r = 0.52$). There were no differences between risk group son the BODI 2 control scale ($U = 323$, $p = 0.582$, $r = 0.07$). Please see Appendix G for more details.

Finally, when comparing SZ patients, individuals at risk, and individuals at low risk, we also found differences in the BODI 2 total scores ($\chi^2_{(2)} = 22.3$, $p <.0001$). Surprisingly, however, the risk group scored the highest on the BODI 2, with a median of 39, SZ median of 25, and low risk median of 10. The difference between SZ patients and risk group was not significantly different however ($U = 349$, $p = .301$, $r = .13$). Please see Appendix G for more details on the differences among these three groups on the BODI 2 items.

Figure 13. BODI 2 Total Scores by SZ Risk Group



BODI 2 Distress Groups

Since we hypothesized that the distress associated with BODI 2 endorsements was important for distinguishing between SZ-spectrum participants and healthy controls, we decided to create three groups based on how many distressing endorsements an individual made on the BODI 2. The "low" BODI 2 distressing endorsement group was made up of individuals that scored zero distressing endorsements on the BODI 2. The "mid" BODI 2 distressing endorsement group was made up of individuals that scored between one and five distressing endorsements on the BODI 2. The "high" BODI 2 distressing endorsement group was made up of individuals that scored over five distressing endorsements on the BODI 2. These cut points were created after looking at the distribution of the BODI 2 distress sum scores. These three BODI 2 distress groups were matched for all demographic variables, including age, education, sex, race, handedness, and Edinburgh laterality (p >.1).

For predicting SZ spectrum risk group status, these three BODI 2 distress groups were significant in their classification accuracy ($\chi^2_{(2)}$=17.6, p <.0001) with a likelihood ratio of 13.9. For predicting High PQ-B status, these three BODI 2 distress groups were significant in their classification accuracy ($\chi^2_{(2)}$=27.6, p <.0001) with a likelihood ratio of 21.13.

Furthermore, when looking at all participants who have completed the BODI 2, we created three groups based on risk: (1) healthy controls; (2) individuals at risk for psychosis, due to high PQ-B scores, high SPQ scores, or family history of a psychotic disorder; or (3) confirmed schizophrenia or schizoaffective disorder diagnosis. For predicting risk group status, the three BODI 2 distress groups were significant in their classification accuracy ($\chi^2_{(3)}$=51.9, p<.0001) with a likelihood ratio of 47.6.

Sensitivity & Specificity

After conducting Binary Logistic Regression analyses in SPSS, ROC curve analyses were conducted in SPSS to determine levels of sensitivity and specificity BODI 2 scores in determining SZ status, Risk status, High PQ-B status, High SPQ status, and High DES-II status (see Table 37 below for details). BODI 2 total scores were also useful in determining Low PQ-B status when the direction was turned in the opposite direction (area under the curve = .777, p <.0001), and similarly for Low SPQ status (area under the curve = .825, p <.0001).

Figure 14. ROC Curve Showing BODI 2 Total scores Determining High PQ-B Status

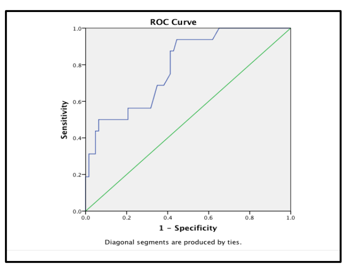


Table 37. *ROC Curve Data for BODI 2 Total Scores to Determine Risk Status Outcomes*

Status Outcome	Area Under the Curve	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
BODI 2: SZ Status	.626	.073	.067†	.483	.769
BODI 2: Risk Status	.766	.038	<.0001*	.691	.840
BODI 2: High PQ-B	.790	.059	<.0001*	.674	.906
BODI 2: High SPQ	.873	.055	<.0001*	.766	.981
BODI 2: High DES-II	.878	.073	.005*	.735	1.00

**p < .05; † p<.1; Note: not corrected for multiple comparisons*

BODI 2 total scores were not as useful in determining SZ status (area under the curve = .626, p = .067) as we had predicted. However, similar null results were found for the SELF measure as well (area under the curve = .630, p = .280). Furthermore, we found that other BODI 2 variables were more helpful in determining SZ status than total status, as can be seen below in Table 38. The best BODI 2 variables for determining agreement with SZ status classification are the Distressing Endorsements sum, HA factor, and Factor 3 for determining SZ status. Further, it is notable that all of the BODI 2 variables above are significant with the exception of the Factor 1 for agreement with High PQ-B status outcome, as can be seen in Table 39 below.

Table 38. *ROC Curve Data for BODI 2 Variables Determining SZ Status Outcome*

Variable	**Area Under the Curve**	**Std. Error**	**Asymptotic Sig.**	**Asymptotic 95% Confidence Interval**	
				Lower Bound	**Upper Bound**
Total	.626	.073	.067†	.483	.769
Distress Sum	.628	.073	.063†	.485	.770
Distressing End. Sum	.682	.062	.008*	.562	.803
Current Dist. End.	.586	.069	.211	.452	.720
DD Factor	.561	.078	.375	.407	.715
BS Factor	.626	.070	.067†	.489	.763
HA Factor	.666	.071	.016*	.526	.805
Brief (BS, DD)	.600	.075	.147	.452	.747
Factor 1	.635	.071	.050†	.496	.774
Factor 2	.547	.070	.491	.410	.684

Table 39. *ROC Curve Data for Variables Determining High PQ-B Status Outcome*

Variable	**Area Under the Curve**	**Std. Error**	**Asymptotic Sig.**	**Asymptotic 95% Confidence Interval**	
				Lower Bound	**Upper Bound**
BODI 2 Total	.790	.059	<.0001*	.674	.906
BODI 2 Distress Sum	.805	.058	<.0001*	.691	.920
BODI 2 Distressing End	.801	.066	<.0001*	.672	.930
BODI 2 Cur. Dist. End.	.789	.067	<.0001*	.657	.920
BODI 2 DD Factor	.748	.080	.002*	.591	.905
BODI 2 BS Factor	.796	.067	<.0001*	.666	.926
BODI 2 HA Factor	.684	.075	.024*	.537	.831
BODI 2 Brief (BS, DD)	.782	.066	.001*	.652	.911
BODI 2 Factor 1	.614	.082	.161	.453	.775
BODI 2 Factor 2	.803	.060	<.0001*	.684	.921
BODI 2 Factor 3	.734	.074	.004*	.590	.879
DES-II Total	.749	.064	<.0001*	.624	.873
OBE Frequency	.643	.068	.028*	.509	.776

**p < .05; † p<.1; Note: not corrected for multiple comparisons*

After examining the coordinates of the ROC curve, we calculated cut-off scores that would yield the best sensitivity and specificity for determining High PQ-B scores among healthy participants, as one can see in Table 40 below. We conducted analyses on the BODI 2 Total 22 cutoff score to determine how helpful it is in classifying High Risk participants. 55% of all subjects were below 22, and 45% were above 22. 53% of SZ patients scored above 22, 82% of participants at risk scored above 22, and 37% of individuals at low risk scored over 22, and this Chi-Square test was significant ($\chi^2_{(2)}$= 30.304, p = 0.001). Further, when looking more specifically at PQ-B groups, 88% of the High PQ-B distress group scored above 22 on the BODI 2 Total score, while only 12% scored below 22, and this Chi-Square test was also significant ($\chi^2_{(1)}$= 10.2, p = 0.001).We also conducted analyses on the BODI 2 Distress Sum 8 cutoff score to determine how helpful it is in classifying High Risk participants. 54% of all subjects were below 8, and 45% were above 8 on the distress sum. 53% of SZ patients scored above 8, 82% of participants at risk scored above 8, and 38% of individuals at low risk scored over 8, and this Chi-Square test was significant ($\chi^2_{(2)}$= 29.2, p = 0.001). Further, when looking more specifically at PQ-B groups, 94% of the High PQ-B distress group scored above 8 on the BODI 2 Distress sum score, while only 6% scored below 8, and this Chi-Square test was also significant ($\chi^2_{(1)}$= 13.3, p <.001). Please see Table 40 below for the details on the remaining cutoff score options.

Table 40. *Classification Accuracy of BODI 2 Scores versus High PQ-B Distress Group Status (High Risk)*

Cutoff Scores	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**LR**	$\chi^2_{(1)}$	***Fisher's Exact Test***
Total ≥ 22	88%	57%	34%	94.7%	11.3	10.2 (p = .001*)	p =.001*
Distress ≥ 8	94%	57%	36%	97%	15.7	13.3 (p <.0001*)	p <.0001*
End with Distress ≥ 2	63%	70%	35%	88%	5.6	5.74 (p = .017*)	p =.022*
Curr. Dis. End. ≥1	88%	56%	33%	95%	9.5	9.5 (p = .002*)	p =.002
Brief ≥17	69%	65%	33%	89%	5.9	6.0 (p = .014*)	p =.022
BS Factor ≥11	81.3%	74.6%	45%	94%	17.0	17.13 (p <.0001*)	p <.0001*
Factor 2 ≥ 15	81.3%	57.1%	33%	92%	8.1	7.5 (p = .006*)	p =.010*
Factor 3 ≥ 6	68.8%	73%	39%	90%	9.4	9.73 (p = .002*)	p =.003*

**p < .05; † p<.1; Note: PPV = positive predictive value; NPV = negative predictive value; LR = likelihood ratio*

Based on these results presented in Table 40, we believe the BODI 2 Bodily Self Aberration Factor cutoff at 11 might serve as our most useful cutoff point, particularly due it's very large likelihood ratio, and the fact that it has the highest specificity value of the variables assessed above. However, if one were looking to maximize sensitivity, then the cutoff score of 8 on the BODI 2 distress variable would be most appropriate. We will examine other variables with these cutoff scores, in addition to the BODI 2 distress group described earlier, in Study 3 when we look at the Pinocchio Illusion.

Discussion

The major aim of Study 2B was to further develop a self-report inventory designed to quantify out-of-body experiences (OBEs) and related dissociative bodily-self experiences in both clinical and healthy populations (the BODI 2). We assessed internal consistency, split-half reliability, test-retest reliability, convergent validity analyses, divergent validity analyses, generated ROC curves to help clarify sensitivity and specificity for predicting SZ-spectrum outcomes with scores on the BODI 2, and identified cut off scores to be tested in future samples. Further, we conducted two factor analyses, one conceptual and one exploratory, to help analyze the data better. We look forward to confirming the utility of these factors and cutoff scores in future studies. Finally, we used the BODI 2 to look at the relationship between anomalous self-disturbances across the schizophrenia-spectrum.

Reliability

The BODI 2 had adequate internal consistency and split-test reliability. Our test-retest reliability was extremely small (N = 11), and thus although we reached acceptable reliability, we need to continue to collect repeat test administration data from our sample of SZ patients and healthy controls in order to test this aspect of reliability for the BODI 2. Furthermore, it would be very important to see how BODI 2 scores change as a function of symptom fluctuations, mood episodes, stress, and possibly by antipsychotic medication type (i.e., typical vs. atypical) and dosage (because, although we did not determine a relationship between CPZ and BODI 2 scores here, this could have been due to the small sample size in the Spearman's correlation analysis). It is still an open and interesting question to determine how sense of self responds to changes in mood, light (e.g., seasonal psychosis and mood episodes), and dopaminergic activity fluctuations.

Factor Structure

We conducted two factor analyses on the BODI 2 data. The first was conceptually driven and represented what the authors thought the individual items would be grouped together in the data. The second was exploratory and yielded different factors altogether statistically. Confirmatory factor analysis will be helpful in the future to assess utility of these factors in different samples. Nonetheless, we assessed these six factors with the current data and looked at how they were related to one another and other measures of dissociative experiences and psychosis proneness. It looks like the conceptually developed "Bodily Self Aberration (BS)" factor might be the most helpful in terms of predicting anomalous self experiences that might put someone at risk for psychosis, or at least help classify those as being in the psychometric high group for psychosis proneness. ROC curves and subsequent sensitivity and specificity cutoff scores were generated for these factors, as well as the other BODI 2 variables, and it looks like the BS factor cutoff at 11 might have the best balance of sensitivity, specificity, positive predictive value and negative predictive value in classifying high PQ-B distress grouping among healthy controls.

Validity

Many of the BODI 2 items were positively correlated with our measures of convergent validity. Some items were very weakly related to any of the other measures, however, including #4 sleep paralysis, #9 doppelganger, #12 OBE, #13 polyopic heautoscopy, #16 feeling like an animal, and #19 body coming apart. It should also be noted that many of the control items were positively related to our measures of convergent validity as well, which was unpredicted.

BODI 2 scores were strongly positively correlated with many other measures of schizophrenia-spectrum symptoms and dissociative experiences, in addition to scales that have had overlapping item content removed, including DES-II, TLS, Perceptual Aberration Scale, PQ-B, and SPQ. Further, BODI 2 scores were not related to scales that they should not be related to, including the physical anhedonia scale, and thus we achieved both convergent and divergent validity for the BODI 2 in the current sample.

As predicted, for SZ patients, total BODI 2 scores were positively correlated with positive symptoms (SAPS scores), replicating the finding that bodily self-disturbances and psychotic symptoms are related. As predicted, antipsychotic dosage was unrelated to any of the BODI 2 variables, indicating either that bodily self-disturbances are not related to antipsychotic medication, that self-disturbances are resistant to medication, or simply that our sample size was too small and variable to accurately detect such a relationship. Thus, repeating this analysis with a larger sample and a smaller variance in the CPZ equivalent variable would be helpful to address this question in the future.

Total BODI 2 scores were inversely correlated with SANS scores in SZ patients, which contrasts with the result above for BODI 1, in which there was not a statistically significant relationship with SANS scores. This could be due to a difference in negative symptom severity among the participants, or we could have inadvertently recruited more predominantly negative SZ patients during the testing for the BODI 2. This will be examined more carefully for future studies and we will try to obtain a more balanced sample of SZ patients to determine if there is in fact a robust negative relationship between self-disturbances and negative symptoms, or if this finding is simply an artifact of a skewed sample of negative symptoms in this particular sample of SZ patients.

BODI 2 total scores were strongly positively correlated with prodromal risk in the undergraduate sample. Specifically, BODI 2 total scores and PQ-B total scores were strongly positively correlated, as well as BODI 2 total scores and PQ-B endorsements, BODI 2 total scores and PQ-B distress, BODI 2 total scores with PQ-B frequency, and BODI 2 total scores and PQ-B endorsements with distress, confirming predictions and replicating Study 2A with a brand new sample of participants. These findings also provide more evidence for relationship between bodily self-disturbance and prodromal psychosis symptomatology.

BODI 2 total scores were also correlated with total SPQ scores, SPQ cognitive-perceptual factor scores, SPQ interpersonal factor scores, and SPQ disorganized factor scores. These findings provide evidence for convergent validity with a well-established schizophrenia-spectrum scale that is widely used in research on individuals in the general population.

BODI 2 total scores were positively correlated with total scores on the dissociative experiences scale (DES-II), DES-II Amnesia factor, DES-II Depersonalization factor, DES-II Absorption factor, and the pathological 8 “DES Taxon” scores. Since the DES-II is currently the gold standard self-report measurement for quantifying dissociative experiences in both clinical and healthy populations, this strong correlation between the BODI 2 and the DES-II and all of its variables is definitely good news for the convergent validity of our scale.

Similarly, BODI 2 total scores were strongly correlated with scores on the SELF, which also provides excellent convergent validity evidence for our new scale. Specifically, the SELF was correlated with total BODI 2 scores (and all of the overarching variables, such as distress sum, frequency, vividness, and so on), as well as four out of the six proposed BODI 2 factors, including the Bodily Self Aberration Factor, the Hallucinatory Experiences Factor, and Factor 3 from the exploratory Principal Axis Factor analysis, which contains items that represent disturbances in the bodily sense of self that may sometimes border on psychotic severity. However, the SELF was not significantly related to the conceptually developed Dissociative Depersonalization Factor, nor the Factor 1 from the PAF (which represents experiences that are common to people who exhibit TPJ abnormalities), and only reached trending level significance in the positive correlation with the Factor 2 from the PAF (which represents items that portray disturbances in the sense of self, particularly abnormalities in the constant and stable experience of the self). Thus, importantly, there is space for both of these scales to be useful in the research world of self-disturbances in schizophrenia-spectrum populations, as the SELF captures abstract and cognitive self-disturbances, and the BODI 2 captures bodily self-disturbances and concurrent dissociative experiences and resultant perceptual aberrations pertaining to the bodily self.

BODI 2 total scores were positively correlated with Temporal Lobe Scale, providing convergent evidence for similarity of scale content, and also provides support for the consideration of temporal lobe lability in connection with bodily self disturbance, which fits with the literature on the localization of hyperactivity and general structural abnormalities in the TPJ for the development and persistence of out-of-body experiences (e.g., Blanke et al., 2004; Blanke et al., 2005). Indeed, the TLS was significantly positively correlated with the Factor 1 from the BODI 2 PAF, which is hypothesized to represent items that are common in people with TPJ abnormalities, including the sober OBE item (i.e., the item that directly asks about OBE's, and instructs participants to only endorse the item during times when they were not under the influence of substances).

BODI 2 total scores were positively correlated with Perceptual Aberration Scale, providing convergent validity with an established scale utilized to quantify abnormal bodily perceptions as a symptom of psychosis proneness in the general population. Further, since 28 of the 35 items were specifically designed to quantify bodily self aberrations, this strong positive relationship with the Perceptual Aberration Scale is extremely good support for the development of the BODI 2 validity in the literature. It would be beneficial to look at the 28 items of the Perceptual Aberration Scale in particular to address convergent validity with the BODI 2 in the future. Indeed, the total scale of all 35 items from the Perceptual Aberration Scale was positively correlated with 20 of the 25 BODI 2 items, excluding only the items about sleep paralysis, meeting one's doppelganger, polyopic heautoscopy (which was trending), the feeling that that one's body is coming apart (which was surprising actually), and the tickle control item at the end.

BODI 2 total scores were positively correlated with the Hypomanic Personality scale, providing support for the relationship between bodily self-disturbances in the schizophrenia-spectrum, but not divergent evidence for the BODI 2, or showing that it is specific to the SZ-spectrum. It would be good to test patients with Bipolar Disorder with the BODI 2 in the future to test this question more rigorously.

Unexpectedly, total BODI 2 scores were positively correlated with total AQ scores, and thus failing to provide divergent validity evidence in favor of the BODI 2's specificity for the schizophrenia-spectrum. However, when controlling for SPQ, the relationship between AQ and

BODI 2 diminished significantly. The AQ total score was significantly related to the Dissociative Depersonalization Factor, the Bodily Self Aberration Factor, Factor 1 (TPJ), Factor 2 (Unstable Self), but did not reach significance in its relationship with Factor 3 or the Hallucinatory Experiences Factor, both of which are more related to symptoms that border on psychotic severity of self-disturbances. Thus, the current results suggest that non-psychotic anomalous bodily self-experiences are positively related to autism spectrum traits, providing evidence for overlap between dissociative experiences and ASD, but likely mediated by the relationship between ASD traits and schizotypal personality traits. These results also contribute evidence for the overlap between the autism spectrum and the schizophrenia-spectrum, in addition to the similarities that both populations exhibit abnormalities in multisensory processing and sense of self. However, it is my understanding that individuals on the autism spectrum are typically in opposition with those with SZ in terms of self-disturbances (e.g., Noel et al., 2017), and thus this positive relationship between the BODI 2 and the AQ is not clear in its meaning at this time. Future work should look at this relationship carefully, and perhaps recruit more individuals with high levels of ASD traits (as only two of our participants qualified as having "High AQ" scores in the current dissertation; see Study 3 below), and contrast those individuals with the participants who are at psychometric risk for psychosis.

As predicted, BODI 2 total scores were unrelated to scores on the Physical Anhedonia Scale, providing discriminant validity for the BODI 2 since the Physical Anhedonia Scale aims to quantify negative symptoms of schizotypy, and thus this suggests that the BODI 2 is more specific than simply capturing all facets of psychosis-proneness, or psychopathology in general, in healthy populations. Further, since many of the physical anhedonia scale questions deal with bodily pleasure, this is another reason why we needed to diverge from the scale. The BODI 2 isn't about all bodily experiences, only about strange bodily self experiences (with the exception of the control items, of course).

As a whole, the BODI 2 control scale was unrelated to any of the convergent validity measures. The only two scales the BODI 2 control scale was somewhat related to was the DES-II total score, which seems to have been driven by the trending relationship between the BODI 2 control scale items and the DES-II absorption scale. Since the more relevant DES-II subscale for the current purposes, the DES-II depersonalization scale, was hardly related to the BODI 2 control scale at all, a possible confounding relationship between DES-II absorption and BODI 2 control items is not a concern for us.

Nevertheless, it is certainly an unexpected finding that so many of the control "normal" bodily items significantly positively correlate with other measures of dissociative experiences. One possibility is that individuals who are more prone to dissociate are also more prone to somaticize, and perhaps be more distressed by their frequent bodily sensations, which may be driving these correlations. This can certainly be seen by the Tewksbury Hospital case study described in Appendix K below, and is supported by the literature as well (e.g., van der Kolk et al., 1996). Thus, this trending relationship between absorption and suggestibility of somatic concerns could be considered a replication of the relationship between dissociative absorption and somatization in the general adult population.

Group Differences

As predicted, SZ patients scored higher on the BODI 2 scale compared to healthy controls. High risk controls scored higher on the BODI 2 scale compared to lower risk controls. There was a significant difference between SZ patients, high risk, and low risk controls, but the high risk group actually scored higher than the SZ patients, although this difference was not statistically significant. This trending difference between risk group and SZ patients could be due to a number of reasons, including 1) strong negative symptoms in the current SZ sample could have been diminishing the current BODI 2 scores; 2) bodily self-disturbances are more frequent, distressing, and vivid in young people high at risk for psychosis compared to patients who have been diagnosed with a psychotic illness for most of their adult life, and perhaps have grown accustomed to such experiences and are not as distressed by them anymore. Finally, this could be an effect of the fact that the high group is not medicated with antipsychotics, which could be diminishing the prevalence of dissociative self-experiences in the SZ group even though we did not find a relationship between CPZ equivalents and BODI 2 scores. The possibility that high risk group score higher than actual diagnosed patients on the BODI 2 will need to be examined again in the future with an independent sample of patients and high risk adults, preferably matched for demographic characteristics.

Unexpectedly, healthy controls scored higher on the BODI 2 control items that consisted of normal bodily sensations such as headaches, itching, butterflies in the stomach, and tickling. Indeed, we unfortunately had to exclude four SZ patients for not meeting the criteria of endorsing at least one control item. It is possible that our SZ patient population might have wanted to underreport these symptoms as they are familiar with the lab's policy that participants must not meet criteria for neurological disorders, and perhaps they thought that these items were somehow trying to capture such a vulnerability to medical complications. However, this is entirely speculation. The more convincing hypothesis for this unexpected difference actually makes quite a bit of sense now after substantial consideration. Patients with schizophrenia exhibit abnormal processing of their own bodily signals, which takes the form of increased pain insensitivity (Fishbain, 1982; Rosenthal et al., 1990; Dworkin, 1994; Singh et al., 2006), reduced tactile sensitivity (Lenzenweger, 2000; Chang & Lenzenweger, 2004; Chang & Lenzenweger, 2005), altered proprioception (Thakkar et al., 2011; Michael & Park, in preparation), and interoceptive deficits (Dawson et al., 2010; Lewis et al., 2001; Ellis & Lewis, 2001; Roux et al., 2010; Williams et al., 2007), which could possibly account for the observed difference in control items among groups. Since SZ patients are hypothesized to have abnormal sense of bodily self, it is also likely that they are less likely to experience "normal" bodily sensations at the same time as being more prone to abnormal and distressing bodily symptoms. Since SZ patients and those at risk for psychosis report greater levels of alexithymia (e.g., Van't Wout et al., 2007; Aaron et al., 2015), an interesting future direction would be to examine levels of alexithymia with interoception and bodily self disturbances in schizophrenia, autism, and healthy matched controls. However, it is odd that so many people from the same group wouldn't even endorse having a headache at least once in their lifetime. This points to a possibility of SZ patients misunderstanding the instructions as well, which needs to be recognized and rectified in the future if this is determined to be the case.

Interestingly, and importantly, there was no difference among PQ-B distress groups on the BODI 2 control scale, which is in contrast to the group difference seen between SZ patients and healthy controls.

Sensitivity & Specificity

Our analyses above show that 1) distress, and 2) items from the Bodily Self Aberration Factor, helps in adding sensitivity and specificity to the BODI 2 measure in predicting both SZ status and High PQ-B risk in the current sample. We will examine other variables with this cutoff score in Study 3 when we look at the Pinocchio Illusion.

Limitations & Future Directions

Results of the current study should be considered in light of several potential limitations. First, BODI 2 scores were significantly different across races, and we encountered difficulties trying to control for race while using nonparametric methods (e.g., unable to control for race in Mann-Whitney U tests). We need to continue to match for race in the future when comparing groups, although this may have been an unusual sample since the BODI 1 was unrelated to race in Study 2A. Further, we may take this to be a marker of cultural differences in self-disturbances, which we are currently examining, as described next in Chapter 6.

Second, it is unfortunate that our “general adult” category is mostly Vanderbilt undergraduates. It will be helpful to collect data on more diverse populations to establish norms in the future, which is happening right now around the world (see Chapter 6 next).

Third, we made a lot of multiple comparisons here, particularly in the correlation section when we were trying to establish convergent validity. Everything we reported here was ad hoc with the exception of the unexpected relationships with the demographic variables and the control items. We are trying to learn about the performance of our new measure. Proceed with caution when interpreting the hundreds of comparisons presented in Appendix G. We will continue to attempt to replicate these findings with separate samples in the future.

Further, online testing has some drawbacks, so we were prepared to thoroughly screen for potential lazy participants by utilizing control questions whenever possible to help ensure validity (e.g., Chapman infrequency items, new BODI 2 control items, overlapping item content analyses across measures such as the SPQ, PQ-B, and the Perceptual Aberration Scale). Thus, even though it is not ideal that most of the measures used in this study were administered on the computer, most of the participants completed the questionnaires in the lab, and were screened for unusual performance in the data by evaluating infrequency items, control items (e.g., on the BODI 2, and looking for consistency across measures when overlapping items were present).

The fact that so many BODI 2 items and related measures were significantly positively correlated with the BODI 2 control items could indicate a general response style that is common in these participants. It would be extremely helpful to have reverse scored items in this measure. Perhaps in a future version of the BODI, we could either 1) add a new item that is reverse scored, or 2) edit one of the more common items and reverse the caption, such as "I always recognize myself in the mirror" or something of that nature. It would also be helpful to have other types of control items since it is possible that there is an unexpected confounding relationship between physical symptoms and bodily self-disturbance that is perhaps mediated by psychological distress and somatization.

Finally, the BODI 2 items yielded many zeros, thus skewing the data significantly and making parametric analyses difficult. For example, this skewed distribution of BODI 2 scores made controlling for certain variables (e.g., race and Edinburgh) challenging when we wanted to stick with non-parametric tests.

Conclusions

In the second study to use the BODI, we added control items, updated the pictures, created 6 factors, and demonstrated divergent validity. We also replicated the strong relationship that the BODI has with measures of convergent validity and the schizophrenia-spectrum in a separate sample of participants. Finally, we began to look at test-retest reliability in the current study, although we need more participants to confirm the reliability of the BODI.

CHAPTER V:

STUDY 2C: COMPARING BODI 1 AND BODI 2

Aims

The major aim of the current study was to compare the first two versions of the BODI utilized in the current dissertation. Secondly, we wanted to take this opportunity to take a look at how the different groups are responding to the BODI scale, and how each version of the scale is related to other measures in the field. Finally, we wanted to analyze which items on the scale are the strongest and which items might need to be corrected in future versions of the BODI to best suit our aim of assessing bodily self-disturbances that are common to individuals on the schizophrenia-spectrum, and quantifying the distress associated with such experiences in such a way that is useful to help guiding treatment plans and future interventions.

Methods

Participants

We initially aimed to collect data from 300 participants in total for development and validation of the BODI. 470 participants completed the BODI by the time of the writing of this dissertation (either version 1 or BODI 2). Forty-nine of those participants were SZ patients, 48 were healthy controls, and 373 were adults from the general population, mostly from the Vanderbilt undergraduate SONA pool. Data from 70 participants was excluded. 119 of the individuals in the general adult population completed the BODI 2 with a modified response option, which included a "not sure" option for the true/false component of each of the BODI 2 items. Of those 119 participants, 53 people chose "Not sure" to at least one of the BODI 2 items, and were thus excluded from the current analyses as the majority of the sample filled out the earlier true/false version of the BODI 2. We excluded a total of seven subjects (4 SZ patients and

3 healthy adults) due to invalid scores on the control BODI 2 scale (i.e., if an individual did not endorse any of the “normal” BODI 2 control items, such as headache, stomachache, etc.). Furthermore, 10 of the 90 subjects from Study 3 were excluded for various reasons (described below), and were excluded from the BODI 2 analyses as well. Thus, 277 participants’ data were included in final BODI 2 analyses (19 SZ, 28 HC, and 231 General Adults [i.e., adults from the community that are not demographically matched with SZ; mostly undergraduates]), with a total of 400 participants in the current dissertation for either BODI 1 or BODI 2. Please see Table 41 below for an outline of how many individuals participated in the different versions of the BODI questionnaire that are currently being included in the current dissertation.

Table 41. *Numbers of Subjects for Different Versions of BODI Utilized in Current Dissertation*

BODI Version	Total N	SZ Patients	Healthy Controls	General Adults
Pilot	13	0	0	13
BODI 1	109	26	17	66
BODI 2	277	19	28	231
TOTAL	400	45	45	310

Ten participants have completed the Spanish version of the BODI and 30+ participants have completed the French version of the BODI (see Appendix I for Spanish and French translations of the BODI captions). Furthermore, the measure is currently being utilized in Dr. Peter Brugger’s neurology clinic and a small select sample of individuals completed the BODI 2 as a clinical assessment tool during my internship year at Tewksbury Hospital; please see Appendix K for a case study.

Measures

The scores on the BODI 1 (see Study 2A above) and BODI 2 (see Study 2B above) were compared in the current study. Further, we compared these BODI scores with measures of convergent validity, including the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Perceptual Aberration Scale (Per Ab; Chapman et al., 1978), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), and Prodromal Questionnaire, Brief; PQ-B; Loewy et al., 2011), all of which are described in detail above in earlier chapters.

Hypotheses & Predictions

Since we made very minimal changes to the original BODI by simply updating the pictures, we predicted that the two BODI versions would be very similar to one another in terms of descriptive statistics, difference between groups, and how the versions were related to measures of convergent validity. If there were a significant difference between the BODI versions, we predicted that the BODI 2 would yield stronger convergent validity correlations and larger group differences among controls and SZ-spectrum participants, since we hypothesized that such a change would be due to the beneficial impact of the inclusion of the new BODI 2 control scale. The BODI 2 control does not feed into the BODI 2 total score, so it does not affect the comparison between the two BODI totals, but rather the control scale simply helps to filter out participants who may not be paying attention, or who may not want to participate fully in the study, as can often be the case when giving undergraduate students many questionnaires to complete on the computer in one sitting (or SZ patients with intense negative symptoms).

Finally, we wanted to compare the utility and positive predictive value of the Dream Questionnaire OBE item compared to the BODI 1 OBE item and the BODI 2 item to see which one has better predictive value for determining SZ status and High PQ-B status.

We hypothesized that OBE with distress is more pathological than OBE without distress, and OBE while sober is also more pathological than OBE while only under the influence of a substance, and thus we predicted that the BODI OBE item would have better specificity than the Dream Questionnaire since it excludes experiences that only occurred while under the influence of a substance. Further, we predicted that endorsement of the BODI OBE item with distress associated with it would be better at predicting SZ-risk status than OBE without distress (and the Dream Questionnaire OBE item without the sober specification).

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All significance tests were 2-tailed, unless otherwise indicated.

One Sample t Tests were conducted in SPSS to compare BODI 2 mean scores with BODI 1 mean scores (i.e., comparing BODI 2 sample and using the BODI 1 scores as the hypothesized mean to compare with BODI 2), using all participants from both versions of the BODI. We then compared proportions of BODI endorsement by version and by group (see Appendix H). We also used the Fisher r-to-z transformation to compare Spearman's correlations of the two BODI scales with related measures to see if measures of convergent validity changed since we updated the BODI pictures, compared effect sizes between versions, and examined the predictive value of the two BODI versions compared with the Dream Questionnaire for OBE assessment.

Results

Descriptive Statistics

Please see Study 2A and Study 2B above, and Appendices E, G, and H below, for detailed tables on the descriptive statistics for both BODI versions, correlation and covariance matrices of each item in each version, group differences by item, and comments made by study participants by group and by version in Appendix J. Table 42 below shows the results of conducting One-Sample t Test to compare mean scores on the two BODI versions. Specifically, in SPSS, we compared the means of BODI 2 scores with the BODI 1 mean as the hypothesized value.

Table 42. *Comparing BODI 1 vs. BODI 2 Scores with One-Sample t Test*

BODI 1 vs. BODI 2	***t***	**df**	***p***	**Mean Difference**	**95% CI of the Difference**	**Conclusion**
Total	.43	275	.66	.80	-2.8 – 4.4	1 = 2
Endorsements	2.2	275	.03*	.46	.04 - .88	1 < 2
Distressing Endorsements	-.96	275	.34	-.11	-.34 - .12	1 = 2
Distress	.69	275	.49	.50	-.92 – 1.92	1 = 2
Frequency	-1.0	275	.30	-.29	-.86 - .27	1 = 2
Vividness	.19	275	.85	.14	-1.3 – 1.5	1 = 2
Item 1: unsure of who I am	5.2	275	<.0001*	1.4	.88 – 1.9	1 < 2
Item 2: soul leaves body	.41	275	.68	.05	-.20 - .31	1 = 2
Item 3: bodily disconnection	.42	275	.68	.06	-.22 - .33	1 = 2
Item 4: sleep paralysis	.63	275	.53	.15	-.32 - .61	1 = 2
Item 5: time perception	4.1	275	<.0001*	1.0	.53 – 1.5	1 < 2
Item 6: feeling of presence	3.8	275	<.0001*	.97	.46 – 1.5	1 < 2
Item 7: felt like somebody else	-10	275	<.0001*	-1.9	-2.2 - - 1.5	1 > 2
Item 8: floating through air	-3.5	275	.001*	-.46	-.72 - -.20	1 > 2
Item 9: doppelganger	-4.2	275	<.0001*	-.46	-.68 - -.25	1 > 2
Item 10: strange face in mirror	-.34	275	.74	-.07	-.49 - .35	1 = 2
Item 11: spiritual being	-2.1	275	.041*	-.28	-.54 - -.01	1 > 2
Item 12: OBE	.54	275	.592	.09	-.24 - .42	1 = 2
Item 13: polyopic heautoscopy	-1.5	275	.139	-.11	-.26 - .04	1 = 2
Item 14: bodily disconnection	.44	275	.662	.06	-.21 - .33	1 = 2
Item 15: perceptual aberration	.143	275	.886	.024	-.3 - .35	1 = 2
Item 16: feeling like animal	-3.0	275	.003*	-.36	-.59 - - .13	1 > 2
Item 17: inner voice	-2.6	275	.008*	-.49	-.85 - -.13	1 > 2
Item 18: bodily transformation	-.28	275	.774	-.05	-.39 - .29	1 = 2
Item 19: body coming apart	2.8	275	.004*	.59	.19 – 1.0	1 < 2
Item 20: human hallucination	-4.9	275	<.0001*	-.51	-.72 - -.31	1 > 2
Item 21: thought insertion	-2.9	275	.003*	-.52	-.86 – -.17	1 > 2

$* p < .05; ^{\dagger} p < .1$

As one can see in Table 42 above, total scores between the BODI 1 and the BODI 2 were not statistically different from one another. Distress sums, frequency sums, vividness sums, and number of distressing endorsements (as characterized by choosing “strongly agree” for the distress question on items that participants endorse as being true) were all roughly equivalent across the two different versions of the BODI. However, number of total endorsements, regardless of whether or not they were distressing to the individual, increased significantly from version 1 of the BODI to the second version with the new pictures and control scale.

Twelve out of 21 items were significantly different between BODI 1 and BODI 2. Eight items yielded higher scores on the first version of the BODI, including # 7 (felt like somebody else), #8 (floating through the air), #9 (doppelganger), #11 (visited by spiritual being), #16 (feeling like an animal), #17 (hearing an inner voice call your name), and #20 (experiencing a visual hallucination of another person in front of you). In contrast, four items yielded higher scores on the second version of the BODI, including #1 (unsure of who I am), #5 (time perception disturbance), #6 (feeling of presence), #19 (feeling as if one's body is coming apart), and #21 (thought insertion).

However, importantly, it should be noted that the One Sample t Test above is looking at means of the BODI scores, when we know that the distributions of each of the BODI versions are skewed toward zero and not normal. Thus, using this parametric test was not optimal and could have caused some distortion in the comparison of the two BODI versions. Nonparametric analyses were used for the remainder of the comparisons below whenever possible. Table 43 below presents the medians of the two BODI forms to descriptively evaluate the differences between medians.

Table 43. *Comparing BODI 1 vs. BODI 2 Medians*

	BODI 1			BODI 2			Difference Scores		
BODI VARIABLE	**Total N**	**HC**	**SZ**	**Total N**	**HC**	**SZ**	**Total N**	**HC**	**SZ**
Total Sum	12	5	47	18	4	25	6	-1	-22
Endorsements	2	1	5	2	1	3	0	0	-2
Distressing End.	0	0	2	1	0	1	1	0	-1
Distress	4	2	17	7	1	10	3	-1	-7
Frequency	1	0	8	2	0	3	1	0	-5
Vividness	4	1	23	6	1	9	2	0	-14

As one can see in Table 43 above, the total sum of BODI scores dropped dramatically for SZ patients with the revision of the BODI pictures (47 → 25), but hardly changed at all for healthy controls (5 → 4). Number of endorsements appears similar across versions, as did number of distressing endorsements. However, distress sum scores dropped for SZ patients on the BODI 2, as did vividness ratings, while frequency ratings did not appear to change very much across groups.

Reliability

Internal consistency analyses were conducted in SPSS for the two BODI versions. For BODI 1, Cronbach's coefficient $\alpha = .891$. For BODI 2, Cronbach's coefficient $\alpha = .867$. Thus, both BODI versions achieved acceptable levels of internal consistency, which some might even classify as "good" (George & Mallery, 2003). Since the two coefficients logically seem so similar to one another, and are designated in the same classification range, a statistical test will not be computed to compare the two for a significant difference between the two versions.

Split half reliability analyses were also conducted in SPSS for both versions of the BODI. The BODI 1 was split into two halves, the first with 11 items (Cronbach's $\alpha = .807$) and the second half with 10 items (Cronbach's $\alpha = .796$). The correlation between the two BODI 1 forms was .821, the Spearman-Brown Coefficient was .901, and the Guttman Split-Half Coefficient was .889. The same procedure was done for the second version of our measure, although this time we had more items to split due to the addition of the 4 control items. Specifically, the BODI 2 was split into two halves, the first half with 13 items (Cronbach's $\alpha = .759$) and the second half with 12 items (Cronbach's $\alpha = .759$). The correlation between the two BODI 2 forms was .751, the Spearman-Brown Coefficient was .858, and the Guttman Split-Half Coefficient was .844.

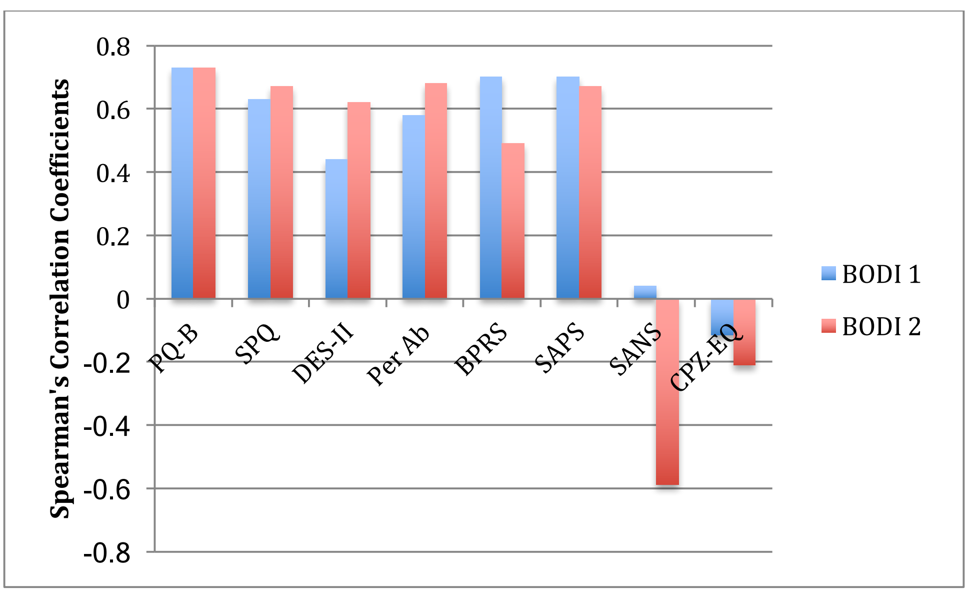
Again, it appears the BODI 1 version showed slightly stronger internal consistency and split-half reliability, but likely not statistically different or something that we are concerned about at this time. Rather, the reduction in internal consistency for the BODI 2 likely has more to do with the addition of the control items which are not conceptually related to the other items, or at least not as strongly related to one another as the remaining 21 target items on the BODI 1 and

2. Finally, we were able to assess test-retest reliability for the BODI 2 using a small sample size of 11 participants and found acceptable reliability ($\rho = .73$, $p = .01$), although we need to continue to assess reliability with larger samples in the future.

Comparing Spearman's Correlations with Other Measures: Validity Analysis

As one can see in Figure 15 below, the two BODI versions correlated similarly with other measures of convergent and divergent validity. The biggest difference between the two versions was the difference in relationship with SANS scores (negative symptoms) in SZ patients. For the BODI 1, there was no relationship between BODI 1 total scores and negative symptoms. For the BODI 2, there was a significant inverse relationship between BODI 2 total scores and negative symptoms. The difference in these results likely has more to do the differences in symptoms ratings between the two SZ samples than a difference between the two versions of the BODI.

Figure 15. BODI 1 vs. BODI 2 Spearman Correlations



Fisher's r-to-z transformations were calculated to determine whether the difference between BODI spearman's correlation coefficients with related scales were significantly different between the two BODI versions. For Table 44 below, we focused on only the non-overlapping versions of the most relevant variables (e.g., the PQ-B endorsement sum without overlapping BODI content). Further, it is important to note that the following two correlation comparison tables only include data from healthy controls and adults from the general population; we did not include data from SZ patients. We did not want to muddle the data by combining SZ and HC data, and further, the SZ patients have not all completed the PQ-B, SPQ or Perceptual Aberration Scale, as these are generally used in non-clinical populations, and so the SZ patient sample would be too small and underpowered to run such correlational analyses. Thus, it would be a good idea to have more SZ patients complete these measures in conjunction with the BODI in the future to analyze their relationship with these indices of convergent validity, and whether or not these values have changed across BODI versions.

Table 44. *Comparison of BODI 1 and BODI 2 Spearman's Correlations with Related Scales: Convergent Validity*

	BODI Variables					
	Total Sum	**Endorsement Sum**	**Endorsement with Distress**	**Distress Sum**	**Frequency Sum**	**Vividness Sum**
PQ-B Endorsements (No Overlap)						
BODI 1:	.72***	.73***	.52***	.69***	.59***	.71***
BODI 2:	.72***	.69***	.55***	.71***	.73***	.67***
BODI 1 VS. BODI 2:	$z = 0$	$z = 0.26$	$z = -0.33$	$z = -0.31$	$z = -1.96^{\dagger}$	$z = 0.6$
SPQ Total (No Overlap)						
BODI 1	.64***	.65***	.47**	.62***	.59***	.65***
BODI 2	.66***	.63***	.48***	.65***	.71***	.61***
BODI 1 VS. BODI 2	$z = -0.3$	$z = 0.26$	$z = -0.1$	$z = -.39$	$z = -1.64$	$z = 0.52$
DES-II Total (No Overlap)						
BODI 1	.45**	.46**	.32*	.43**	.38**	.44**
BODI 2	.62***	.61***	.42***	.59***	.61***	.59***
BODI 1 VS. BODI 2	$z = -1.9^{\dagger}$	$z = -1.65^{\dagger}$	$z = -0.91$	$z = -1.7^{\dagger}$	$z = -2.41$*	$z = -1.6$
Perceptual Aberration Total (No Overlap)						
BODI 1	.51**	.53**	.39**	.49**	.36**	.49**
BODI 2	.59***	.59***	.45***	.58***	.63***	.54***
BODI 1 VS. BODI 2	$z = -.9$	$z = -.68$	$z = -0.57$	$z = -.99$	$z = -2.85$**	$z = -0.53$

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: not corrected for multiple comparisons*

As one can see in Table 44 above, most of the indices of convergent validity remained unchanged between the two versions of the BODI. However, there were two significant differences between versions (DES-II and Perceptual Aberration Scale with BODI frequency variable), and a few relationships that were trending significance (PQ-B, DES-II) all in the direction of the BODI 2 having a stronger relationship with related measures than the BODI 1. Notably the SPQ correlations stayed similar throughout the change in BODI pictures.

Thus, from the current analyses, we might say that the BODI 2 has better convergent validity with the DES-II (and somewhat the PQ-B) compared to the BODI 1.

<u>Group Differences</u>

Comparing effect sizes for group differences in median scores, we found very similar values between the two BODI versions. In both BODI versions we found stronger effect size for group difference between low risk and high risk.

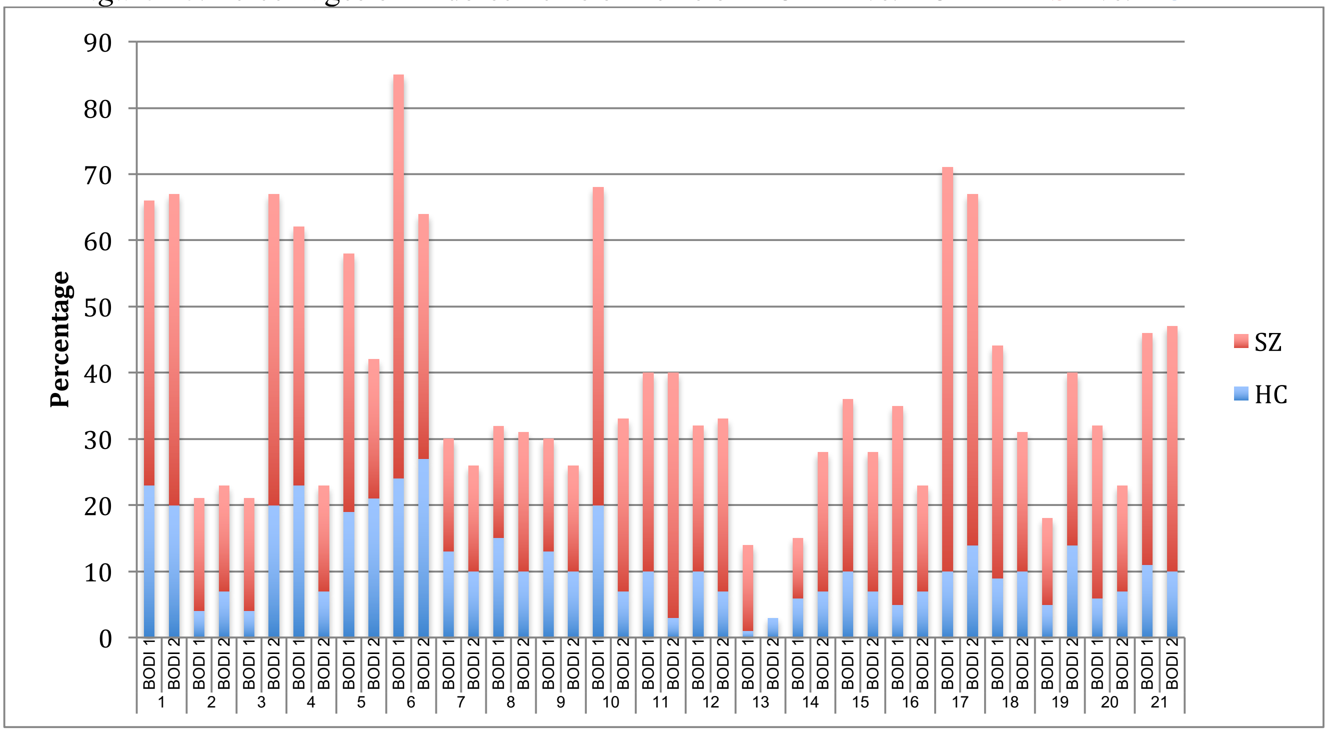
Table 45. *Comparing Effect Sizes for Group Differences in BODI 1 vs. BODI 2*

	BODI 1	**BODI 2**	**BODI 1 vs. BODI 2**
SZ vs. HC	$r = 0.43$	$r = 0.44$	BODI 1 ≤ BODI 2
Risk vs. Low	$r = 0.56$	$r = 0.52$	BODI 1 ≥ BODI 2

As one can see in Appendix H and visually in Figure 16 below, when looking at the data from the total samples for each BODI version, there were three significant differences in proportions of endorsements for items # 1, 5, and 19, between the BODI 1 and the BODI 2, with the BODI 2 yielding the higher overall endorsements on all three items. In contrast, there were no significant differences between BODI versions for SZ patients on any of the individual items. For healthy controls, there were four items with significant differences in proportion of endorsement across the BODI versions, with two items being yielding greater endorsements in

HC on the BODI 1 (items #10 and #11), and two items yielding greater endorsements in HC on the BODI 2 (items #5 and #19).

Figure 16. Percentages of Endorsements of Items on BODI 1 vs. BODI 2 in SZ vs. HC



There were 8 items that were significantly different between SZ and HC on BODI 1 that were no longer significant on the BODI 2 (#1, 3, 6, 10, 13, 16, 18, 20). There were three items that were significantly different between groups on both BODI versions (# 11, 17, 21).

There were 10 items that were either equal or trending between groups on both BODI versions (#1, 4, 5, 7, 8, 9, 12, 14, 15, 19). None of the items were significantly different between SZ and HC on the BODI 2 but not on BODI 1. Please see Appendix I below for a side-by-side comparison of the two pictures of each version of the BODI to try to better understand why there would be a change in the scores of these items.

Comparing Sensitivity and Specificity of BODI 1, BODI 2, and Dream Questionnaire OBE

One limitation of Study 1 was that we did not assess whether individuals were under the influence of a substance or medication when the OBE occurred. Further, we did not quantify whether or not the individual felt distress with the OBE. Thus, the BODI aimed to address these issues and specifically asks about distress associated with OBEs (and the other 20 anomalous self experiences assessed), and also explicitly instructed participants to only endorse experiences that they have had while sober. Thus, we were able to compare differences in prevalence rates in different populations on 1) OBE compared to Sober OBE, and 2) Distressing OBE vs. Not Distressing OBE in a way that we were unable to accomplish by using just the single item on the dream questionnaire. Further, with the BODI 2, we calculated whether or not the experiences were current, and currently distressing, so we could also test the relative contributions of these factors as well.

Table 46. *Classification Accuracy of Different OBE Items versus SZ Risk Status*

OBE Item	Sensitivity	Specificity	PPV	NPV	LR	$\chi^2_{(1)}$	*Fisher's Exact Test*
Dream Q: OBE History	35%	93%	62%	82%	9.5	10.9 (*p* = .001*)	*p* = .003*
BODI 1: OBE	22%	91%	39%	81%	2.1	2.3 (*p* = .129)	*p* = .156
BODI 1: Distressing OBE	60%	25%	33%	50%	.33	.32 (*p* = .57)	*p = 1.0*
BODI 2: OBE	26%	86%	12%	94%	1.6	1.8 (*p* = .18)	*p* = .191
BODI 2: Distressing OBE	15%	97%	27%	94%	4.6	7.43 (*p*=.006*)	*p* = .032*
BODI 2: Current OBE	5%	93%	5%	93%	.13	.12 (*p* = .73)	*p = 1.0*
BODI 2: Current Dis OBE	0%	100%	0%	93%	.143	.07 (*p* = .785)	*p = 1.0*

**p < .05; † p<.1; Note: PPV = positive predictive value; NPV = negative predictive value; LR= likelihood ratio; Note: all BODI OBE items are sober*

Table 47. *Classification Accuracy of Different OBE items versus High PQ-B Status*

OBE Item	Sensitivity	Specificity	PPV	NPV	LR	$\chi^2_{(1)}$	*Fisher's Exact Test*
Dream Q: OBE History	44%	80%	35%	85%	3.3	3.6 (*p* = .06†)	*p* = .103
BODI 1: OBE	14%	93%	57%	60%	.72	.73 (*p* = .39)	*p* = .443
BODI 1: Distressing OBE	75%	25%	50%	50%	.058	.06 (*p* = .81)	*p = 1.0*
BODI 2: OBE	25%	88%	33%	82%	1.4	1.5 (*p* = .221)	*p* = .25
BODI 2: Distressing OBE	13%	97%	50%	82%	1.9	2.3 (*p* = .129)	*p* = .181
BODI 2: Current OBE	50%	97%	50%	81%	1.9	*2.3* (*p* = .129)	*p* = .181
BODI 2: Current Dis OBE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**p < .05; † p<.1; Note: PPV = positive predictive value; NPV = negative predictive value; LR= likelihood ratio; Note: all BODI OBE items are sober; Note: Currently Distressing OBE could not be assessed because not a single High PQ-B subject fit into this category*

Contrary to predictions, it appears as though the specification of the sober instructions in the BODI created such a drastic drop in sensitivity that we no longer saw the predictive value in assessing OBE history in predicting psychosis risk groups. However, the presence of distress associated with the BODI 2 OBE item was significant in agreement with SZ status classification. Thus, we will continue to administer the two scales in conjunction with one another, and will gain a lot more detail from the BODI than simply the dream questionnaire item.

Discussion

In sum, we collected data from 470 participants for the current dissertation's analysis of the two BODI measures. Four hundred of those participants' data were able to be utilized here. Excitingly, the collection of BODI data is ongoing around the world, and additional normative and validation data is coming in literally as I compose this dissertation (e.g., adolescent data from Geneva using the French version of the BODI 2, courtesy of Lénie Torregrossa)!

Both versions of the BODI showed good internal consistency and acceptable reliability indices by way of split-half reliability for both BODI versions, and also some promising pilot results for test-retest reliability for the BODI 2 that needs to be confirmed with larger samples. Additionally, each version of the BODI was strongly correlated with measures of convergent validity, including the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Perceptual Aberration Scale (Chapman et al., 1978), Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), Positive symptoms in SZ patients (SAPS; Andreasen, 1984), and the SELF (Heering et al., 2016) and Temporal Lobe Scale (TLS; Persinger, 1984), in the BODI 2. In addition, we demonstrated that the BODI 2 showed good discriminant validity in that it was not correlated with measures of negative schizophrenia-spectrum scales, such as the Physical Anhedonia Scale in healthy controls, and was inversely related to negative symptoms (SANS scores) in SZ patients.

We also generated ROC curves and areas under the curve were calculated to determine levels of sensitivity and specificity for the BODI scales in their diagnostic decision making value for risk of psychosis. We identified cut scores to help in the BODI 2, and conducted two factor analyses, one conceptual and one exploratory, to help analyze the data better. We look forward to confirming the utility of these factors and cutoff scores in future studies, including Study 3 below.

BODI 1 vs. BODI 2 Comparison Summary

When comparing mean scores of the two BODI versions, we found that distress sums, frequency sums, vividness sums, and number of distressing endorsements were all roughly equivalent across the two different versions of the BODI. However, number of total endorsements, regardless of whether or not they were distressing to the individual, increased from version 1 of the BODI to the second version with the new pictures and control scale. However, given the skewed nature of the distributions of the BODI data, we feel that comparing medians might be more appropriate. When comparing the medians of each BODI version visually, one could see the total sum of BODI scores drop for SZ patients with the revision of the BODI pictures, but hardly changed at all for healthy controls. Number of endorsements appeared similar across versions, as did number of distressing endorsements. However, distress sums and vividness ratings dropped for SZ patients' scores while frequency ratings did not appear to change very much across groups. It is an open question as to whether or not the differences between the two BODI versions in two SZ groups were due to the differences in the new picture update or whether the first SZ sample simply found the experiences to be more distressing (and vivid) than the second sample of SZ patients. Given the stability of the HC scores, it is likely something about the SZ samples than the pictures themselves, but nevertheless this is something to test in the future.

For group differences in proportions of endorsements per item, descriptively it looks as though there have not been huge changes across the measures. Further, statistical tests indicate that the two SZ patient samples were not significantly different in their endorsement frequency between different versions of the BODI. Comparing effect sizes for group differences in median scores, we found very similar values between the two BODI versions. In both BODI versions we found stronger effect size for group difference between low risk and high risk.

We also sought to assess the predictive value of the BODI OBE items compared with the Dream Questionnaire OBE item, since the new BODI items incorporate instructions that explicitly exclude OBEs that are only specific to situations when somebody is under the influence of a substance or medication. Contrary to predictions, it appears as though the specification of the sober instructions in the BODI created such a drastic drop in sensitivity that we no longer saw the predictive value in assessing OBE history for predicting High PQ-B status. However, the presence of distress associated with the BODI 2 OBE item was significant in agreement with SZ status classification. Thus, we will continue to administer the two scales in conjunction with one another, and will continue to assess the distress component associated with OBE, and importantly, we will gain a lot more detail from the BODI than simply the dream questionnaire item.

Finally, Fisher's r-to-z transformations were calculated to determine whether the difference between BODI spearman's correlation coefficients with related scales have changed significantly between the two versions. Most of the indices of convergent validity remained unchanged between the two versions of the BODI with a few exceptions, which are all in favor of the BODI 2 having stronger correlations with measures of convergent validity. Thus, from the current analyses, we might say that the BODI 2 has better convergent validity with the DES-II (and somewhat the PQ-B) compared to the BODI 1.

Limitations and Future Directions

One limitation of the BODI is the lack of convergent validity with an interview-based assessment of anomalous self-experiences, such as the Examination of Anomalous Self-Experiences (EASE; Parnas et al., 2005). This would be extremely helpful for our convergent validity. It would also be good to validate the prodromal status of the individuals at risk for psychosis by administering the Structured Interview for Prodromal Symptoms (SIPS; Miller et al., 2003).

Another limitation of the BODI is that we did not correlate self-report self-disturbance scores with a behavioral measurement of anomalous sense of self, such as the Rubber Hand Illusion (RHI; Botvinick & Cohen, 1998). We addressed this limitation in Study 3 by collecting BODI 2 data in conjunction with the Pinocchio Illusion, which is a proprioceptive-tactile illusion that induces the feeling that one's nose is growing in susceptible individuals, which can be seen as evidence of exhibiting a fluid body boundary, and a behavioral example of an anomalous self-experience. Further, since the enfacement illusion has never been utilized in the schizophrenia-spectrum, it would be a useful future direction to assess ease of changes of self-identification in individuals at risk for developing schizophrenia with this task, and how that relates to scores on the BODI 2, particularly the item about the "strange face in the mirror" experience.

As another future direction, we would like to compare BODI scores with patients with Bipolar Disorder and relatives of patients with schizophrenia to assess the specificity of the scale with SZ populations in particular.

Finally, as previously mentioned, since we provided individuals a space to comment on each individual item on the BODI questionnaire, we look forward to analyzing those comments for group differences in first person singular vs. plural pronouns as has been described above in previous studies (e.g., Fineberg et al., 2014). To see a select sampling of comments on the BODI items by group, please see Appendix J.

Conclusions

To conclude, we feel we have reached the goal of further developing a self-report inventory designed to quantify out-of-body experiences (OBEs) and related dissociative bodily-self experiences in both clinical and healthy populations. The scale is continuing to evolve and improve and we believe we have a built a solid foundation upon which the BODI will grow.

CHAPTER VI:

STUDY 3: PINOCCHIO ILLUSION ACROSS THE SCHIZOPHRENIA SPECTRUM

Aims

The main goal of the third study was to examine the relationship between psychosis-proneness and anomalous multisensory integration. We also aimed to investigate tactile discrimination deficits in relation to proprioception dysfunction in schizotypes prone to dissociative experiences. Further, we also planned to test the strength of the relationship between BODI 2 scores and tactile discrimination deficits, parietal abnormalities, and anomalous multisensory integration, in order to better understand possible etiological contributions to the experiences quantified with the BODI 2. Finally, we sought to test some predictions made by the diathesis-stress response model described above by testing the relationships between psychosis-proneness, self-reported self-disturbance, multisensory abnormalities, and levels of stress among non-help-seeking adults in the population.

Methods

Participants

Vanderbilt undergraduates were screened with the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011) at the beginning of the Fall 2015 semester in PSY 1200 (General Psychology), and also in the Spring 2016 semester. Individuals scoring over 6 on the PQ-B were considered for the "high" psychosis-proneness group, while individuals scoring under 2 were considered for the "low" psychosis-proneness group. Potential subjects were contacted via email to participate in a two-hour SONA study for partial psychology course credit.

Additionally, the study, entitled "Personality and Perception," was made available to all undergraduates through SONA, and recruitment was not limited to those who score either high or low on the PQ-B (Loewy et al., 2011) through the screening process with the PSY 1200 students. This additional precaution was taken in order to prevent potential problems in the event that we were unable to identify and recruit enough participants in each group in the academic year. In this case, we were able to alter the design of the current study to include all participants (regardless of their PQ-B score), and were able to utilize both correlations in addition to between-group comparisons. If not, and we only had very high and very low PQ-B distress scores in the sample, we could not have run correlations with the PQ-B because the two extreme ends would have caused distortion in the data and possible spurious relationships to be found. Thus, we kept the mid group PQ-B data for correlational analyses, but compared groups using the High vs. Low PQ-B distress groups. Data analyses will be described in further detail below.

We hoped to collect data from 60-75 participants in total for Study 3 of the current proposal, but we ended up collecting data from 90 participants. However, ten participants were excluded from final analyses. Reasons for exclusions include 1) more than two endorsements on Chapman Infrequency Scale (n = 1), 2) excessive movement or other behavior that yielded non-standardized administration of the Pinocchio Illusion (e.g., excessive coughing or sneezing, itching nose, messing with phone in pocket during procedure; n = 4), and 3) having had taken a pain reliever (e.g., Tylenol or Advil) in the past 24 hours of administration of the 2-point discrimination procedure (n = 4). We also excluded 1 subject out of 90 due to invalid scores on the control BODI 2 scale (i.e., one individual did not endorse any of the "normal" BODI 2 control items, such as headache, stomachache, itch, and tickle).

The demographic information for the 80 subjects included in Study 3 is reported in Table 48 below. Sixteen out of 80 participants qualified to be in the "High" PQ-B group, by totaling over 6 distressing endorsements on the scale of prodromal psychosis symptomatology. Twenty out of 80 participants were classified as the "Mid" PQ-B group by scoring between 3-5 distressing endorsements on the scale, and 43 out of 80 participants were classified as the "Low" PQ-B group by scoring between 0-2 distressing endorsements on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). One participant did not complete the PQ-B, and therefore could not be classified in any of the risk groups, but the remainder of his data was utilized in the analyses involving the entire sample. There were no significant differences among demographic variables across the three PQ-B risk groups as can be seen in Table 48 below. Specifically, there was no difference in sex, age, years of education, handedness, Edinburgh laterality, or race.

Table 48. *Study 3 Demographic Information*

Demographic Variable	**Total Sample (N = 80)**	**"Low" PQ-B group (n = 43)**	**"Mid" PQ-B group (n = 20)**	**"High" PQ-B group (n = 16)**	***Low vs. Mid vs. High PQ-B Groups***	
					$\chi^2_{(2)}$	*p*
Sex						
Female	63% (50/80)	63% (27/43)	65% (13/20)	63% (10/16)	0.03	.98
Male	37% (30/80)	37% (16 /43)	35% (7/20)	37% (6/16)		
Age	*M* =19 *SD* = 1.2	*M* = 19 *SD* = 1	*M* = 19.5 *SD* = 1	*M* =18 *SD* = 1	1.32	.52
Education (Years)	*M* = 13 *SD* = 1	*M* = 13 *SD* = 1	*M* =13 *SD* = 1	*M* =13 *SD* = 1	0.75	.68
Handedness						
Right	91% (73/80)	88% (38/43)	100% (20/20)	88% (14/16)	2.6	.27
Left	9% (7/80)	12% (5/43)	0% (0/20)	12% (2/16)		
Edinburgh Laterality Index	*M* = 67 *SD* = 40	*M* = 66 *SD* = 43	*M* = 75 *SD* = 16	*M* = 58 *SD*= 51	0.84	.66
Race					0.84	.66
Caucasian	51% (41/80)	56% (24/43)	50% (10/20)	44% (7/16)		
Asian	15% (12/80)	16% (7/43)	10% (2/20)	18% (3/16)		
African-American	15% (12/80)	14% (6/43)	20% (4/20)	13% (2/16)		
Hispanic/Latino	8% (6/80)	9% (4/43)	0% (0/20)	13% (2/16)		
Multiracial	5% (4/80)	2% (1/43)	10% (2/20)	6% (1/16)		
Other	6% (5/80)	0% (0/43)	5% (1/20)	6% (1/16)		

**Note: the High vs. Low PQ-B groups were also matched as well (p > .1) on these variables.*

Ten out of 80 (13%) participants qualified as being in the "High SPQ" group, scoring over 42 on the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), suggesting they are at high psychometric risk for developing a schizophrenia-spectrum disorder, particularly schizotypal personality disorder. The 3 PQ-B groups differed significantly in numbers of individuals scoring in the "High SPQ" range ($\chi^2_{(2)}$=33.86, p<.0001), with 8/16 (50%) of the "High PQ-B" individuals scoring above 42 on the SPQ, 1/20 (5%) of the "Mid PQ-B" group scoring above 42, and 1/43 (2%) of the "Low PQ-B" group scoring above 42.

The 3 PQ-B groups differed significantly in numbers of individuals scoring in the "High AQ" (Baron-Cohen et al., 2001) range ($\chi^2_{(2)}$=7.95, p=0.018), with 2/16 (12.5%) of the "High PQ-B" individuals also scoring above 32 on the AQ and none of the other participants in either other PQ-B group scoring above the cutoff of 32.

Five out of 80 (6.25%) participants qualified as being in the "High DES-II" (Bernstein & Putnam, 1986) group (i.e., scores over 30), suggesting they are at high risk of a dissociative disorder. Three of those individuals were in the "High PQ-B" group, and the other two were in the "Mid PQ-B" group ($\chi^2_{(2)}$=7.99, p=0.018).

Two out of 80 (2.5%) participants qualified as being in the "High" Physical Anhedonia (Chapman et al., 1976) group (over 28 for males and over 20 for females), and both of these individuals were in the "Mid" PQ-B group ($\chi^2_{(2)}$=6.05, p=0.048), with none in the other two other PQ-B risk groups.

Four out of 80 (5%) qualified as being in the "High" Hypomanic Personality (Eckblad & Chapman, 1986) group (over 37 for males and over 38 for females), and they were evenly distributed throughout the PQ-B distressed groups ($\chi^2_{(2)}$=1.7, p=0.42).

Only one out 80 (1.25%) qualified as being in the “High” Perceptual Aberration (Chapman et al., 1978) group (over 19), and this individual was also in the “High” PQ-B distress group ($\chi^2_{(2)}$=3.9, p=0.14), with no other individuals from the other groups scoring over the perceptual aberration cutoff score.

Thus, the most reasonable risk cutoff group is the PQ-B, which we recruited for specifically, since none of the other possible risk measures were able to differentiate enough participants for the high vs. low groups. However, we also created a new composite variable made up of all these SZ-spectrum measures, and created two groups by conducting a median split on the z scores of the SZ-spectrum composite measure. Thus, if there were not enough participants in the high vs. low group to conduct a powerful analysis, we used this schizophrenia-spectrum composite split instead.

Measures

Participants completed a battery of questionnaires on Redcap (an online data collection tool), including the BODI 2 (Benson et al., in prep), Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Perceptual Aberration Scale (Chapman et al., 1978), Dream Questionnaire (McIntosh et al., in prep), Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001), Temporal Lobe Scale (TLS; Persinger, 1984), Adverse Childhood Events scale (ACE; Anda et al., 2010), Perceived Stress Scale (Cohen et al., 1983), and the UCLA Loneliness Scale (Russell et al., 1996). Please refer to Study 1 and Study 2 for more detailed information on these self-report measures, and the sections below for the new measures, including the new self-tickle item that was mixed in with the other scales.

Participants also completed the Pinocchio Illusion (PI; Burrack & Brugger, 2005; Michael & Park, 2016), 2-point discrimination task (2PT; Chang & Lenzenweger, 2001, 2005) and Line Bisection Task (Schenkenberg et al., 1980). The order of task presentation was counterbalanced across participants.

Pinocchio Illusion (PI)

The Pinocchio Illusion (PI; Burrack & Brugger, 2005) task gauges susceptibility to perceive flexible bodily boundaries and ambiguous spatial location of one's body (i.e., proprioceptive confusion). Specifically, the PI is a proprioceptive-tactile illusion that induces the feeling that one's nose is growing in susceptible individuals. SZ patients show greater PI compared to healthy controls (Michael & Park, 2016), providing evidence for anomalous multisensory self-disturbance in the schizophrenia-spectrum.

In this experimental design, the participant was blindfolded and was sitting in front of a table in an upright position. The participant rested his or her elbow on the table while an experimenter administered harmless pulses from a physiotherapy vibrator to the individual's bicep while the participant touched the tip of their nose, with the same arm being stimulated by the vibrator. Specifically, the experimenter stimulated the bicep brachii tendon of the upper arm (at 120 Hz) with a physiotherapy vibrator (Novafon SK 1/1). Before the stimulation began, the participant was instructed to report the onset of any sensations he or she might feel, apart from the vibrations. The vibration lasted for approximately two minutes and was applied to each arm. The procedure was performed using the physiotherapy vibrator on the highest amplitude setting which reaches a depth of 1.6 mm on both the right and left arms. The arm stimulated first in the task was counterbalanced across participants.

After each vibration administration, participants were asked to complete an 11-question interview (e.g., “My nose feels like it is elongating”) to quantify how strongly participants may have felt the illusion (see Appendix L). The participant was asked to respond to each of the 11 statements on a scale from 0 to 100 in 25 point increments. A rating of 0 meant that the participant did not have that experience during the stimulation, while a rate of 100 points means the participant fully endorsed having the experience described in the statement during the stimulation.

The 11 items were scored as one total sum, in addition to two subscales of items: 1) Physical Sensation Subscale (Items # 5, 6, 7, 8, 10) and 2) Perceptual Aberration Subscale (Items #1, 2, 3, 4, 9, 11). Cronbach’s α for the total PI questionnaire was .761 in the current sample, in the acceptable range. Similarly, Cronbach’s α was acceptable for the Perceptual Aberration Subscale at $\alpha = 0.784$ in the current sample. However, Cronbach’s α was questionable for the Physical Sensation Subscale at $\alpha = 0.611$. Please see Table 49 below for specific individual item content and subscale classification.

Table 49. *Pinocchio Illusion Interview Items and Proposed Subscale Classification*

Item Content	Subscale
1. I felt like my nose was pushing my finger forward.	Perceptual Aberration
2. My nose felt like it was becoming longer.	Perceptual Aberration
3. My nose felt like it was becoming wider.	Perceptual Aberration
4. My nose and my index finger felt disconnected from my hand and arm.	Perceptual Aberration
5. I felt a pulsation in my nose and/or index finger.	Physical Sensation
6. I felt a pulsation in my arm.	Physical Sensation
7. I felt “tingliness” in my nose and or index finger.	Physical Sensation
8. I felt “tingliness” in my arm.	Physical Sensation
9. My arm felt like it was extending forward.	Perceptual Aberration
10. My arm, index finger, or nose felt like it became warmer or colder.	Physical Sensation
11. My nose felt like it was becoming smaller.	Perceptual Aberration

We decided to classify these items because it seemed as though the total PI interview was asking about two types of experiences commonly found in the Pinocchio Illusion: (1) the actual physical effects of the vibration procedure, or *physical sensations* associated with the PI procedure, and (2) the perceived feeling that parts of one's body were changing in an illusory way, or *perceptual aberrations* associated with the Pinocchio Illusion. We hypothesized that the perceptual aberration items of the PI might be more relevant in its predictive value in determining psychosis proneness and anomalous sense of bodily self compared to scores on the physical sensation items, although we did not necessarily think that these two were entirely independent of one another. In contrast, if one is feeling strong physical sensations associated with the PI then they are probably going to be more likely to feel the perceptual aberrations associated with the PI, particularly if you have tactile abnormalities and propensity towards these experiences to begin with, as is hypothesized in the case of individuals in the high PQ-B group.

After we asked participants the 11 questions above, we also asked participants to estimate how long their nose grew in centimeters (if they endorsed that item). We asked them to specify if they felt their body become warmer or colder (again, if applicable), how many locations they felt strange sensations on their body, and how vividly they felt the sensations. Further, during the procedure, we recorded when participants first reported the onset of sensations. We created a variable for each of these measures, in addition to a composite measure which sums the nominal endorsement of each of these components (i.e., if someone 1) felt their nose grow, 2) felt warmer, 3) reported multiple locations on their body, 4) reported onset, and 5) reported vividness, they would score 5 on this "PI total endorsement sum" variable that we created).

Finally, at the very end of the experiment, we described the Pinocchio Illusion in detail, and asked each participant if they thought they experienced the Pinocchio Illusion (yes or no). Then we asked if they had ever heard of the Pinocchio Illusion, which luckily nobody had, and asked them not to share the details of the experiment with their peers, particularly if they knew someone who was going to come in to participate in the study.

During this debriefing interview process, one girl indicated that she thought her “multiple nose jobs” in the past few years may have influenced her susceptibility to feeling the Pinocchio Illusion. After consulting with the rest of the lab, we all agreed to exclude her data from the rest of the PI analyses.

2-Point Discrimination Task (2PT)

The 2-point discrimination task (2PT; Chang & Lenzenweger, 2001; 2005) measures tactile sensitivity in participants. An anesthesiometer was utilized to deliver precise tactile stimulation on the palms of participants with either two points (the distance between two points was 6 or 10 mm), or one point, while they were blindfolded. The anesthesiometer had two moveable points and a ruler on one side to mark the distance between the points. There were three stimulus conditions: 1 point, 6mm between the two points (hard) and 10mm between the two points (easy). There were 50 trials per hand, consisting of 30 one-point trials, 10 hard two-point trials, and 10 easy two-point trials, on each hand. The order of these trials was randomized for the right hand and left hand, and the order of the stimulation of the hand was counterbalanced across participants. The participant rested his/her hand flat on the table, palm up while blindfolded and was asked to determine whether he/she feels one point or two points on his/her palm. After the tactile stimulation, the participant was instructed to respond by saying “one” or “two.” Variables included accuracy (hits), errors (misses and false alarms), and a measure of d’ sensitivity (hit rate – false alarm rate) similar to Chang & Lenzenweger (2005). We also tested the difference between performance on one’s dominant hand and their non-dominant hand since we speculated that performance might be worse on one’s non-dominant hand.

Line Bisection Task (LB)

The line bisection task (LB; Schenkenberg et al., 1980) is a measure of spatial neglect that has implications for parietal abnormalities (e.g., Mort et al., 2003; Vandenberghe et al., 2005). The version of the LB utilized in the current study was the standard paper-and-pencil version in which participants are presented with a packet containing 9 pages, each with a line approximately 16 cm varying locations in the middle of the page. Participants were instructed to keep the edges of the packet parallel to the edge of the table and mark the center of the line by drawing a small dash (i.e., bisecting the line).

Participant's line bisections were scored by measuring how many millimeters each drawn bisection was away from the actual center of the of the line. Experimenters noted the magnitude of the deviation from each of the nine trials, in addition to whether or not each deviation is on the left or right side of the actual center of the line. Bias scores were calculated by counting the number of left deviations and number of right deviations to calculate the index scores (i.e., number of right deviations minus the number of left deviations). Then experimenters computed the sum of the left deviations and the sum of the right deviations and use the following formula to calculate bias: ((sum of right deviations/number of right deviations)-(sum of left deviations/number of left deviations)).

Previous research utilizing the line bisection task has found that spatial neglect is associated with lesions in the right parietal lobule (e.g., Mort, Malhotra, Mannan, Rorden, Pambakian, Kennard & Husain, 2003; Vandenberghe, Geeraerts, Molenberghs, Lafosse, Vandenbulcke, Peeters, Peeters, Van Hecke & Orban, 2005), right superior temporal gyrus (Karnath, Ferber & Himmelbach, 2001), while others have found that neglect results from disconnections in the frontoparietal pathways (He, Snyder, Vincent, Epstein, Shulman, & Corbetta, 2007).

Based on previous literature implicating parietal abnormalities in schizophrenia in general (Torrey, 2007 for a review) and spatial neglect in particular (Cavezian, Striemer, Saoud, Rossetti, & Danckert, 2006), we predict a relationship between psychosis –proneness and line bisection scores. Previous results have found a relationship between leftward bias and schizotypal features, particularly magical ideation (e.g., Ribolsi et al., 2013, Brugger and Graves, 1997; Nalcaci et al.). However, since Mohr et al. (2003) found that healthy controls showed this relationship between magical ideation and left bias on behavioral tasks (e.g., whole-body movement tasks, such as turning and veering), but found a lack of pseudoneglect (leftward bisection in neurologically healthy controls) on traditional paper and pencil line bisection task such as the one in the current study, we predicted that individuals in the high PQ-B distress group would show more right line bisection biases compared with their lower risk peers, thus being more similar to SZ patients (e.g., Benson & Park, 2013; Petty, 1999; Ribolsi et al., 2013) in their line bisection scores than healthy controls. Furthermore, since we hypothesize that TPJ and parietal abnormalities are relevant for the etiology of multisensory self-disturbances, we predicted a significant positive relationship between line bisection scores measures of self-disturbance (e.g., BODI 2, self-tickle).

Adverse Childhood Events (ACE) Scale

Although there has been much work investigating the relationship between trauma and dissociative self-experiences (e.g., Bremner & Marmar, 2002; Scaer, 2014; Spiegel, 1997), and a growing body of literature implicating the role of traumatic history on psychotic symptoms in general (e.g., Hardy et al., 2005; Lysaker et al., 2005; Lysaker & LaRocco, 2008; Ross et al., 1994), there remains a gap in the literature that focuses on the potential importance of traumatic experiences in the etiology of dissociative self-experiences in psychotic populations, with a few notable exceptions, including Holowka et al. (2003), Vogel et al. (2006), and Vogel et al. (2009).

We utilized the ACE (Anda et al., 2010) when collecting BODI 2 data in Study 3 to test whether there is a relationship between trauma history and anomalous self-experiences in the schizophrenia spectrum. The ACE scale consists of 10 questions, asking participants about a series of negative events that may or may not have occurred during the person's first 18 years of life. Examples of items include "Did a household member go to prison?" and "Was a household member depressed or mentally ill, or did a household member attempt suicide?" ACE scores range from 0-10, and have been utilized in a variety of studies assessing public health concerns (e.g., Chapman et al., 2011; Dube et al., 2009). The ACE was included here to test predictions from the diathesis stress response model described above in conjunction with the BODI 2, psychosis proneness, and multisensory behavioral tasks.

Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS; Cohen et al., 1983) is a 10-item scale that quantifies how much one feels stressed in the past month. Items include "In the last month, how often have you felt that you were unable to control the important things in your life?" Participants are instructed to choose a number between 0 (Never) to 4 (Very Often). The PSS was included here to test predictions from the diathesis stress response model described above in conjunction with the BODI 2, psychosis proneness, and multisensory behavioral tasks.

UCLA Loneliness Scale (Version 3)

The UCLA Loneliness Scale (Version 3; Russell, 1996) is a 20 item self-report scale that was created to quantify a participant's subjective feeling of loneliness, in addition to feelings of social isolation. Participants are asked to rate each statement on a Likert scale from 1 (Never) to 4 (Often). Examples of items include “How often do you feel alone?” and “How often do you feel left out?” Eight items are reversed scored, including “How often do you feel close to people?” The UCLA Loneliness Scale was included here to test predictions from the diathesis stress response model described above in conjunction with the BODI 2, psychosis proneness, and multisensory behavioral tasks. Based on the social deafferentation hypothesis (Hoffman, 2007), we predicted that high risk individuals would show increased levels of self-reported loneliness, which would be positively correlated with positive schizophrenia-spectrum symptoms in the current sample. Further, we predicted that loneliness would be positively related to PI scores, similar to the finding in Michael and Park’s (2016) study with SZ patients.

Self Tickle Ability

Based on the intriguing result that some patients with schizophrenia are able to tickle themselves (Blakemore et al., 2000), a novel ability that has been postulated to be a result of deficiencies in the corollary discharge system, we sought to test whether this ability is present in individuals at risk for psychosis as well. As part of the large battery of questionnaires administered in the current study, we included a single item at the very end of the 74 items of the Schizotypal Personality Questionnaire (SPQ). Specifically, we asked participants to respond True/False, the same way that they had been responding to SPQ items, to the item: “Sometimes I find that I am able to tickle myself.” We chose this location in the battery of questionnaires because the response format was identical to the other SPQ items, and it did not seem out of place conceptually in the context of SPQ items, which also ask about potentially strange sounding items. Exclusion procedures were identical to the other questionnaires in that if a participant did not endorse at least one of the BODI 2 control items or if they endorsed over two of the Chapman Infrequency Scale items, they were considered appropriate for exclusion prior to analyses.

We predicted individuals at greater psychometric risk (i.e., prodromals or schizotypes) would also share this self-tickling ability (and thus, potentially an underlying abnormal corollary discharge system) more than those at lower risk for psychosis. Furthermore, we predicted that the presence of self-tickling ability would be related to increased scores on the BODI 2 (particularly items of passivity, such as thought insertion #21), and greater right line bisection scores. Finally, to begin to assess whether self-tickling is specific to the positive SZ-spectrum syndrome, we also sought to test whether the presence of self-tickling yields higher scores on the hypomania scale, physical anhedonia scale, and AQ.

Hypotheses & Predictions

Based on the hypothesis that individuals on the SZ-spectrum exhibit impaired tactile sensitivity, we predicted the high PQ-B distress group to be less sensitive on the 2 point discrimination task compared to low PQ-B distress group, and that 2 point sensitivity would be inversely related to schizophrenia-spectrum symptoms.

Based on the hypothesis that individuals on the SZ-spectrum exhibit proprioception deficits, in addition to increased self-disturbances, we predicted that the high PQ-B distress group would show greater scores on the Pinocchio Illusion. We also predicted PI scores to be related to positively related to BODI 2 scores and positive schizophrenia-spectrum symptoms. We predicted PI scores to be inversely related to 2 point discrimination sensitivity to replicate Michael & Park (2016)'s finding with SZ patients and healthy controls. Finally, we predicted both line bisection scores and TLS scores to be positively related to the Pinocchio Illusion scores, demonstrating TPJ influence on the etiology of multisensory self-disturbance.

Based on the hypothesis that individuals on the SZ-spectrum exhibit parietal abnormalities, we predicted greater line bisection bias scores in the high PQ-B distress group compared to the low PQ-B distress group. We also predicted positive relationship between line bisection and our behavioral measure of self-disturbance, the Pinocchio Illusion.

Based on the hypothesis that self-tickling is related to abnormal corollary discharge and symptoms of passivity, which are related to parietal abnormalities, we predicted that the presence of self-tickling ability would be related to greater right line bisection scores (i.e., more right deviations). Further, we predicted self-ticklers to exhibit increased scores on measures of schizophrenia-spectrum scores, self-disturbance (including the BODI 2), and dissociative experiences (including the DES-II).

Finally, we sought to test some of the predictions of the diathesis stress response model proposed at the beginning of this dissertation, and created composite variables of many scales to create larger factors to test this hypothesis. We predicted that the stress composite scale based on loneliness, trauma, and perceived stress would be related to all components of the proposed diathesis stress model, including self-disturbance, dissociative response, weak body, and subsequent schizophrenia-spectrum symptoms. We predicted that all of these components would help predict the level of overall schizophrenia-spectrum symptoms, particularly positive symptoms.

Data Analysis

Data was entered and organized in Microsoft Excel prior to analysis via JMP, version 13 (SAS Institute Inc., 2016) and SPSS, version 22 (IBM Corp, 2013). All significance tests were 2-tailed, unless otherwise indicated.

Prior to analysis, the distribution of each variable was visually scanned to check for the presence of a non-normal distribution, which was predicted in most cases. Furthermore, descriptive statistics were outlined to determine skewness and kurtosis of each variable (see Table 50 below). If variables had skewness or kurtosis values greater than +/- 2, they were considered not normal (Trochim & Donnelly, 2006; Field, 2000 & 2009; Gravetter & Wallnau, 2014). Finally, tests of normality (Shapiro-Wilks tests) were conducted on variables in question to make the final decision whether to conclude if a variable had a normal distribution. Since most of the variables utilized in the current study were considered non-normal (i.e., BODI 2 variables, perceptual aberration scale scores, and dissociative experience scale scores), and because of the small sample sizes, nonparametric tests were utilized in favor of parametric tests. Furthermore, since we do not know the population distribution for many variables (e.g., OBE), we thought nonparametric statistical methods would be the most appropriate to use whenever possible, similar to Bernstein & Putnam (1986). However, when necessary (e.g., to properly control for confounding variables), we used parametric tests if the variables to be analyzed were at least approximately normally distributed. As another example, matched pairs t tests were conducted to test for differences across dominant vs. non-dominant hand for the 2 point discrimination task, and across hands and trials for the Pinocchio Illusion task.

Spearman's rank correlations were conducted to test the correlation predictions described above. Kruskal-Wallis tests were used to compare the data between the three groups (i.e., high risk compared with mid risk and low risk), and Mann-Whitney U-tests were used to compare the data between two groups (i.e., high risk compared with low risk). Effect sizes (*r*) were calculated after conducting Mann-Whitney U tests using the formula $[Z / \sqrt{N}]$, where Z represents the converted U value from the Mann-Whitney U test in SPSS.

After conducting Binary Logistic Regression analyses in SPSS, receiver operating characteristic (ROC) curves were generated and areas under the curve (AUCs) were calculated to determine levels of sensitivity and specificity for the various Study 3 variables in their diagnostic decision making value for risk of psychosis. Finally, multiple regressions were used to test the predictive value of our new composite variables of stress, bodily self-disturbance, and dissociative responses in their prediction of psychosis risk.

Results

Descriptive Statistics

Table 50. *Descriptive Statistics of Study 3 Variables*

Variable	Range	Min	Max	Median	Mean (SE)	Std. Dev.	Variance	Skewness (SE)	Kurtosis (SE)	Normal?
BODI 2 Total	166	0	166	22.5	32.2 (3.6)	32.7	1073.6	1.66 (.264)	3.08 (.52)	Not Normal
Endorsements Sum	18	0	18	3	3.94 (.42)	3.86	14.96	1.49 (.264)	2.11 (.52)	Not Normal
#End. With Distress	9	0	9	1	1.8 (.25)	2.32	5.4	1.55 (.264)	1.78 (.52)	Normal
#Current Endorsements	17	0	17	2	2.9 (.34)	3.2	10.06	1.75 (.264)	4.05 (.52)	Not Normal
Frequency Sum	32	0	32	2.5	4.01 (.53)	4.9	23.65	2.8 (.264)	12.6 (.52)	Not Normal
Distress Sum	61	0	61	8	12.3 (1.4)	13	170.17	1.6 (.264)	2.2 (.52)	Not Normal
Vividness Sum	55	0	55	8	11.9 (1.4)	12.3	151.3	1.6 (.264)	2.6 (.52)	Not Normal
Control Scale Sum	2	2	4	4	3.8 (.05)	.48	.231	-2.5 (.264)	5.8 (.52)	Not Normal
DES-II Total	43.6	0	43.6	11.43	13.2 (1.0)	8.98	80.66	1.08 (.27)	1.07 (.54)	Normal
Amnesia Factor	29	0	29	3	4.96 (.59)	5.24	27.52	1.85 (.27)	5.06 (.54)	Not Normal
Depersonalization Factor	23	0	23	0	2.01 (.46)	4.07	16.56	3.46 (.27)	13.5 (.54)	Not Normal
Absorption Factor	54	0	54	16	19.6 (1.5)	13.6	186.16	.918 (.27)	.049 (.54)	Normal
Pathological 8 Taxon	23	0	34	2.5	4.3 (.57)	5.02	25.186	1.88 (.27)	3.8 (.54)	Not Normal
PQ-B Total	111	0	111	35	43.2 (3.5)	31.2	971.6	.48 (.27)	-.86 (.54)	Normal
Endorsements	19	0	19	7	7.3 (.55)	4.9	23.8	.44 (.27)	-.66 (.54)	Normal
End. with Distress	12	0	12	2	3.11 (.37)	3.34	11.18	.95 (.27)	-.19 (.54)	Normal
Occurrence	44	0	44	9	11.7 (1.2)	10.4	107.6	1.2 (.27)	1.01 (.54)	Normal
Distress	68	0	68	22	24.3 (2.0)	18.2	331.93	.52 (.27)	-.81 (.54)	Normal
SPQ Total	55	2	57	21	23 (1.6)	14.4	207.95	.51 (.27)	-.68 (.54)	Normal
CP Factor (+)	28	0	28	6	8.2 (.77)	6.87	47.24	.88 (.27)	-.01 (.54)	Normal
Interpersonal Factor (-)	27	0	27	10	10.7 (.84)	7.44	55.40	.34 (.27)	-1.01 (.54)	Normal
Disorganized Factor	15	0	15	6	6.4 (.50)	4.43	19.70	.32 (.27)	-1.01 (.54)	Normal
Per Ab Scale	26	0	26	3	4.2 (.52)	4.6	21.03	2.22 (.27)	6.24 (.54)	Not Normal
Temporal Lobe Scale	22	0	22	9	9.2 (.51)	4.5	20.6	.84 (.27)	.93 (.54)	Normal
Physical Anhedonia	31	1	32	11	11.6 (.62)	5.50	30.3	.97 (.27)	1.6 (.54)	Normal
Hypomanic Personality	39	0	39	18	19.9 (1.0)	9.2	84.5	.17 (.27)	-.58 (.54)	Normal
AQ Total	31	6	37	17	17.1 (.78)	6.94	48.19	.55 (.27)	-.251 (.54)	Normal
ACE Total	10	0	10	1	1.81 (.28)	2.52	6.310	1.46 (.27)	1.36 (.54)	Normal
Loneliness	46	21	67	40	41.1 (1.3)	11.4	128.95	.27 (.27)	-.77 (.54)	Normal
Perceived Stress Scale	30	5	35	18	18.8 (.68)	6.06	36.75	.152 (.27)	-.05 (.54)	Normal
Line Bisection Bias	14	-8	6	-.5	-.77 (.35)	2.99	8.96	-.135 (.281)	-.06 (.55)	Normal
# Left Deviations	9	0	9	5.5	5.12 (.29)	2.54	6.47	-.334 (.281)	-.861 (.55)	Normal
# Right Deviations	9	0	9	2	3.01 (.29)	2.54	6.48	.747 (.281)	-.554 (.55)	Normal
Index Score	18	-9	9	-3	-2.63 (.55)	4.74	22.54	.718 (.281)	-.333 (.55)	Normal
2pt Disc. Task Total %	46	48	94	76	75.7 (1.2)	9.2	84.81	-.721 (.30)	1.45 (.60)	Normal
1 Accuracy %	53.33	46.7	100	89.2	85.4 (1.6)	12.7	162.3	-.91 (.31)	.390 (.60)	Normal
Hard (6mm) Accuracy %	85	0	85	50	45.8 (2.7)	20.9	440.98	-.17 (.31)	-.66 (.60)	Normal
Pinocchio Illusion Total	1250	250	1500	712.5	760.8 (41)	324	105056	.429 (.31)	-.59 (.60)	Normal
Total # Locations on Body	5	0	5	1	1.3 (.16)	1.29	1.66	.62 (.30)	-.36 (.60)	Normal
Estimated Size Change	6.5	0	6.5	0	.61 (.132)	1.05	1.10	3.35 (.302)	15.7 (.60)	Normal

Questionnaires

Table 51. *Medians of Questionnaire Results by PQ-B Distress Group*

Questionnaires	**Total N** Median	**"Low" PQ-B** Median	**"Mid" PQ-B** Median	**"High" PQ-B** Median
SPQ **Total**	21	14	25.5	38.5
Cognitive Perceptual Factor (+)	6	4	7	14.5
Interpersonal Factor (-)	10	5	14.5	18
Disorganized Factor	6	4	6	12
Ideas of References	3	2	2.5	7
Excessive Social Anxiety	4	2	5	6.5
Odd Beliefs/Magical Thinking	0	0	1	1
Unusual Perceptual Experiences	1	1	2	3
Odd/ Eccentric Behavior	2	1	2	5
No Close Friends	2	1	3	3.5
Odd Speech	4	2	4	7
Constricted Affect	2	1	3	3
Suspiciousness	2	1	3	5
DES-II Total	11.43	8.9	15.7	18.6
Taxon (8 critical items)	2.5	2	4	4
Amnesia Factor	3	3	3	8
Depersonalization Factor	0	0	1	2
Absorption Factor	16	12	23	27
AQ Total	17	13	19	23
Social Skill	2	2	3	4.5
Attention Switching	5	4	5.5	6
Attention to Detail	5	5	5	6.5
Communication	2	2	2.5	4
Imagination	2	2	3	2.5
Perceptual Aberration Scale	3	1	3.5	5
Temporal Lobe Scale	9	7	10	11
Physical Anhedonia Scale	11	10	11	10.5
Hypomanic Personality Scale	18	17	19	23.5
Adverse Childhood Events (ACE)	1	0	2	1
Perceived Stress Scale	18	16	20	24
UCLA Loneliness Scale	40	35	46	54

As can be seen in Table 50 above, there were no significant differences among demographic variables across the three PQ-B risk groups, and there were also no differences among these variables when comparing the High vs. Low PQ-B distress group (p > .1). Thus, it is reasonable to compare the three groups on the following variables described below. However, BODI 2 total scores (ρ = -.269, p = 0.004), loneliness (ρ = -.296, p = 0.009), PQ-B occurrence scores (ρ = -.292, p = 0.010), and the disorganized factor of the SPQ (ρ = -.278, p = 0.014) were all negatively related to Edinburgh laterality index scores (ρ = -.296, p = 0.009) so we tried controlled for Edinburgh during analyses whenever possible when analyzing data with these measures.

Please refer to Chapter 5 above and Appendix G below for descriptive statistics for BODI 2 results, and Table 51 below for descriptive statistics of all remaining Study 3 questionnaires, and Appendix M for further details.

Unexpectedly, when dividing groups into two PQ-B groups (high compared to low), we did not find a significant difference on our measure of trauma history ($p > .05$). As predicted, when dividing groups into two PQ-B groups (high compared to low), we found significant differences (High scoring greater than Low) on loneliness scores (U=107.5, p<.0001, r = .49). As predicted, when dividing groups into two PQ-B groups (high compared to low), we found significant differences (High scoring greater than Low) on temporal lobe scale scores (U=88, p<.0001, r = .55).

New Composite Variables

We created composite variables out of the many scales and items that assess the same common factor to better test our hypotheses in the current sample. Please see Table 52 below for details on the new composite variables.

Table 52. *New Composite Variables Utilized in Study 3 Analyses*

New Composite Variable	Component 1	Component 2	Component 3	Component 4
Stress Composite Variable	ACE	PSS	Loneliness	-
SZ Spectrum Symptom Composite Variable	SPQ	PQ-B Total	Perceptual Aberration	Hypomanic Personality
Positive SZ Spectrum Composite variable	SPQ C-P (+) Factor	PQ-B Total	Perceptual Aberration	Hypomanic Personality
Negative SZ Spectrum Composite Variable	SPQ Inter (-) Factor	Physical Anhedonia	-	-
Dissociative Response Composite Variable	BODI 2 DD Factor	DES-II Total	-	-
Self-Disturbance Composite Variable	BODI 2 Total	DES-II 8	Perceptual Aberration	OBE & Self-Tickle Items
Weak Body Composite Variable	Total PI Score	Total 2pt Misses	-	-

Note: composite variables were comprised of weighted scores when appropriate

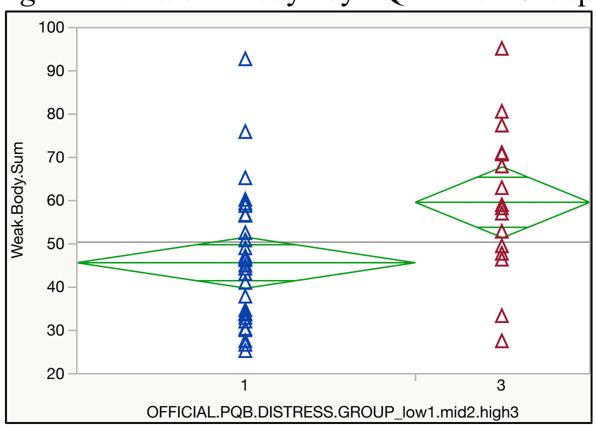
The High PQ-B distress group was significantly greater than Low PQ-B distress group on the **stress** composite score (U=125, p<.0001, r = 0.47), which is made up of ACE, Perceived Stress, and Loneliness. Further, after dividing the participants into 3 groups based on level of stress, we found group differences for levels of self-disturbance ($\chi^2_{(2)}$=7.7, p=0.02), dissociative response ($\chi^2_{(2)}$=7.3, p=0.02), total schizophrenia-spectrum symptoms ($\chi^2_{(2)}$=10.6, p=0.004), positive SZ-spectrum symptoms ($\chi^2_{(2)}$=9.9, p=0.006), negative SZ-spectrum symptoms ($\chi^2_{(2)}$=10.6, p=0.004), and weak body strength ($\chi^2_{(2)}$=7.43, p=0.024), not correcting for multiple comparisons. Thus, our hypothesis about how stress may act as a catalyst to schizophrenia-like symptomatology is seen in these analyses with the current dataset.

The High PQ-B distress group was significantly greater than Low PQ-B distress group on scores of **self-disturbance** (U=102, p<.0001, r = 0.57) when comparing scores on a composite stress variable made up of BODI 2 total scores, DES-II pathological 8 taxon scores, Perceptual Aberration total scores, OBE history, and ability to tickle oneself (as described in the introduction above).

The High PQ-B distress group was significantly greater than Low PQ-B distress group on scores of **dissociative responses** (U = 112.5, p<.0001, r = 0.51) when comparing scores on a composite stress variable made up of BODI 2 dissociative distancing factor items (see Study 2B above for details) and total DES-II scores.

The High PQ-B distress group was significantly greater than Low PQ-B distress group when comparing scores on a composite stress variable made up of total Pinocchio Illusion scores and 2 Point Discrimination Task errors (specifically, misses), which we will now call "**weak body**" (U=144, p=0.020, r = 0.36), as can be seen in Figure 17 below.

Figure 17. "Weak Body" by PQ-B Risk Group.

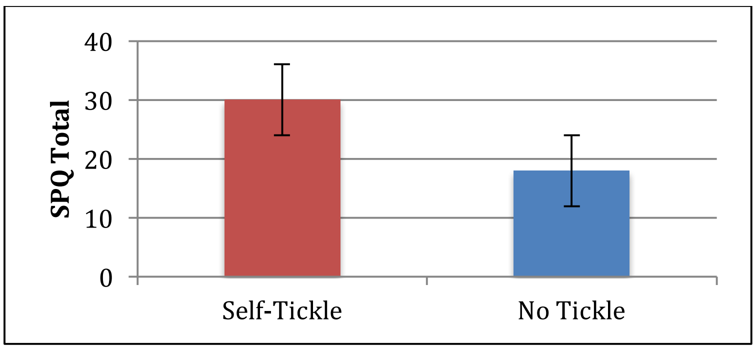


Self-Tickle Item

We found that 15% of individuals reported being able to tickle themselves. Self-tickling was unrelated to sex, years of education, handedness, Edinburgh laterality, or race (p > .1). Self-tickling showed a trending difference in age (U = 279.5, p = 0.09), with self-ticklers being slightly younger (*Median* = 18.8) than their non-self-tickling peers (*Median* = 19.3) (U = 279.5, p = 0.09).

As predicted, participants who reported being able to tickle themselves also scored higher on schizophrenia-spectrum measures, including total SPQ scores (U = 254, p = 0.047), and PQ-B occurrence (U = 254; p = 0.047). Further, self-ticklers were more likely to be in the high group of the SZ-spectrum composite score split based on z-scores ($\chi^2_{(2)}$= 7.3, p = 0.007, Fisher's exact test $p = 0.010$). Notably, self-ticklers did not endorse significantly more PQ-B items, or yield higher PQ-B distress scores, than people that cannot tickle themselves, which went against our predictions. The self-ticklers also did not score higher on measures of negative or disorganized schizotypy, including the SPQ negative factor, SPQ disorganized factor, or physical anhedonia scores. Thus, self-tickling seems to be associated with higher levels of schizotypal traits that are driven by positive schizotypal traits, such as referential thinking, magical ideation, and unusual perceptual experiences.

Figure 18. Median SPQ scores in Self-Ticklers



Since it important to determine the specificity of this phenomenon (i.e., if other clinical disorders, such as bipolar disorder, also share this ability to tickle themselves), we tested whether the presence of self-tickling yields higher scores on the hypomania scale and AQ. Self-ticklers were not different in terms of their hypomania scores, but did show trending greater scores on the AQ scale ($U = 268.5$, $p = 0.077$), with self-ticklers' median = 20, and non self-ticklers' median = 16 on the AQ.

As predicted, individuals who can tickle themselves scored higher on measures of bodily self-disturbance compared to those who do not report this ability, including BODI 2 total scores ($U = 331.5$, $p = 0.022$), and the dissociative experiences composite scale ($U = 238.5$, $p = 0.029$).

Moreover, individuals in the High BODI 2 Distress based on the proposed cutoff of eight from Study 2B were more likely to be able to report being able to tickle themselves ($\chi^2_{(2)}$= 8.7 , p=0.003). In contrast, self-tickling was unrelated to perceptual aberration scale scores, or weak body scores. We did not compare self-disturbance composite scores with the self-tickling item since the self-tickling item is included in the self-disturbance composite calculation. Interestingly, there were no differences in the BODI 2 control tickle item ($p > .1$) but there was a slight difference in the thought insertion item, which we predicted a priori to be elevated in self-ticklers due to the passivity connection between corollary discharge abnormalities and self-tickling in the right parietal lobe in SZ, and thus, the trending p – value at the one-tailed level somewhat confirms our predictions (U = 331.5, p = 0.09) that ability to tickle oneself is related to thought insertion in non-clinical populations.

<u>Pinocchio Illusion</u>

Matched pairs t tests were conducted to test for differences across dominant vs. non-dominant hand and across trials for the Pinocchio Illusion task. We found significant no difference across trials (i.e., first vs. second trial) or across hands ($p > .1$), but did see trending greater differences between dominant hand PI total scores compared to non-dominant hand scores.

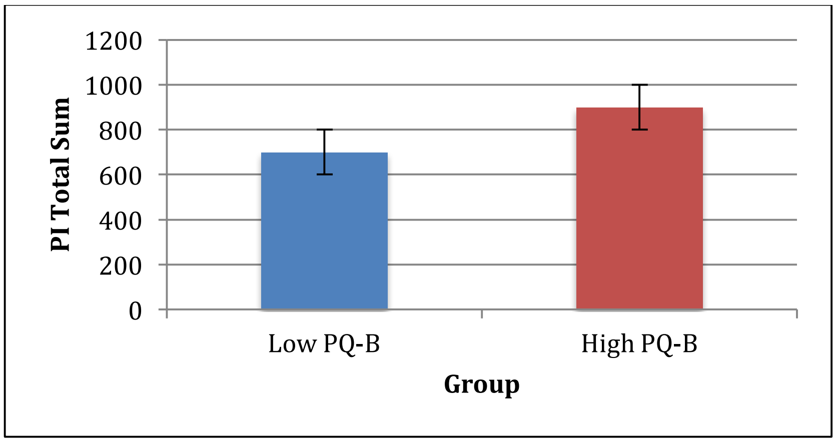
Approximately 50% of participants endorsed experiencing the Pinocchio Illusion when asked outright at the end of the procedure as described above in the methods section. Endorsement of the Pinocchio Illusion was unrelated to age, sex, race, handedness, Edinburgh laterality, or years of education ($p < .05$). Please refer to Table 53 below for full details of the descriptive statistics of the Pinocchio Illusion results. Results describing relationship between PI and the other behavioral tasks are described in further detail below in the other task sections.

Table 53. *Pinocchio Illusion Results (Medians & Percentages)*

Pinocchio Illusion (PI) Variables	**Total N**	**"Low" PQ-B**	**"Mid" PQ-B**	**"High" PQ-B**
1) Nose Pushing Forward	25	0	0	62.5
% Endorsement	51%	50%	29%	75%
2) Nose Feeling Longer	0	0	0	0
% Endorsement	35%	34%	29%	44%
3) Nose Feeling Wider	0	0	0	25
% Endorsement	39%	31%	36%	56%
4) Disconnected from self	50	0	50	112.5
% Endorsement	100%	100%	100%	100%
5) Pulsation in nose/finger	75	75	50	100
% Endorsement	73%	72%	64%	81%
6) Pulsation in arm	200	200	162.5	200
% Endorsement	57%	59%	50%	56%
7) "Tingliness" in nose/finger	75	50	50	100
% Endorsement	73%	69%	64%	88%
8) "Tingliness" in arm	175	200	137.5	200
% Endorsement	98%	97%	100%	100%
9) Arm extending forward	0	0	0	75
% Endorsement	40%	25%	43%	69%
10) Temperature Change	75	50	62.5	162.5
% Endorsement	81%	72%	86%	94%
11) Nose feeling smaller	0	0	0	0
% Endorsement	19%	19%	14%	25%
Total Sum (Q items)	712.5	700	575	900
1st Trial (Q items)	400	367	300	462
2nd Trial (Q items)	350	312.5	325	450
Total Physical Q Sum	525	537	500	562.5
Total Perceptual Ab. Q Sum	104.5	100	87.5	312.5
Dominant hand Q Sum	400	350	325	475
Non dominant hand Q Sum	350	300	250	475
Total (Sum of Q endorsements)	6	6	6	7.5
Subjective PI Endorsement	49%	56%	28%	56%
Avg Onset Sensations (sec)	40	49.5	43.3	29
Total # Locations on Body	1	.5	1	2
Estimated Size Change (cm)	0	0	0	1.5
Vividness	0	0	0	0
Total Nominal Endorsements	2	2	2.5	2.5

As predicted, participants in the High PQ-B distress group scored significantly higher on the PI total sum across trials (U = 146, p = 0.016, r = 0.35) compared to the Low PQ-B distress group. The High PQ-B distress group was also higher on the Perceptual Aberration PI subscale items (U = 138, p = 0.009, r = 0.38) than the Low PQ-B distress group. In contrast, the two groups were not significantly different on the PI Physical subscale items (U = 209, p = 0.303, r = 0.15), which we predicted as well.

Figure 18. Pinocchio Illusion in High vs. Low PQ-B Distress Groups



As predicted, PI total scores were positively correlated with Positive Schizophrenia-Spectrum Symptom Composite Scores (ρ =0.287, p=0.024), but not Negative Schizophrenia-Spectrum Symptom Composite Scores (ρ = -0.081, p=0.529).

PI endorsement totals of vividness of illusion, temperature change, onset of sensation, number of locations of sensations, and estimated size change were significantly positively correlated with BODI 2 total scores (ρ =0.265, p=0.038). Furthermore, we found that BODI 2 BS factor was positively correlated with PI endorsement totals (ρ =0.259, p=0.042), but not the BODI 2 DD factor (ρ =0.147, p=0.25) or the BODI 2 HA factor (ρ =0.19, p=0.14).

Finally, as predicted, PI total scores were positively related with Temporal Lobe Scale scores (ρ =0.31, p=0.019).

2 Point Discrimination Task

We had to exclude one participant for only achieving 48% accuracy across all trials of the 2 point discrimination task. Matched pairs t tests found no difference ($p > .1$) in performance between dominant hand palm and non-dominant hand palm for easy trials, hard trials, one point trials, and overall accuracy, sensitivity and errors ($p > .1$), so the accuracy, errors, and sensitivity scores were averaged into one score for both palms for each participant for each type of trial.

2 point discrimination accuracy was significantly related to age ($\rho = -0.282$, $p = 0.028$), Edinburgh laterality index ($\rho = 0.257$, $p = 0.046$), sex ($U = 260.5$, $p = 0.011$), and handedness ($U = 44.5$, $p = 0.012$). Thus, we tried to controlled for these demographic variables in our analyses whenever possible.

Table 54. *2 Point Discrimination Medians by PQ-B Distress Group*

2 Point Variables	Total N	"Low" PQ-B	"Mid" PQ-B	"High" PQ-B
Total Accuracy (%)	76	78	76	75.5
"1 point" Accuracy (%)	89.2	89.2	86.7	90.1
"Easy" (10mm) Accuracy (%)	80	90	72.5	75
"Hard" (6mm) Accuracy (%)	50	52.5	42.5	50
Total Errors	24	22	24	24.5
Total False Alarms	7	7	8	6.5
Total Misses	14	12	17	17
Total d'	.7	.71	.695	.675
1 point d'	.46	.46	.44	.49
10mm d'	.12	.16	.09	.10
6mm d'	.3	.3	.4	.4
6mm Dominant Hand d'	.4	.4	.4	.5
6mm Non-Dominant Hand d'	.4	.4	.3	.4

Contrary to predictions, the high and low PQ-B distress groups were not significantly different on 2 point discrimination sensitivity scores ($p > .1$). However, for individuals in the highly distressing PQ-B group, schizophrenia-spectrum symptom scores were inversely related to 2 point discrimination sensitivity (d') scores ($\rho = -0.54$, $p = 0.019$) on the hard trials, which has been implicated as the most important variable to assess in this population (Chang & Lenzenweger, 2001; 2005). This relationship was not found in the low PQ-B distress group or mid PQ-B distress group ($p > .1$).

2 point sensitivity scores were unrelated to total PI scores or PI physical subscale scores ($p > .1$), but were inversely related to PI perceptual aberration scores ($\rho = -0.26$, $p = 0.044$). In contrast, PI physical factor scores were positively correlated with 2 point overall accuracy ($\rho = 0.25$, $p = 0.04$). We also found that the "nose longer" PI item (which is arguably the item that best describes the essence of the PI illusion) was negatively related to 2 point hit rate ($\rho = -0.26$, $p = 0.043$) across all 2 point discrimination task trials, although this was not corrected for multiple comparisons, however.

Line Bisection Task

Line Bisection Index scores were significantly related to handedness ($U = 60.5$, $p = .001$), meaning that left-handed participants made significantly greater amounts of left deviations than right handed participants, and were more likely to be classified in the "Left Bias" group described below ($\chi^2_{(1)} = 5.9$, $p = 0.015$; Fisher's Exact Test $p = .017$). Similarly, Edinburgh laterality scores were positively related to line bisection index scores ($\rho = 0.302$, $p = 0.01$), and sum of right deviations ($\rho = 0.263$, $p = 0.026$), while inversely related to sum of left deviations on the line bisection task ($\rho = -0.297$, $p = 0.011$). Finally, line bisection index scores were positively related to years of education ($\rho = 0.247$, $p = 0.037$), indicating that participants with fewer years of education were more likely to make more left deviations on the line bisection task. Thus, we controlled for these demographic variables whenever possible in our analyses below.

After categorizing overall line bisection bias scores into right or left, we found that 44% of subjects showed a right overall line bisection bias, and 56% showed a left overall line bisection bias. To determine if PQ-B distress group classification could be predicted by right vs. left line bisection bias, a chi-square contingency table was created in SPSS. Results suggest no significant difference between the High and Low PQ-B distress groups ($\chi^2_{(1)=}$0.49, p = 0.49). However, we found that individuals who were classified as "Right Bias" were significantly more likely to be able to tickle themselves than people in the "Left Bias" category ($\chi^2_{(2)}$ = 4.28, p = 0.039) as predicted above. Furthermore, total PI endorsements were positively related to right line bisection deviations (ρ = 0.318, p = .02), providing indirect evidence for right parietal contributions to anomalous self-disturbance in this sample.

Table 55. *Line Bisection Medians by PQ-B Distress Group*

Line Bisection Variables	**Total N**	**"Low" PQ-B**	**"Mid" PQ-B**	**"High" PQ-B**
Bias	-.5	-.13	-.5	-1.44
Index Score	-3	-2	-4	-4.5
# Left Deviations	5.5	5	6	6
# Right Deviations	2	3	2	2
Sum Left Deviations	18	14	22	24.5
Sum Right Deviations	6	8	4	4

Contrary to predictions, we did not find significant differences in line bisection bias scores when comparing the two groups of prodromal distress risk (see Table 55 above for medians). Line bisection scores were unrelated to measures of schizotypy, with the exception of the SPQ "ideas of reference" subscale, which was trending significant for a positive relationship with sum of left deviations (ρ = 0.209, p = .078) but was not corrected for multiple comparisons.

Correlations among Study 3 Measures

Table 56. *Spearman's Correlation Matrix: Questionnaires Utilized in Study 3*

	1	2	3	4	5	6	7	8	9	10	11	12
1. BODI 2 Total												
2. PQ-B Total	.73*											
3. SPQ Total	.67*	.81*										
4. DES-II Total	.62*	.61*	.63*									
5. Perceptual Aberration	.68*	.70*	.70*	.62*								
6. TLS	.69*	.63*	.63*	.51*	.56*							
7. AQ	.41*	.54*	.71*	.49*	.45*	.25*						
8. Physical Anhedonia	.11	.17	.26*	.15	.07	-.04	.39*					
9. Hypomania	.28*	.33*	.33*	.25*	.32*	.48*	.01	-.26*				
10. Perceived Stress	.47*	.48*	.47*	.40*	.43*	.41*	.33*	.16	.17			
11. Loneliness	.43*	.49*	.57*	.39*	.37*	.31*	.51*	.39*	.09	.59*		
12. ACE	.18†	.23*	.21†	.07	.18	21†	.17	.01	.15	.35*	.3*	

**p* <.05; † *p* <.1; Note: not corrected for multiple comparisons*

As expected, ACE scores (traumatic experiences in childhood) were positively related to PQ-B total scores, perceived stress, and loneliness among Vanderbilt undergraduates. Contrary to predictions, ACE total scores were only trend-level positively correlated with BODI 2 total scores. Similarly, ACE scores were also unrelated to DES-II scores, which is also surprising.

Perceived stress was related to everything except hypomania and physical anhedonia scores. Loneliness was positively related to everything except hypomania. Hypomania and physical anhedonia were inversely related to one another. Temporal lobe scale scores were related to everything except physical anhedonia and ACE (which was trending). Similarly, AQ was also positively related to everything except for physical anhedonia and ACE.

Table 57. *Spearman's Correlations among Composite Variables Utilized in Study 3*

	1	2	3	4	5	6	7
1. Stress Variable							
2. Self-Disturbance Variable	.47*						
3. Dissociative Response Variable	.47*	.99*					
4. SZ Spectrum Variable	.53*	.78*	.88*				
5. Positive SZ Spectrum Variable	.49*	.78*	.74*	.98*			
6. Negative SZ Variable	.59*	.53*	.53*	.69*	.56*		
7. Weak Body Variable	.03	.16	.16	.33*	.40*	-.03	

**p* <.05; † *p* <.1; Note: not corrected for multiple comparisons*

As one can see in Table 57, as predicted, the Self-Disturbance composite variable was positively related to positive schizophrenia-spectrum symptoms. The Weak Body variable was positively related to schizophrenia spectrum symptoms and positive symptoms, but not related to negative symptoms. Unexpectedly, the Weak Body variable was unrelated to the Stress variable, Self-Disturbance variable or Dissociative Response variable.

Table 58. *Spearman's Correlations Matrix: Tasks Utilized in Study 3*

	Total PI	**PI Per Ab**	**PI Physical**	**2Pt Hits**	**2Pt d'**	**LB Bias**	**LB Index**
Total PI							
PI Per Ab	.80*						
PI Physical	.85*	.44*					
2Pt Hits	-.08	-.24†	-.07				
2Pt d'	-.11	-.25*	-.09	.87*			
LB Bias	-.11	-.14	.08	.18	.18		
LB Index	-.07	-.17	-.04	.17	.22†	.83*	

**p <.05; † p <.1; Note: not corrected for multiple comparisons*

As one can see in Table 58 above, as predicted, the PI perceptual aberration scale and the PI physical scale were significantly correlated, but not as strong as one might imagine if we were to simply combine both into one measure without considering separating the two.

Multiple Regressions among Study 3 Measures

In order to test some of the predictions made by the Diathesis Stress Response model described above, we used multiple regression to see if our new composite variables were good at predicting total schizophrenia-spectrum composite scores in general, in addition to positive schizophrenia-spectrum composite scores in particular. Table 59 below outlines our significant results, providing partial support for our proposed hypothesis.

Table 59. Predicting SZ-Spectrum Symptoms from Composite Variables using Multiple Regression.

	t	β	df	*F*	R^2
SZ Spectrum Total			(4, 76)	32.7***	0.68
Weak Body	2.91**	.214			
Dissociative Response	1.35	.203			
Self-Disturbance	3.25**	.469			
Stress	3.54**	.281			
Positive SZ Spectrum			(4, 76)	35.0***	0.69
Weak Body	4.00***	.287			
Dissociative Response	1.55	.226			
Self-Disturbance	3.36**	.474			
Stress	2.61*	.203			

Note. β represents standardized beta coefficient; R^2 represents adjusted *R* squared
*** *p<.001; ** p < .01; * p < .05;* † *p < .1*

Sensitivity & Specificity

After conducting Binary Logistic Regression analyses in SPSS, ROC curve analyses were conducted in SPSS to determine levels of sensitivity and specificity for Study 3 variables in their diagnostic decision making value for psychosis risk. The variable with the most area under the curve for determining psychosis risk for the variables unique to Study 3 (i.e., variables not included in previous analyses in earlier studies below, such as BODI 2 and DES-II) was the self-disturbance composite variable (see Figure 20 below), followed by the perceived stress scale, dissociative response composite variable, loneliness, weak body composite variable, stress composite variable, Pinocchio Illusion total sum, and finally levels of adverse childhood events, which was not significant (see Table 60 below for details). Further, Self-Disturbance Composite scores were also useful in determining Low PQ-B status when the direction was turned in the opposite direction (area under the curve = .791, *p*<.0001).

Figure 20. ROC Curve Showing Self-Disturbance Determining High PQ-B Status in Study 3.

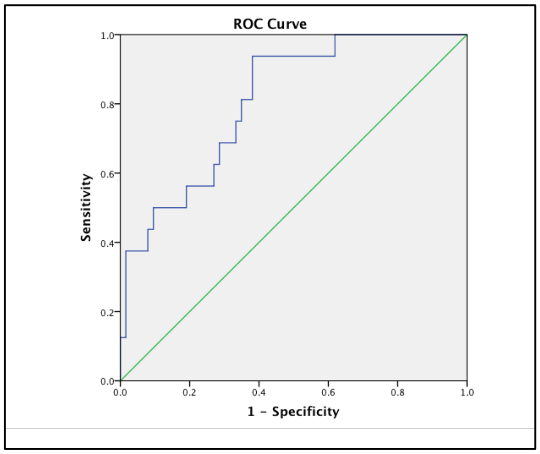


Table 60. *ROC Area Under the Curve Data Determining High PQ-B Distress Group Status*

Variable	Area under the curve	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Total PI Sum	.730	.070	.006*	.593	.968
PI "Nose Longer" Item	.715	.078	.011*	.561	.868
Loneliness	.748	.069	.003*	.611	.884
Perceived Stress Scale	.798	.063	<.0001*	.674	.922
ACE	.544	.084	.587	.379	.709
Stress Composite	.738	.078	.004*	.585	.891
Self Disturbance	.807	.061	<.0001*	.688	.926
Dissociative Response	.772	.076	.001*	.623	.921
Weak Body	.741	.075	.004*	.594	.888

**p < .05; † p<.1*

Table 61. *Classification Accuracy of Study 3 Variables versus High PQ-B Distress Group Status (High Risk)*

Cutoff Scores	Sensitivity	Specificity	PPV	NPV	LR	$\chi^2_{(1)}$	***Fisher's Exact Test***
Total PI Sum ≥ 675	80%	51%	35%	89%	4.7	4.43 (p = .035*)	p = .041*
Loneliness ≥ 40	75%	57%	31%	90%	5.5	5.27 (p = .022†)	p = .027*
Perceived Stress Scale ≥ 16	87%	38%	27%	92%	4.3	3.78 (p = .052†)	p = .074†
Stress Composite ≥ 63	73%	63%	33%	89%	5.2	5.18 (p = .023*)	p = .045*
Self Disturbance ≥ 37	75%	67%	37%	91%	8.9	8.8 (p = .003*)	p = .004*
Dissociative Response ≥ 27	75%	71%	40%	92%	11.3	11.4 (p = .001*)	p = .001*
Weak Body ≥ 53	60%	76%	45%	85%	6.2	6.40 (p = .011*)	p = .024*

**p < .05; † p<.1; Note: PPV = positive predictive value; NPV = negative predictive value; LR = likelihood ratio*

In determining High PQ-B distress group status, the best predictor from the Study 3 variables was scoring over 27 on the Dissociative Response Composite Variable, which has a likelihood ratio of 11.3, 75% sensitivity and 71% specificity as can be seen above in Table 61, and is comprised of the BODI Dissociative Depersonalization Factor and the total score of the DES-II.

Discussion

Pinocchio Illusion

The major aim of the third study in the current dissertation proposal was to examine the relationship between psychosis-proneness and anomalous multisensory integration. This was accomplished comparing Pinocchio Illusion scores across groups of psychosis risk as indexed by sum of distressing endorsements on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011).

As predicted, participants in the highly distressing PQ-B group scored significantly higher on the PI total sum across trials compared to the low PQ-B distress group. The High PQ-B distress group was also higher on the Perceptual Aberration PI subscale items compared with the Low PQ-B distress group, but the two groups were not significantly different on the PI Physical subscale items, which we predicted as well. Total Pinocchio Illusion scores were positively correlated with positive schizophrenia-spectrum symptom scores, but not negative schizophrenia-spectrum symptoms. Finally, as predicted, PI total scores were positively related with Temporal Lobe Scale scores, indicating possible temporal lobe contributions to abnormal multisensory self-disturbance, and PI total endorsements were positively related to right line bisection deviations, providing indirect evidence for both temporal lobe and right parietal contributions to anomalous self-disturbance in this sample.

Thus, our predictions were confirmed that individuals with higher risk for psychosis would have greater feelings of Pinocchio Illusion in total, and also more specifically related to the Perceptual Aberration aspects of the Pinocchio Illusion, including feeling as if one's nose is growing, as opposed to feeling the pulsation of the vibration, for example. This is significant because it shows that the high risk group is endorsing more of the types of effects that are related to a fluid body boundary, which is related to self-disturbance, as opposed to general bodily symptoms related to the Pinocchio Illusion, which could be a result of suggestibility and general response bias. Further, we found that the Pinocchio Illusion was related to positive schizotypal symptoms, but not negative, indicating specificity of this multisensory self-disturbance. We also found a positive relationship between the Pinocchio Illusion and the BODI 2 scores, and more specifically that the PI was more strongly related to the Bodily Self-Aberration factor of the BODI 2 compared to the Dissociative Depersonalization factor and Hallucinatory Experiences factor. This finding provides convergent validity support for the BODI 2 in that the PI is a behavioral measure of self-disturbance. Finally, the relationship between the PI and both the TLS and line bisection task implicates temporal lobe and right parietal contributions to multisensory self-disturbances in psychosis-prone individuals. This collection of results also suggests that the TPJ might be important for this illusion as well, which makes sense given the literature that the TPJ is involved in multisensory integration (Ionta et al., 2011), positive schizotypal traits (Arzy et al., 2007), self-disturbances, such as the OBE (Blanke et al., 2004; Blanke et al., 2005), and vestibular functioning (Lopez et al., 2008), all of which have been shown to be relevant to the current study.

2 Point Discrimination

A **secondary aim** of the current study was to investigate tactile discrimination deficits in relation to proprioception dysfunction in schizotypes prone to dissociative experiences. This was accomplished in part by conducting Spearman's correlations between PI scores and 2 discrimination point sensitivity scores.

Based on the hypothesis that individuals higher on the schizophrenia-spectrum exhibit impaired tactile sensitivity, we predicted that the high psychometric risk group (i.e., high PQ-B distress group) would show decreased tactile sensitivity on the 2 point discrimination task. Contrary to predictions, the high and low PQ-B distress groups were not significantly different on 2 point discrimination sensitivity scores. However, for individuals in the highly distressing PQ-B group, schizophrenia-spectrum symptom scores were inversely related to 2 point discrimination sensitivity (*d'*) scores on the hard trials, which has been the variable at the focus of previous studies, and at least somewhat consistent with previous findings in the literature (e.g., Chang & Lenzenweger, 2005).

Total PI scores were not related to total 2 point accuracy scores as predicted, but that was likely because the two PI subscales performed in opposite directions with 2 point discrimination scores. Specifically, we found that PI perceptual aberration factor scores were inversely related to *d'* scores, while PI physical factor scores were positively correlated with 2 point overall accuracy. The fact that the PI physical scores with 2 point accuracy are positively correlated with 2 point accuracy makes sense conceptually; both variables indicate that high scores mean that the participant is feeling sensations well. Thus, these findings partially replicate Michael & Park's (2016) that tactile discrimination and PI strength are inversely related, and also helps clarify that it seems as if the perceptual aberration type items in the PI interview (e.g., nose growing, feeling disconnected from the rest of one's body) seem to be driving this inverse relationship, rather than the more general physical sensations such as tingling or pulsations, which most of the participants in this sample endorsed, and would help explain why this relationship is so important for individuals on the schizophrenia-spectrum. Indeed, we found that the "nose longer" PI item, which is arguably the item that best describes the essence of the PI illusion, was negatively related to 2 point hit rate across all 2 point discrimination task trials. Taken together, the current study supports the hypothesized relationship between tactile discrimination sensitivity deficits and increased susceptibility to PI strength in both people at risk for psychosis and healthy adults in the general population.

Measures of Self-Disturbance

A **third aim** of the current study was to correlate measures of self-disturbance with behavioral measure of anomalous multisensory integration. This was accomplished in part by conducting Spearman's correlations between BODI 2 scores with Pinocchio Illusion scores. We also sought to specifically test the utility and positive predictive value of the BODI 2 cutoff scores found previously in Study 2B with the Study 3 variables. Finally, we also looked at the self-tickle nominal item that was briefly mentioned above in the methods section.

BODI 2

PI endorsement totals were significantly positively correlated with BODI 2 total scores, in addition BODI 2 Bodily Self Aberration factor, but not the BODI 2 Dissociative Depersonalization factor, or the BODI 2 Hallucinatory Experiences factor, indicating that the items about bodily self-disturbance are what may be driving the relationship with the Pinocchio Illusion rather than dissociative depersonalization or hallucinatory experiences. Importantly, this finding provides convergent validity support for the BODI 2 in that the PI is a behavioral measure of self-disturbance.

Self-Tickle

We also looked at the results from the self-tickle item that we introduced in the current study to test the hypothesis that individuals at high risk for psychosis would be more likely to report being able to tickle themselves compared to lower risk peers. We found that 15% of individuals reported being able to tickle themselves. As predicted, participants who reported being able to tickle themselves also scored higher on schizophrenia-spectrum measures, including total SPQ scores, and PQ-B occurrence. Further, self-ticklers were more likely to be in the high group of the SZ-spectrum composite score variable. Notably, self-ticklers did not endorse significantly more PQ-B items, or yield higher PQ-B distress scores, than people that cannot tickle themselves, which goes against our predictions. The self-ticklers also did not score higher on measures of negative or disorganized schizotypy, including the SPQ negative factor, SPQ disorganized factor, or physical anhedonia scores. Thus, self-tickling seems to be associated with higher levels of schizotypal traits that are driven by positive schizotypal traits.

As predicted, individuals who report being able to tickle themselves score higher on measures of bodily self-disturbance compared to those who do not report this ability, including BODI 2 scores and the dissociative experiences composite scale. In contrast, self-tickling was unrelated to temporal lobe scale scores, perceptual aberration scale scores, or weak body scores. Interestingly, there were no differences in the BODI 2 control tickle item but there was a slight difference in the thought insertion item, which we predicted a priori to be elevated in self-ticklers due to the passivity connection between corollary discharge abnormalities and self-tickling in the right parietal lobe, and thus somewhat confirms our predictions.

Furthermore, individuals who are able to tickle themselves were also more likely to be in the right line bisection bias category, providing further support for the link between right parietal abnormalities and self-disturbance, which is described in further detail below.

Since it important to determine the specificity of this phenomenon (i.e., if other clinical disorders, such as bipolar disorder, also share this ability to tickle themselves), we tested whether the presence of self-tickling yielded higher scores on the hypomania scale and AQ. Self-ticklers were not different in terms of their hypomania scores, but did show trending greater scores on the AQ scale, which has interesting implications for autism, sense of self agency, and possible differences in corollary discharge functioning in ASD populations. This needs replication, of course.

Diathesis Stress Response Model

The **fourth aim** of the current dataset was to test the utility of the proposed diathesis stress response model that is outlined in the introduction above, and investigate the relationships between (1) tactile and proprioception abnormalities, indicating a "weak body"; (2) dissociative depersonalization; (3) anomalous bodily self-experiences; and (4) level of stress and trauma in relation current level of schizophrenia-spectrum symptoms and relative to one's psychometric risk for developing a psychotic disorder. This was accomplished through conducting a multiple regression analysis through several composite variables that represented the components described above. The multiple regression analysis indicated that these four variables are significant in predicting schizophrenia-spectrum symptoms in general, and even better at predicting positive schizophrenia-spectrum symptoms.

In determining High PQ-B distress group status, the best predictor from the Study 3 variables is scoring over 27 on the Dissociative Response Composite Variable, which has a likelihood ratio of 11.3, 75% sensitivity and 71% specificity, and is comprised of the BODI Dissociative Depersonalization Factor and the total score of the DES-II.

We also conducted Spearman's correlations between several of these components, and found that the weak body composite, which is comprised of PI scores and 2 point misses, was related to positive schizophrenia-spectrum symptoms (e.g., magical thinking, perceptual aberrations), but not negative schizophrenia-spectrum symptoms (e.g., anhedonia), indicating that the sensory disturbances quantified here are more related to positive symptom risk as opposed to negative schizotypal traits, such as anhedonia or amotivation. This piece of the result is important because a trait like low motivation could significantly impact our data in a misleading way (e.g., if someone very high in negative schizotypal traits with high anhedonia and low motivation came in to do the study simply wanting SONA credit hours, they might not care if they guessed the accurate 2 point decision, and thus their actual tactile discrimination ability would not be reflected in their 2 point discrimination sensitivity score).

The PQ-B risk groups were significantly different in reporting of stress when comparing scores on a composite stress variable made up of loneliness, perceived stress, and adverse childhood events. After dividing the participants into three groups based on level of stress, we found group differences for levels of self-disturbance, dissociative response, total schizophrenia-spectrum symptoms, positive SZ-spectrum symptoms, negative SZ-spectrum symptoms, and weak body strength. Thus, our hypothesis about how stress may act as a catalyst to schizophrenia-like symptomatology is seen in these analyses with these data. Further, we also found relationships between BODI 2 and perceived stress, loneliness and trend relationship with adverse childhood events, indicating possible relationship between trauma and self-disturbance in healthy populations.

Future directions include more complex statistical analyses of the data, including structural equation modeling, to help clarify the specific relationships among these variables. It would also be helpful to study these components in adolescents at risk for psychosis in a prospective study.

Possible Etiological Factors in Multisensory Self-Disturbances in the SZ-Spectrum

The **final aim** of the current study was to look at possible etiological factors for these multisensory self-disturbances. Since the TPJ has been implicated in OBEs and dissociative depersonalization experiences, as well as positive schizophrenia-spectrum symptoms more generally such as voices and multisensory integration abnormalities, we sought to use a proxy for both temporal lobe abnormalities and parietal lobe abnormalities. We used the Temporal Lobe Scale (TLS; Persinger, 1984), which has been previously validated in a sample of patients with epilepsy (Persinger & Makarec, 1993) and correlated with EEG activity in temporal lobe (Makarec & Persinger, 1990) as a proxy for temporal lobe functioning, and the line bisection task as a proxy for parietal lobe abnormalities, since it has been used to measure spatial neglect (Schenkenberg et al., 1980).

To investigate the possible etiological contributions of the temporal lobe we looked at the relationship between TLS scores and Pinocchio Illusion scores and measures of psychosis proneness to assess whether temporal lobe dysfunction was significantly related with these measures in this sample. TLS scores were positively related to total Pinocchio Illusion scores. Further, we found that the two PQ-B groups differed significantly on the TLS, with the high group having the higher median, which has never been reported to our knowledge. Thus, the current study supports the possibility that temporal lobe abnormalities related to both psychosis proneness and perceptual aberrations associated with multisensory illusions. When combined with the strong correlational findings from Study 2B between TLS and the BODI 2, it seems as though the evidence is building for abnormalities in the temporal lobe to be relevant for multisensory self disturbances in the schizophrenia spectrum.

One goal of utilizing the line bisection task in this study was to investigate possible parietal contributions to anomalous multisensory integration and the development of disturbed sense of self in the schizophrenia-spectrum. We found that total Pinocchio Illusion endorsements were positively related to right line bisection deviations, providing indirect evidence for right parietal contributions to anomalous self-disturbance in this sample.

Further, individuals who were classified as "Right Bias" were significantly more likely to be able to tickle themselves than people in the "Left Bias" category. Previous studies have found that SZ patients are more likely to be classified in the "Right Bias" category as well, and it is thought that this finding reflects abnormalities in the right parietal lobe in SZ-spectrum individuals (Benson & Park, 2013, Cavezian et al., 2006; He et al., 2007; Molenberghs & Sale, 2011; Mort et al., 2003; Ribolsi et al., 2012; Schenkenberg et al., 1980; Vandenberghe et al., 2005). Imaging research has shown that abnormalities in this area in particular contributes to symptoms of passivity and agency disturbances in SZ patients (Dankert et al., 2004), which certainly fits with the current finding that people who are able to tickle themselves are also be more likely to demonstrate right parietal abnormalities, since the ability to tickle oneself is thought to be an example of the corollary discharge system gone awry in individuals with schizophrenia.

Importantly, a very recent study just published the finding that individuals with schizophrenia responded the same way as controls in the Full Body Illusion paradigm (Shaqiri et al., 2017), indicating a lack of body ownership disturbances in SZ. Thus, the authors argue that while there is much evidence for disruptions in agency in SZ, their multisensory bodily self-representation may be intact in SZ, at least when tested on the Full Body Illusion. Taking the results from Study 3 here, we have to argue that individuals at risk for psychosis showed increased multisensory self-abnormalities as quantified by higher scores on the PI questionnaire. Further, the PI items that capture perceptual aberration reactions to the PI were inversely related to tactile discrimination sensitivity, an objective measure of sensory processing in this population that is not confounded by overall response bias as would be the case if we just looked at accuracy (Chang & Lenzenweger, 2001; 2005). Further, results also indicate differences in agency among those at risk for psychosis, with ability to tickle oneself and increased BODI 2 scores both relating to positive schizotypal traits.

Limitations & Future Directions

Results of the current study should be considered in light of several potential limitations. The Pinocchio Illusion procedure would be significantly strengthened if it had an objective measure to quantify illusion strength as opposed to simply self-report methodology. A fruitful future direction might be to administer the Pinocchio Illusion procedure while individuals are connected to EEG, NIRS, or other psychophysiological or imaging tools to better quantify the subjective illusion strength and its underlying neural substrates that we hypothesize to account for the subjective changes our participants report during the Pinocchio illusion procedure.

It would also be beneficial to compare scores of individuals at risk for psychosis with SZ patients, such as with PI data and the 2 point discrimination task data. Further, we need to validate our self-tickle item with SZ patients, and preferably, with an experimental design (as in Lemaitre et al., 2016). We also need to verify the specificity of this phenomenon and should follow up with the trending relationship between autism spectrum traits and self-tickling ability in a validated population of adults with autism spectrum disorder compared with SZ patients.

Another limitation is that many of our variables of interest were related to demographic variables, such as Edinburgh laterality scores. We were unable to control for these confounding factors for some of our analyses with the use of nonparametric tests, and thus our findings may have been distorted as a result. However, the group comparisons were matched for these factors, so it should not discount many of the findings of the current study.

Finally, many of the analyses here were uncorrected multiple comparisons. These results, which were explicitly labeled above, should be taken with caution and replicated to ensure the significance and utility in the literature.

Conclusions

In sum, the results from the third study provide additional evidence for multisensory self-disturbance across in psychosis proneness that implicates both parietal and temporal contributions as important etiological factors to the development of illusory perceptual experiences in a healthy adult population.

CHAPTER VII:

GENERAL DISCUSSION

In sum, previous research indicates that sense of self is weakened or disturbed in patients with schizophrenia-spectrum disorders. In the current set of studies, we aimed to contribute to the literature on schizophrenia-spectrum disorders by further elucidating the importance of anomalous self-disturbances, specifically dissociative experiences, in relationship to multisensory abnormalities, and how this contributes to risk for transitioning to full-blown psychosis and schizophrenia. For a review of the major findings in the current dissertation, please refer to Table 62 below.

In **Study 1**, we replicated and extended previous research demonstrating the increased prevalence of OBEs and dissociative experiences in schizophrenia and those at risk for schizophrenia. Further, results from 350 undergraduate students indicate that approximately 1 in 5 adults report at least one OBE in their lifetime. OBE history was more common in individuals with elevated psychometric risk for psychosis, and undergraduates at risk for psychosis reported greater levels of dissociative experiences. Levels of dissociative experiences in general appeared to be useful at predicting whether or not one will be classified in the high PQ-B group. Furthermore, we showed that dissociative experiences were related to positive schizophrenia-spectrum symptoms and not to general psychiatric symptoms, and to a lesser extent related to negative schizophrenia-spectrum symptoms, which across studies was not as consistent as the relationship between dissociative experiences and positive symptoms.

In **Study 2**, we developed and validated a new imagery-based questionnaire designed to quantify anomalous bodily-self experiences called the **Brugger et al. Out-of-Body and**

Dissociative Experiences Inventory (BODI). The first two studies to use the BODI presented here suggest that the BODI accurately captures bodily self-aberrations in both patients with schizophrenia and healthy controls.

In **Study 2A**, we showed that the BODI 1 showed adequate internal consistency and split-half reliability. Further, BODI 1 scores were significantly correlated with scales that have already been established in the literature, including the dissociative experiences scale (DES-II) and the perceptual aberration scale (Per Ab), providing evidence for convergent validity. Moreover, the BODI 1 scores were significantly related to indices of schizophrenia-spectrum symptoms in both clinical populations and healthy populations, including Schizotypal Personality Questionnaire (SPQ), Prodromal-Questionnaire Brief (PQ-B), Brief Psychiatric Rating Scale (BPRS), and Scale for the Assessment of Positive Symptoms (SAPS), but not negative symptoms. Group comparison analyses suggest that the BODI 1 accurately captures bodily self-aberrations in both patients with schizophrenia and healthy controls. Furthermore, the BODI 1 is useful in distinguishing individuals with psychosis-spectrum liability from controls. These results provide partial evidence for the hypothesis that weakened sense of self may be central to the prodromal stage of schizophrenia, and dissociative experiences may be a latent risk factor for psychosis.

The major aim of **Study 2B** was to further develop a self-report inventory designed to quantify out-of-body experiences (OBEs) and related dissociative bodily-self experiences in both clinical and healthy populations (the BODI 2). We assessed internal consistency, split-half reliability, test-retest reliability, convergent validity analyses, divergent validity analyses, generated ROC curves to help clarify sensitivity and specificity for predicting SZ-spectrum outcomes with scores on the BODI 2, and identified cut off scores to be tested in future samples.

Further, we conducted two factor analyses, one conceptual and one exploratory, to help analyze the data better. We look forward to confirming the utility of these factors in future studies. Finally, we used the BODI 2 to look at the relationship between anomalous self-disturbances across the schizophrenia-spectrum and found significant predictive value with using BODI 2 scores to differentiate between SZ-spectrum risk groups.

The major aim of **Study 2C** was to compare the two versions of the BODI utilized in the current dissertation. To summarize, we collected data from 470 participants for the current dissertation's analysis of the two BODI measures. Four hundred of those participants' data were able to utilized here. Excitingly, the collection of BODI data is ongoing around the world, and additional normative and validation data is continues to flow in to the lab.

Both versions of the BODI showed good internal consistency and acceptable reliability indices by way of split-half reliability for both BODI versions and also a promising start for test-retest reliability for the BODI 2. Additionally, each version of the BODI was strongly correlated with measures of convergent validity, including the Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993), Perceptual Aberration Scale (Chapman et al., 1978), Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011), Schizotypal Personality Questionnaire (SPQ; Raine, 1991), Positive symptoms in SZ patients (SAPS; Andreasen, 1984), and the SELF (Heering et al., 2016) and Temporal Lobe Scale (TLS; Persinger, 1984), in the BODI 2. In addition, we demonstrated that the BODI 2 showed good discriminant validity in that it was not correlated with measures of negative schizophrenia-spectrum scales, such as the Physical Anhedonia Scale in healthy controls, and was inversely related to negative symptoms in SZ patients. Both versions of the BODI do well at predicting SZ status and High PQ-B risk.

Finally, the BODI 2 was related to a behavioral measure of multisensory self-disturbance, the Pinocchio Illusion.

In **Study 3**, we built on the previous two studies by utilizing behavioral experiments in conjunction with our newly developed assessment (the BODI 2) to study the relationship between multisensory abnormalities and anomalous self-experiences in those at risk for schizophrenia compared to those at lower risk.

The major aim of the third study in the current dissertation was to examine the relationship between psychosis-proneness and anomalous multisensory integration. This was accomplished comparing Pinocchio Illusion scores across groups of psychosis risk as indexed by sum of distressing endorsements on the Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011). As predicted, participants in the highly distressing PQ-B group scored significantly higher on the PI total sum across trials compared to the low PQ-B distress group.

A secondary aim of the current study was to investigate tactile discrimination deficits in relation to proprioception dysfunction in schizotypes prone to dissociative experiences. This was accomplished in part by conducting Spearman's correlations between PI scores and 2 discrimination point sensitivity scores. Greater Pinocchio Illusion strength was related to impaired tactile sensitivity, providing clues into the multisensory mechanisms underlying the Pinocchio Illusion and the related fluid body boundary disturbance seen in psychosis-prone individuals.

A third aim of the current study was to correlate measures of self-disturbance with tactile discrimination deficits, parietal abnormalities and anomalous multisensory integration. We found evidence of a relationship between Pinocchio Illusion strength and BODI 2 total scores, in addition to BODI 2 Bodily Self Aberrations factor scores indicating that the items about bodily self-disturbance are what may be driving the relationship with the Pinocchio Illusion rather than dissociative depersonalization or hallucinatory experiences. Importantly, this finding provides convergent validity support for the BODI 2 in that the PI is a behavioral measure of self-disturbance.

We also found a relationship between BODI 2 and self-tickling, a self-disturbance that is seen as a disturbance of agency and possibly corollary discharge abnormalities that is sometimes seen in patients with schizophrenia. Unsurprisingly, self-reported self-ticklers also displayed higher positive SZ-spectrum traits, including thought insertion, which may be considered a type of passivity symptom, and has been linked with right parietal abnormities (Dankert et al., 2004; Maruff et al., 2005).

The fourth aim of the third study was to test the utility of the proposed diathesis stress response model that is outlined in the introduction above, and investigate the relationships between (1) tactile and proprioception abnormalities, indicating a "weak body"; (2) dissociative depersonalization; (3) anomalous bodily self-experiences; and (4) level of stress and trauma in relation current level of schizophrenia-spectrum symptoms and relative to one's psychometric risk for developing a psychotic disorder. This was accomplished through conducting a multiple regression analysis through several composite variables that represented the components described above. The multiple regression analysis indicates that the combination of these variables are significant in predicting schizophrenia-spectrum symptoms in general, and even better at predicting positive schizophrenia-spectrum symptoms. We also conducted Spearman's correlations between several of these components, and found that the weak body composite, which is comprised of PI scores and 2 point misses, was related to positive schizophrenia-spectrum symptoms (e.g., magical thinking, perceptual aberrations), but not negative schizophrenia-spectrum symptoms (e.g., anhedonia), suggesting specificity for psychosis.

The final aim of the third study was to look at possible etiological factors for these multisensory self-disturbances. Since the TPJ has been implicated in OBEs and dissociative depersonalization experiences, as well as positive schizophrenia-spectrum symptoms more generally such as voices (Vercammen et al., 2010) and multisensory integration abnormalities, we sought to use a proxy for both temporal lobe abnormalities and parietal lobe abnormalities. We used the Temporal Lobe Scale (TLS; Persinger, 1984), which has previously been validated in a sample of patients with epilepsy (Persinger & Makarec, 1993) and correlated with EEG activity in temporal lobe (Makarec & Persinger, 1990) as a proxy for temporal lobe functioning, and the line bisection task as a proxy for parietal lobe functioning (Benson & Park, 2013; Cavezian et al., 2006; He et al., 2007; Molenberghs & Sale, 2011; Mort et al., 2003; Ribolsi et al., 2012; Schenkenberg et al., 1980; Vandenberghe et al., 2005). Temporal lobe scale scores were positively related to total Pinocchio Illusion scores. Further, we found that the two PQ-B groups differed significantly on the TLS, with the high group having the higher median, which has never been reported to our knowledge. Thus, the current study supports the possibility that temporal lobe lability is related to both psychosis proneness and perceptual aberrations associated with multisensory illusions. When combined with the strong correlational findings from Study 2B between TLS and the BODI 2, it seems as though the evidence is building for abnormalities in the temporal lobe to be relevant for multisensory self disturbances in the schizophrenia spectrum. In addition to its relationship with temporal lobe scale scores, total Pinocchio Illusion endorsements were also positively related to right line bisection deviations, providing indirect evidence for right parietal contributions to anomalous self-disturbance in this sample. Finally, we found indirect evidence of a relationship between self-tickling ability, which can be seen as a disturbance of agency and corollary discharge, and right parietal abnormalities as quantified by right line bisection biases.

Thus, the results from the third study provide further evidence for multisensory self-disturbance across the schizophrenia spectrum that implicates both parietal and temporal contributions as important etiological factors to the development of illusory perceptual experiences in healthy adult populations.

Importantly, across studies we consistently found an inverse relationship between Edinburgh laterality indices and our variables of interest, including measures of psychosis-proneness (PQ-B), schizotypal personality (SPQ), self-disturbance (BODI 2), social stress (UCLA Loneliness Version 3), parietal lobe proxy measure (line bisection bias), and tactile discrimination sensitivity (2 point discrimination task). These findings indicate that 1) we must adequately control for Edinburgh laterality differences across groups and in our analyses with these populations and measures, and 2) we must not forget the relevance of the fact that individuals on the schizophrenia-spectrum are more likely to be left-handed than the general population (e.g., Crow et al., 1996; Green et al., 1989; Orr et al., 1999; Schiffman et al., 2005), and thus their brains are literally more likely to be wired differently. Understanding the complexities of this complication is crucial if we are ever going to fully understand how the mind works for these individuals, and we must not always assume that the connections between these variables operate in the same way as individuals who are primarily right handed.

Finally, it is important to recognize that we are discussing self-report data, and often using correlational methods to analyze said self-report data. We cannot determine causation from correlations, and it would be better to have objective measures of self-disturbance that did not rely on participants' responses. Nevertheless, objective behavioral data from experimental measures is not feasible in all populations in all settings, which is one reason we have worked to develop a useful self-report measure to quantify self-disturbances in a variety of populations to help bridge the gap between self-report method shortcomings and the preferred behavioral data methodologies.

The BODI helps us work with impaired populations better than traditional measures because the pictures add extra clarity to the experiences they portray. SZ patients have been shown to exhibit enhanced imagery (e.g., Benson & Park, 2013), and thus, we hypothesize that the additional layer of visual information is helpful to clarify these mystifying and often stressful anomalous self-experiences. Furthermore, the BODI has been useful in multiple cultures and languages, and can be used in a variety of environments, including research labs, inpatient psychiatric hospitals, and outpatient neurological clinics.

Table 62. *Hypotheses, Predictions, and Results for Current 3 Studies in Dissertation*

Hypothesis	Prediction	Result
Hypothesis 1: SZ-spectrum patients exhibit anomalous sense of self	**Study 1A:** SZ patients will report more OBE history	SZ patients more likely to report OBE history compared to HC
	Study 1A: SZ patients will report more OBE frequency	SZ patients reported significantly greater OBE frequency compared to HC
	Study 1B: High psychometric risk groups more likely to report OBE	OBE history was significantly greater in students at risk for psychosis
	Study 2A: SZ patients score higher on BODI 1	SZ scored higher than HC on BODI 1 scores
	Study 2A: High psychometric risk groups score higher on BODI 1	BODI 1 scores differentiated psychosis risk status group
	Study 2B: SZ patients score higher on BODI 2	SZ scored higher than controls on BODI 1 scores
	Study 2B: High psychometric risk groups score higher on BODI 2	BODI 2 scores differentiated psychosis risk status group
	Study 2B: SZ higher on SELF	SZ patients scored higher on SELF scale
	Study 3: Pinocchio Illusion more likely in High Risk groups	High PQ-B distress group scored higher on PI scores than Low PQ-B distress group
	Study 3: PQ-B and self-disturbance composite score	High PQ-B group scored higher on self-disturbance composite score
Hypothesis 2: Self disturbances linked with positive symptoms	**Study 1A**: Higher positive symptoms in SZ with OBE	SZ patients with OBE history showed elevated SAPS scores
	Study 1A: HC with OBE history will have greater levels of positive schizotypy than those without OBE	HC with OBE history reported greater levels of SPQ cognitive perceptual factor scores than HC without OBE history

Hypothesis	Prediction	Result
	Study 1B: High psychometric risk groups higher levels dissociative symptoms	Students at risk for psychosis reported higher levels of dissociative experiences scale
	Study 1B: Schizotypal personality traits highly positively correlated with dissociative experiences	Students' total SPQ scores were positively correlated with total scores on the dissociative experiences scale
	Study 2A: BODI 1 scores correlated with other measures of dissociative experiences and SZ-spectrum scales	Total BODI scores were positively correlated with total DES-II, Perceptual Aberration, SPQ, PQ-B, BPRS & SAPS
	Study 2B: BODI 2 scores correlated with other measures of dissociative experiences and SZ-spectrum scales	BODI 2 scores were correlated with DES-II, PQ-B, SPQ, Perceptual aberration scale, providing convergent validity
	Study 3: Pinocchio Illusion and positive SZ-spectrum symptoms	Total PI scores correlated with positive SZ-spectrum symptoms, not negative
	Study 3: Self-Disturbance composite and positive SZ-spectrum symptoms	Self-disturbance composite positively correlated with positive SZ-spectrum
Hypothesis 3: Self disturbances are specific to positive SZ-spectrum symptoms (not negative symptoms or related disorders)	**Study 2A**: Did not predict a relationship between BODI 1 scores and negative symptoms in SZ patients	Total BODI 1 scores were not correlated with SANS scores in SZ patients
	Study 2A: Did not predict a relationship between BODI 1 scores and negative schizotypy in controls	Unexpectedly, there was a positive correlation between BODI 1 total and SPQ interpersonal factor
	Study 2B: Did not predict a relationship between BODI 2 scores and negative symptoms in SZ patients	Unexpectedly, total BODI 2 scores were inversely correlated with SANS scores in SZ patients, which is in contrast with result above for BODI 1
	Study 2B: Did not predict a relationship between BODI 2 scores and negative schizotypy in controls	BODI 2 total scores were unrelated to scores on the Physical Anhedonia Scale, but positively correlated with SPQ interpersonal factor
	Study 2B: BODI scores unrelated to autism spectrum scores (among healthy controls)	Unexpectedly, total BODI 2 scores were positively correlated with AQ total scores, but not after controlling for SPQ
	Study 2B: BODI scores unrelated to hypomanic personality scores	BODI 2 total scores were positively correlated with the Hypomanic Personality scale, providing convergent validity for schizophrenia-spectrum scales but not specificity for BODI.
Hypothesis 4: Self disturbances unrelated to antipsychotic medications	**Study 2A:** Did not predict a relationship between BODI 1 scores and CPZ in SZ patients	BODI 1 scores were unrelated to CPZ in SZ patients
	Study 2B: Did not predict a relationship between BODI 2 scores and CPZ in SZ patients	BODI 2 scores were unrelated to CPZ in SZ patients
Hypothesis 5: SZ-spectrum: Impaired tactile sensitivity	**Study 3:** High psychometric risk groups will be less sensitive on 2-point discrimination	No group differences. However, for the High PQ-B group, sensitivity on the hard trials was inversely related to schizophrenia-spectrum symptoms
Hypothesis 6: SZ-spectrum: Proprioception deficits	**Study 3:** High psychometric risk groups will be more likely to feel Pinocchio Illusion	Groups at high risk for prodromal psychosis scored higher on total PI scores than low and mid PQ-B groups
Hypothesis 7: Self disturbances	**Study 3:** PI scores positively correlated with BODI 2	PI endorsement totals significantly positively correlated with BODI 2 totals

Hypothesis	Prediction	Result
linked with differences in sensory systems	**Study 3:** 2 point inversely related to PI scores	PI perceptual aberration factor scores were inversely related to *d'* scores
<u>Hypothesis 8:</u> SZ-spectrum: parietal abnormalities	**Study 3:** High risk group more right line bisection biases, low group more left line bisection biases	Contrary to predictions, line bisection scores were not different among risk groups
<u>Hypothesis 9</u>: Parietal abnormalities related to abnormal sense of self	**Study 3:** Line bisection positively related to PI scores	Pinocchio Illusion endorsement totals were positively related to right line bisections, implicating right parietal involvement with Pinocchio Illusion scores
<u>Hypothesis 10:</u> Temporoparietal abnormalities related to self disturbances	**Study 2:** TLS scores positively related to BODI 2	BODI 2 total scores positively correlated with TLS total scores
	Study 3: TLS scores positively related to Pinocchio Illusion	PI total scores positively related to TLS scores
<u>Hypothesis 11:</u> Stress important aspect to proposed Diathesis Stress Response Model	**Study 3**: Stress composite scale based on loneliness, trauma, and perceived stress will be related to all components of proposed Diathesis Stress Response Model	3 levels of stress yielded different levels of self-disturbance, dissociative response, total SZ-spectrum symptoms, and weak body strength in healthy undergraduate sample

The first line of treatment for someone with psychosis is to be medicated with antipsychotic medication. Since individuals are usually diagnosed with schizophrenia prior to their 30th birthday, this means that many SZ patients will remain on these neurotoxic medications for over 30 years if they are compliant with their treatment plan. The many side effects associated with long-term utilization of antipsychotics are grim, even in atypical antipsychotics, including tardive dyskinesia (e.g., Correl et al., 2004), extrapyramidal symptoms (e.g., Glazer, 2000), weight gain (e.g., Allison et al., 1999), fatigue (e.g., Tuunainen et al., 2002), akathesia (tension and restlessness; Kane et al., 2009; Van Putten & Marder, 1987), increased risk of obstructive sleep apnea (e.g., Rishi et al., 2010; Shirani et al., 2011), increased risk of Type II diabetes (American Diabetes Association, 2004; Nielson et al., 2010; Leslie & Rosenheck, 2004), and more, including general decreased quality of life satisfaction (e.g., Ritsner et al., 2002). The cognitive deterioration seen in individuals medicated with antipsychotics for decades, combined with the state of florid psychosis for extended periods of time, creates lasting and noticeable changes on creative and unique minds. The need to help prevent the flow of psychosis before it begins is essential. However, when that is not possible, there needs to be a new and more effective intervention to help those that are already suffering, in addition to providing medication and psychotherapy. Since it is impossible to change one's genetic makeup (to our knowledge), and lack of social support can be difficult to change in isolated and paranoid populations with little resources and access to new groups of people and who have lost contact with family members, the easiest factor to change that may help people cope with psychotic self-disturbance is to increase tactile connection and increase level of physical activity, thereby strengthening the vestibular sense and proprioception, in those at risk and those already suffering from psychosis.

Schizophrenia seems to affect the body as much as it affects the mind. This can be seen in extreme cases such as catatonia, but also in the abnormal motor movements often seen in prodromal populations as young as childhood (Walker et al., 1994). The mind and body are intricately connected; we propose that if you can heal the body, you might just be able to also begin to heal the mind.

We treat psychosis first, but we believe that evidence in the literature suggests that dissociation might trigger, or at least precede, psychosis. If we can treat the dissociation, perhaps we can prevent further development of a severe psychotic disorder. Unfortunately, there is no effective treatment for dissociation yet. There are a few promising leads to treat dissociative experiences, such as rTMS to the right TPJ for depersonalization (Christopeit et al., 2014), and stimulant use for trauma-related dissociation in general (Scarella & Franzen, 2016), but since we cannot administer amphetamine salts to individuals known to be prone to psychosis due to the risk for dopamine flooding, which could trigger a psychotic episode (e.g., Angrist et al., 1974; Angrist & Gershon, 1970; Harris & Batki, 2000), it is imperative to test the effectiveness of new and alternative treatments for dissociative experiences in traumatized populations at risk for psychosis.

Importantly, this hypothetical new intervention needs to be something that patients with schizophrenia will actually want to do. After spending a year working with inpatients at a Massachusetts state hospital, it became clear to me that most SZ inpatients would not engage in activities unless they were incredibly rewarding. Since many SZ patients suffer treatment-resistant negative symptoms such as amotivation and anhedonia, the new intervention needs to be extremely pleasant to convince people to participate, especially if we need them to continuously engage in the treatment to see any sort of change. Cognitive remediation is effective in SZ patients (Wykes et al., 2011) but many of these programs are likely too boring for many inpatients that are very impaired to choose to participate on their own accord, and, importantly, does not necessarily address the problem of counteracting the dysfunctional bodily symptoms and sensory deficits that are prevalent and may underlie the disordered sense of self in SZ patients. However, there is some evidence that shows that cognitive training combined with sensory interventions has been effective at normalizing some of the sensory abnormalities seen in schizophrenia (e.g., Popov et al, 2011). More work needs to be done on combining cognitive remediation with interventions involving the tactile and proprioceptive senses.

Let us not forget the fascinating fact that although unisensory deficits in almost all senses are considered to be risk factors for schizophrenia, there is the important exception of congenital blindness, which has been found to be a protective factor against developing schizophrenia (Silverstein et al., 2006; Silverstein et al., 2012). If congenital blindness is a protective factor against developing schizophrenia due to the over-compensatory mechanisms of the associated somatosensory system, it remains an intriguing possibility that a type of somatosensory-training paradigm may be a potentially useful protective program for individuals at risk for developing schizophrenia.

Some proposed options for somatosensory-based intervention include pet therapy for both social support and tactile connection (e.g., Chu et al., 2009; Nathans-Barel et al., 2005), yoga (e.g., Behere et al., 2011; Bhatia et al., 2012; Duraiswamy et al., 2007; Vancampfort et al., 2011; Visceglia et al., 2011), multisensory integration stimulation such as those commonly used in occupational or sensory therapies for individuals with autism (e.g., Baranek, 2002), and general exercise and dance classes, such as the “Movin’ and Groovin’” group held at Tewksbury Hospital on Wednesday afternoons. These techniques have also been used in traumatized and dissociative disorders (see Van der Kolk, 1994; 2015), and thus could help both populations begin to restore sense of bodily self, possibly reducing frequency of dissociation and psychotic symptom development. Sensory integration interventions are also useful for individuals with autism (e.g., Baranek, 2002), and thus the commonalities between these two spectrums could also be addressed, researched, and remediated with these techniques as well.

Additionally, based on the anecdotal information included in the case study in Thakkar et al.’s (2012) Rubber Hand Illusion in SZ study, it appears as though psychoeducation on the normality of dissociative experiences, such as the OBE, might prove to be effective in reducing anxiety and distress surrounding these potentially disturbing experiences. The current research presented here suggests that the distress associated with dissociative self experiences is important in distinguishing those determined to be at risk for psychosis compared to those that do not find the experiences as distressing, who are at lesser risk for psychosis. Reducing distress and confusion associated with these experiences through psychoeducation might be an easy and effective way to reach a lot of people and help reduce triggering psychotic risk in some individuals.

The distinction between psychosis and dissociation is far from clear. It seems as though the boundary between these disorders is permeable and the need to delineate this boundary depends mostly on one's needs. For example, in a research study the goal might be to identify SZ patients without comorbid dissociative experiences, which will likely be challenging and end up greatly reducing sample size options. On the other hand, someone might be interested in this distinction in a clinical setting if one is trying to decide which treatment to pursue for a complicated case. For example, if someone has Borderline Personality Disorder (BPD), hears voices and dissociates, is it best to treat the for BPD with Dialectical Behavioral Therapy (DBT), treat dissociation with rTMS to the TPJ or possibly with amphetamines (if one assumes they are not at imminent risk for psychosis), or end up labeling them with schizoaffective disorder due to the presence of voices and emotional dysregulation, which will likely make them end up on neurotoxic antipsychotic medications for the rest of their lives? (In a state hospital, the null hypothesis is that the person is psychotic. The majority of the patients are traumatized and hear voices that are likely due to this trauma history, as opposed to voices that are exclusively related to SZ etiology.) The distinction between schizophrenia and dissociation is frustratingly unclear. I hope that the BODI can help us learn more about the similarities and differences between these two disorders in the future in order to aid future research, assessment and clinical intervention.

To conclude, one particularly pathological combination in the schizophrenia-spectrum is that of a weak sense of body and maximal awareness in individuals prone to dissociative distancing themselves from their minimal sense of self or first-person perspective. Future therapeutic services should aim to attempt to move patients' focus away from their hyperreflective thoughts, and into their physical body (i.e., out of the head, into the body) through yoga, dance, juggling, or some other form of physical exercise (e.g., Vancampfort et al., 2011). Schizophrenia is a devastating and debilitating disorder, but we must recognize that there is much work that can be accomplished in order to improve the lives of these patients and their families.

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APPENDIX A:

Dream Questionnaire (McIntosh et al., in preparation)

1. How often do you remember your dreams?

Never Yearly Monthly Weekly Daily

2. In dreams, rate how often you see yourself from an outside vs. 1st person perspective.

Always see myself from outside Always see the world from inside

|--------------|----------------|---------------|----------------|---------------|----------------|
0 1 2 3 4 5 6

3. Have you ever had the experience of being separated from your body (during wake time)?

Never Once 2-5 times 6-10 times More than 10 times

If you answered anything other than "Never" for question 3, please complete the following questions:

3a. During this experience, were you under the influence of any medication or mind-altering drug?

If yes, have you ever had this experience when not under the influence of medication or mind-altering drugs?

3b. During this experience, were you able to see your physical body as separate from where you seemed to be? If so, please explain.

3c. During this experience, did you seem to be in control of two bodies at once? If so, please explain.

3d. During this experience, did you seem to be hovering above your body? If so, please explain.

3e. During this experience, did your physical surroundings and other body (if applicable) seem realistic? That is, do you remember if there was anything different about the way you looked or your surroundings during this experience versus before or after the experience? Please explain.

3f. How long did this experience last/seem to last?

3g. Would you describe this as a pleasant or unpleasant experience? Please explain.

3h. Please provide any other relevant details regarding this experience that the above questions have not captured.

APPENDIX B:

Scales Reviewed in Construction of BODI Captions

Item #	Item Caption	Source
BODI 1	*I feel unsure of who I am at times.*	Boundary Questionnaire (Hartmann, 1991)
BODI 2	*My soul sometimes leaves my body.*	Personal Philosophy Inventory (Persinger & Makarec, 1991)
BODI 3	*I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.*	Perceptual Aberration Scale (Chapman et al., 1978)
BODI 4	*Sometimes when falling asleep or when waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings.*	Waterloo Unusual Sleep Experiences Questionnaire (Cheyne, 2002)
BODI 5	*Do you ever find that your experience of time changes dramatically?*	Cardiff Anomalous Perception Scale (Bell et al., 2006)
BODI 6	*Have you ever had the feeling of the presence of another being, even if you know that no one is there?*	Schizotypal Personality Questionnaire (Raine, 1991)
BODI 7	*I have had experiences when I felt as if I were someone else.*	Temporal Lobe Scale (Makarec & Persinger, 1985)
BODI 8	*I have had experiences (not related to drugs) where I felt as though I was floating through the air or being transported through time.*	Wisconsin Experience Questionnaire (Kihlstrom et al., 1989)
BODI 9	*Have you ever experienced or seen your "doppelganger" or "double"?*	Original item (Benson et al., in prep)
BODI 10	*Have you ever felt that you looked unreal when you looked at yourself in the mirror?*	Kings Schizotypy Questionnaire (Jones et al., 2000)
BODI 11	*I have been visited by Spiritual Beings.*	Personal Philosophy Inventory (Persinger & Makarec, 1991)
BODI 12	*I have had an "out of the body" experience during which my mind seems to or actually has, left my body.*	Boundary Questionnaire (Hartmann, 1991)
BODI 13	*Have you ever felt like you could see multiple duplicates of yourself (or someone else)?*	Original item (Benson et al., in prep)
BODI 14	*Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?*	Cardiff Anomalous Perception Scale (Bell et al., 2006)
BODI 15	*Do you ever find the appearance of things or people seems to change in a puzzling way, e.g., distorted shapes or sizes or color?*	Cardiff Anomalous Perception Scale (Bell et al., 2006)
BODI 16	*I've had the momentary feeling that I might not be human.*	Magical Ideation Scale (Eckblad & Chapman, 1983)
BODI 17	*I have heard an inner voice call my name.*	Temporal Lobe Scale (Makarec & Persinger, 1985)
BODI 18	*Do you ever have the sensation that your body, or a part of it, is changing or has changed shape?*	Cardiff Anomalous Perception Scale (Bell et al., 2006)
BODI 19	*At times I have felt as if I were coming apart.*	Boundary Questionnaire (Hartmann, 1991)
BODI 20	*On occasions I have seen a person's face in front of me when no one was in fact there.*	Revised Launay Slade Hallucination Scale (Morrison et al., 2002)
BODI 21	*Have you ever felt that thoughts were being put inside your head by some outside force?*	Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984)

APPENDIX C:

BODI Scoring Information

Picture 1. Consider the picture below when answering the following questions:

TRUE = 1 point
False = 0 points

I feel unsure of who I am at times.

True // False

In the past month, how often have you had an experience like this? * must provide value	Never	→ 0 points
	1-2 times in the past month	→ 1 point
	once per week	→ 2 points
	a few times per week	→ 3 points
	daily	→ 4 points
		reset
When this happens, I feel frightened, concerned, or it causes problems for me: * must provide value	Strongly Disagree	→ 1 point
	Disagree	→ 2 points
	Neutral	→ 3 points
	Agree	→ 4 points
	Strongly Agree	→ 5 points
	Not Applicable	→ 0 points
		reset
How vividly do you recall the image of this experience? * must provide value	0% (not at all)	→ 1 point
	25%	→ 2 points
	50%	→ 3 points
	75%	→ 4 points
	100% (very)	→ 5 points
	Not Applicable	→ 0 points
		reset
Do you have any comments/additional thoughts on this image/experience? (optional)		

Maximum Possible Sum Per Item = 15
Maximum Possible Total Sum = 315
Maximum Possible Endorsement Sum = 21
Maximum Possible Frequency Sum = 105
Maximum Possible Distress Sum = 105
Maximum Possible Vividness Sum = 105

APPENDIX D:
Items with Similar Content as BODI in Related Questionnaires

Perceptual Aberration Scale (PerAb; Chapman et al., 1978)

12. Now and then, when I look in the mirror, my face seems quite different than usual.
13. I have never had the passing feeling that my arms or legs have become longer than usual.
14. I have sometimes felt that some part of my body no longer belongs to me.
17. Sometimes part of my body has seemed smaller than it usually is.
22. I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.
24. I have never felt that my arms or legs have momentarily grown in size.
28. I can remember when it seemed as though one of my limbs took on an unusual shape.
29. I have had the momentary feeling that my body has become misshapen.

Prodromal Questionnaire Brief (PQ-B; Loewy et al., 2011)

3. Do things that you see appear different from the way they usually do (brighter or duller, larger or smaller, or changed in some other way)?
5. Have you felt that you are not in control of your own ideas or thoughts?
12. Have you had the sense that some person or force is around you, even though you could not see anyone?
18. Do you feel that parts of your body have changed in some way, or that parts of your body are working differently?

Schizotypal Personality Questionnaire (SPQ; Raine, 1991)

13. Have you ever had the sense that some person or force is around you, even though you can't see anyone?
22. When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes?
48. Do everyday things seem unusually large or small?

Dissociative Experiences Scale (DES-II; Bernstein & Putnam, 1986; Carlson & Putnam, 1993)

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something as if they were looking at another person.
11. Some people have the experience of looking in a mirror and not recognizing themselves.

Temporal Lobe Scale (Persinger, 1984)

16. I have heard an inner voice call my name.

Appendix E. Study 2A: BODI 1 Supplementary Data

BODI 1 Summary Item Statistics							
	Mean	Min	Max	Range	Max / Min	Variance	# Items
Item Means	1.31	0.35	3.17	2.82	9.16	0.51	21
Item Variances	10.11	3.12	21.8	18.67	6.98	22.61	21
Inter-Item Covariances	2.83	-0.47	9.9	10.36	-21.1	3.98	21
Inter-Item Correlations	0.28	-0.07	0.6	0.66	-8.72	0.02	21

BODI 1 Item Statistics (ALL SUBJECTS)		
	Mean	Std. Deviation
#1: unsure of who I am	2.154	3.7952
#2: soul leaves body	0.538	2.1539
#3: bodily disconnection	0.644	2.5002
#4: sleep paralysis	2.24	4.0061
#5: time perception	2.077	3.9381
#6: feeling of presence	3.173	4.6685
#7: felt like somebody else	1.192	3.2173
#8: floating through air	1.154	2.8618
#9: doppelganger	0.99	2.6822
#10: strange face in mirror	2.192	3.9143
#11: spiritual being	0.981	2.5769
#12: OBE	1.087	2.9727
#13: polyopic heautoscopy	0.346	1.7668
#14: bodily disconnection	0.567	2.211
#15: perceptual aberration	1.067	2.8328
#16: feeling like animal	0.865	2.6109
#17: inner voice	1.769	3.8066
#18: bodily transformation	1.221	3.1406
#19: body coming apart	0.721	2.75
#20: human hallucination	0.952	2.9176
#21: thought insertion	1.577	3.7435

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

BODI 1 Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
#1:unsure of who I am	25.356	1235.552	0.573	0.559	0.884
#2: soul leaves body	26.971	1337.252	0.387	0.476	0.889
#3: bodily disconnection	26.865	1306.409	0.499	0.54	0.886
#4: sleep paralysis	25.269	1278.704	0.377	0.362	0.891
#5: time perception	25.433	1228.17	0.576	0.644	0.884
#6: feeling of presence	24.337	1178.303	0.632	0.585	0.882
#7: felt like somebody else	26.317	1253.054	0.612	0.635	0.883
#8: floating through air	26.356	1324.387	0.337	0.496	0.89
#9: doppelganger	26.519	1335.747	0.305	0.456	0.891
#10: strange face in mirror	25.317	1178.646	0.777	0.724	0.877
#11: spiritual being	26.529	1327.067	0.368	0.403	0.889
#12: OBE	26.423	1290.266	0.486	0.648	0.887
#13: polyopic heautoscopy	27.163	1342.915	0.438	0.675	0.889
#14: bodily disconnection	26.942	1323.336	0.464	0.674	0.888
#15: perceptual aberration	26.442	1278.501	0.574	0.665	0.884
#16: feeling like animal	26.644	1295.96	0.532	0.637	0.886
#17: inner voice	25.74	1221.146	0.628	0.602	0.882
#18: bodily transformation	26.288	1307.858	0.375	0.458	0.89
#19: body coming apart	26.788	1326.809	0.342	0.592	0.89
#20: human hallucination	26.558	1269.201	0.602	0.695	0.883
#21: thought insertion	25.933	1226.316	0.62	0.664	0.882

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

Spearman correlations with BODI 1 scores in the general population

		BODI 1 Variables					
		Total Sum	**Endorsement Sum**	**Endorsement with Distress**	**Distress Sum**	**Frequency Sum**	**Vividness Sum**
PQ-B	Total	.73***	.76***	.54***	.72***	.58***	.72***
	Endorsements	.69***	.71***	.52***	.68***	.49***	.69***
	Distressing Endorsements	.58***	.56***	.61***	.61***	.41**	.59***
	Distress	.64***	.65***	.56***	.65***	.49***	.64***
	Occurrence	.67***	.69***	.49***	.65***	.57***	.67***
	PQ-B End. – No Overlap	.72***	.73***	.52***	.69***	.59***	.71***
SPQ	Total	.63***	.64***	.46***	.62***	.53***	.64***
	Cognitive Perceptual	.69***	.69***	.49***	.67***	.57***	.71***
	Interpersonal	.47***	.46***	.43**	.47***	.38**	.49***
	Disorganization	.54***	.56***	.34**	.51***	.49**	.54***
	SPQ Total – No Overlap	.64***	.65***	.47**	.62***	.59***	.65***
DES-II	Total	.44**	.45**	.29*	.42**	.31*	.43**
	Taxon (8 items)	.44**	.44**	.27*	.41**	.38*	.45**
	Amnesia	.37**	.35**	.24*	.32**	.31*	.36**
	Depersonalization	.45**	.46**	.29*	.44**	.33**	.45**
	Absorption	.41**	.41**	.27*	.41**	.29*	.39**
	DES-II Total No Overlap	.45**	.46**	.32*	.43**	.38**	.44**
Perceptual Aberration		.58***	.61***	.43**	.58***	.49**	.55***
Per Ab Total No Overlap		.51**	.53**	.39**	.49**	.36**	.49**

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: Not corrected for multiple comparisons*

Spearman correlations with BODI 1 item total scores in the general population.

BODI 1: ITEM TOTAL SCORES	PQ-B	SPQ	PerAb	DES-II Total	DES-II Taxon	DES-II Amnesia	DES-II Deperson.	DES-II Absorption
#1: unsure of who I am	.57***	.57***	.43**	.22	.39**	.17	.22†	.37**
#2: soul leaves body	.15	.11	.21	-.09	.19	.14	.013	.24†
#3: bodily disconnection	.29*	.32**	.27†	.26†	.24†	.23	.19	.13
#4: sleep paralysis	.34**	.35**	.12	.41**	.42**	.31**	.39**	.34**
#5: time perception	.41**	.27*	.34**	.27†	.17	.17	.19	.21
#6: feeling of presence	.34**	.33*	.15	.21	.21	.21	.21	.15
#7: felt like somebody else	.43**	.32*	.49***	.32*	.29*	.22†	.34**	.37**
#8: floating through air	.44***	.31*	.41**	.31*	.34**	.23†	.32*	.31*
#9: doppelganger	.31*	.32*	.31*	.27*	.12	.23†	.19	-.03
#10: strange face in mirror	.54***	.44**	44**	.42**	.36**	.24†	.39**	.44***
#11: spiritual being	.21	.16	-.01	-.03	-.03	-.035	.11	.03
#12: OBE	.28*	.18	.31*	.24†	.31*	.25*	.28*	.34**
#13: polyopic heautoscopy	.04	.004	.22	.06	-.19	.033	.04	-.12
#14: bodily disconnection	.25†	.24†	.34*	.26†	.29*	.26*	.25*	.35**
#15: perceptual aberration	.45***	.39**	.41**	.27†	.42**	.22†	.23†	.45**
#16: feeling like animal	.26†	.12	.38**	.03	.21	-.11	.07	.25*
#17: inner voice	.35**	.37**	.11	.25†	.21	.19	.14	.12
#18: bodily transformation	.23†	.14	.31*	.09	.04	.09	.15	.06
#19: body coming apart	.13	.15	.13	.21	.17	.25*	.09	.24†
#20: human hallucination	.38**	.31*	.34*	.28*	.32*	.12	.26*	.34**
#21: thought insertion	.35*	.36**	.38**	.21	.36**	.19	.19	.32**

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: Not corrected for multiple comparisons*

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

BODI 1: Inter-Item Correlation Matrix																					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
1																					
2	.17																				
3	.34	.07																			
4	.22	.17	.34																		
5	.34	.16	.15	.17																	
6	.47	.3	.40	.40	.34																
7	.41	.27	.52	.18	.45	.30															
8	.22	.08	.19	.21	.31	.15	.31														
9	.12	.04	.27	.10	.21	.25	.18	.27													
10	.59	.33	.44	.37	.55	.54	.51	.29	.19												
11	.11	.16	.19	.04	.18	.29	.19	.07	.11	.30											
12	.29	.32	.13	.14	.39	.19	.31	.47	.33	.39	.24										
13	.07	.20	.12	.08	.48	.26	.17	.08	.46	.32	.40	.39									
14	.41	.18	.37	.10	.14	.33	.57	.18	.10	.38	.05	.1	-.05								
15	.55	.37	.29	.27	.48	.33	.41	.43	-.01	.52	.08	.36	.01	.33							
16	.32	.21	.24	.18	.34	.31	.31	.08	.12	.59	.40	.26	.51	.12	.17						
17	.37	.27	.37	.28	.37	.55	.39	.07	.19	.43	.34	.28	.25	.31	.44	.39					
18	.13	.28	.32	.26	.38	.27	.37	.04	.12	.29	.08	.01	.3	.24	.26	.24	.28				
19	.25	.08	-.01	.14	.36	.21	.06	.05	.06	.29	.24	.48	.39	.17	.27	.19	.30	.11			
20	.33	.26	.42	.38	.26	.56	.43	.13	.19	.55	.29	.27	.23	.39	.23	.55	.57	.12	.08		
21	.46	.38	.29	.08	.34	.43	.48	.15	.24	.53	.43	.26	.30	.57	.35	.42	.49	.25	.23	.35	

Note: all Study 2A participants included here

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

Spearman correlations with BODI 1 item total scores in both SZ patients (red) and healthy controls (blue)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
#1: unsure of who I am	-	.16	.24	.15	.24	.64*	.34	.03	-.03	.66*	.18	.11	.05	.48*	.45*	.25	.41*	.03	.30	.16	.40*
#2: soul leaves body	.23*	-	.06	.19	.14	.06	.44*	.06	.09	.35†	.13	.28	.18	.34	.36†	.23	.30	.28	.12	.01	.59*
#3: bodily disconnection	.27*	-.04	-	.36†	.20	.43*	.07	.09	.04	.46*	.23	-.02	.12	.30	.21	.26	.23	.30	-.18	.32	.17
#4: sleep paralysis	.13	.02	.22*	-	.19	.40*	.31	.31	.03	.48*	.12	.11	.10	-.23	.50*	.25	.24	.33	.15	.44*	-.01
#5: time perception	.39*	.14	-.10	-.00	-	.40*	.32	.29	.40*	.46*	.07	.51*	.58*	.14	.50*	.27	.38	.43*	.40*	.13	.27
#6: feeling of presence	.29*	.17	.23*	.25*	.07	-	.38†	.00	.24	.70*	.56*	.16	.37†	.35†	.31	.52*	.58*	.21	.23	.63*	.45*
#7: felt like somebody else	.39*	.08	.15	.19†	.58*	.15	-	-.20	.06	.41*	.25	.00	.15	.74*	.25	.28	.51*	.44*	-.18	.34	.49*
#8: floating through air	.29*	.23*	.13	.08	.38*	.14	.59*	-	.15	.16	.06	.56*	.09	-.14	.45*	-.11	-.00	.00	.41*	-.08	-.11
#9: doppelganger	.11	-.08	.53*	.18	.005	.25*	.21†	.27*	-	.08	.43*	.68*	.56*	-.14	-.26	.23	.14	-.07	.24	.17	.38†
#10: strange face in mirror	.45*	.17	.25*	.16	.53*	.29*	.53*	.34*	.13	-	.27	.24	.35†	.41*	.49*	.68*	.35	.27	.35†	.37†	.48*
#11: spiritual being	-.08	.12	-.06	-.10	.12	-.12	.003	.092	-.12	.21†	-	.45*	.50*	.20	-.05	.41	.36†	-.17	.49*	.44*	.54*
#12: OBE	.34*	.48*	.18	.14	.25*	.127	.43*	.36*	.02	.39*	.02	-	.71*	-.16	.11	.31	.22	-.01	.73*	.08	.34
#13: polyopic heautoscopy	-.05	-.03	-.02	-.06	.19†	-.06	.26*	.24*	.33*	-.05	-.04	-.04	-	-.11	-.02	.56*	.22	.21	.65*	.29	.34
#14: bodily disconnection	.27*	-.05	.24*	.24*	.13	.25*	.37*	.21†	.08	.30	-.08	.10	-.02	-	.26	.18	.45*	.20	-.12	.22	.54*
#15: perceptual aberration	.62*	.49*	.18	.05	.46*	.17	.52*	.46*	.02	.47*	.03	.47*	-.03	.26*	-	-.06	.35	.33	.30	.05	.11
#16: feeling like animal	.27*	.20†	-.05	-.00	.27*	-.13	.27*	.37*	-.08	.31*	.12	.12	-.02	.16	.32*	-	.37†	.03	.30	.65*	.40*
#17: inner voice	.14	.13	.17	.14	.05	.27	.14	.11	.27*	.17	.02	.20†	-.03	.106	.21†	-.07	-	.24	.17	.62*	.56*
#18: bodily transformation	.05	.13	.38*	.13	.15	.05	.27*	.10	.28*	.14	.19†	-.10	.36*	.28*	.04	.32*	-.10	-	-.06	.14	.13
#19: body coming apart	.28*	.32*	.28*	.22†	-.04	.15	.26*	-.09	-.08	.18	-.07	.30*	-.02	.42*	.13	-.05	.14	.15	-	.013	.32
#20: human hallucination	.28*	.20†	.24*	.28*	.26*	.40*	.38*	.32*	.23*	.58*	-.08	.44*	-.02	.38*	.28*	.17	.28*	-.07	.17	-	.19
#21: thought insertion	.41*	.11	.16	.01	.23*	.23*	.36*	.23*	.12	.37*	.03	.03	-.03	.58*	.43*	.28*	.15	.17	.10	.26*	-

** $p < .05$, † $p < .1$; Note: scores above are not corrected for multiple comparisons*

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

BODI 1: Inter-Item Covariance Matrix																					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
1	14.4																				
2	1.4	4.6																			
3	3.2	0.4	6.3																		
4	3.4	1.5	3.5	16.1																	
5	5.1	1.4	1.5	2.8	15.5																
6	8.4	3.1	4.7	7.6	6.3	21.8															
7	5.1	1.9	4.2	2.4	5.7	4.6	10.4														
8	2.4	0.5	1.4	2.5	3.5	2.0	2.9	8.2													
9	1.3	0.2	1.8	1.1	2.3	3.1	1.6	2.1	7.2												
10	8.8	2.7	4.3	5.9	8.6	9.8	6.4	3.3	2.0	15											
11	1.17	0.9	1.2	0.51	1.9	3.5	1.6	0.5	0.7	3.1	6.6										
12	3.3	2.08	1.0	1.7	4.6	2.7	3.0	4.0	2.6	4.6	1.8	8.8									
13	0.5	0.78	0.5	0.6	3.3	2.1	0.99	0.4	2.1	2.2	1.8	2.0	3.1								
14	3.4	0.8	2.0	0.9	1.2	3.4	4.0	1.1	0.5	3.3	0.3	0.6	-0.1	4.8							
15	5.9	2.2	2.0	3.1	5.3	4.3	3.7	3.4	-0.1	5.8	0.6	3.1	0.1	2.0	8.0						
16	3.2	1.2	1.6	1.9	3.5	3.7	2.6	0.6	0.8	6.0	2.7	2.0	2.3	0.7	1.2	6.8					
17	5.3	2.2	3.4	4.2	5.6	9.7	4.7	0.7	1.9	6.4	3.3	3.1	1.6	2.6	4.7	3.8	14.				
18	1.5	1.8	2.5	3.2	4.6	3.9	3.7	0.3	1.0	3.5	0.6	-0.1	1.6	1.6	2.2	1.9	3.3	9.8			
19	2.6	0.4	-0.4	1.5	3.9	2.7	0.5	0.4	0.44	3.1	1.6	3.9	1.8	1.0	2.1	1.3	3.1	0.8	7.5		
20	3.61	1.61	3.07	4.45	3.00	7.68	4.06	1.0	1.51	6.2	2.1	2.3	1.2	2.5	1.8	4.1	6.3	1.0	0.6	8.5	
21	6.5	3.1	2.8	1.2	5.1	7.5	5.8	1.6	2.5	7.7	4.1	2.8	2.0	4.7	3.7	4.1	6.9	2.9	2.2	3.8	14

Note: all Study 2A participants included here

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

Medians and Group Differences for SZ vs. HC participants (Study 2A)

Variable		Healthy Controls (n = 17)	Schizophrenia Patients (n = 26)	*SZ patients vs. Controls*		
				U	*p*	*r*
BODI 1	**Total**	5	47	83.5	.007*	.43
	Endorsements	1	5	87	.010*	.42
	End. With Distress	0	2	102	.035*	.37
	Frequency	0	8	86	.009*	.44
	Distress	2	17	83.5	.007*	.44
	Vividness	1	23	78.5	.004*	.46
DES-II	**Total**	11.3	28.6	48	.001*	.49
	Amnesia	4	18	96.5	.042*	.31
	Depersonalization	16	26	122	.231	.27
	Absorption	.5	15	73	.005*	.29
	Taxon (8 items)	3	19.5	31.5	.103	.42

**p < .05; † p<.1; Note: Not corrected for multiple comparisons*

Medians and Group Differences for Risk vs. Low Risk Subjects (Study 2A)

Variable		Low Risk (n = 42)	Risk (n = 29)	*Risk vs. Low Risk*		
				U	*p*	*r*
BODI 1	**Total**	4.5	24	202	<.0001*	.56
	Endorsements	.5	4	197	<.0001*	.57
	End. With Distress	0	1	324.5	.001*	.41
	Frequency	0	2	311	<.0001*	.42
	Distress	1	9	208	<.0001*	.56
	Vividness	.5	7	229	<.0001*	.53
DES-II	**Total**	8.6	10.7	398	.053 †	.24
	Amnesia	3	4	451.5	.205	.16
	Depersonalization	12	17	398	.053 †	.24
	Absorption	0	2	327	.003*	.37
	Taxon (8 items)	2	5	274	.009*	.32
	DES Total No Overlap	8.1	10.4	196.5	.006*	.33
Perceptual Aberration		2	6.5	167	.001*	.47
	PerAb No Overlap	1	4	156.5	<.0001*	.49
SPQ	**Total**	8.5	25	193.5	<.0001*	.58
	Positive Factor	3	8	194.5	<.0001*	.57
	Negative Factor	4	11	277	<.0001*	.45
	Disorganized Factor	2	8	250	<.0001*	.49
	SPQ Total No Overlap	8	24.5	106	<.0001*	.52

**p < .05, † p<.1; Note: Not corrected for multiple comparisons*

Appendix E. Study 2A: BODI 1 Supplementary Data (Continued)

Medians and Group Differences for SZ, Risk and Low Risk Subjects (Study 2A)

Variable		Low Risk (n = 42)	Risk (n = 29)	SZ Patients (n = 26)	SZ vs. Risk vs. Low Risk	
					$\chi^2_{(2)}$	*p*
BODI 1	**Total**	4.5	24	47	28.9	<.0001*
	Endorsements	.5	4	5	28.29	<.0001*
	End. With Distress	0	1	2	16.15	<.0001*
	Frequency	0	2	8	21.12	<.0001*
	Distress	1	9	17	27.12	<.0001*
	Vividness	.5	7	23	27.12	<.0001*
DES-II	**Total**	8.6	10.7	28.6	24.54	<.0001*
	Amnesia	3	4	18	14.26	.001*
	Depersonalization	12	17	26	7.132	.028*
	Absorption	0	2	15	20.84	<.0001*
	Taxon (8 items)	2	5	19.5	11.78	.003*

**p* < .05; † *p*<.1; *Note: Not corrected for multiple comparisons*

Medians and Group Differences for Risk vs. Low Risk Subjects (Study 2A)

Variable		Low Risk (n = 42)	Risk (n = 29)	Risk vs. Low Risk		
				U	*p*	*r*
BODI 1	**Total**	4.5	24	202	<.0001*	.56
	Endorsements	.5	4	197	<.0001*	.57
	End. With Distress	0	1	324.5	.001*	.41
	Frequency	0	2	311	<.0001*	.42
	Distress	1	9	208	<.0001*	.56
	Vividness	.5	7	229	<.0001*	.53
DES-II	**Total**	8.6	10.7	398	.053 †	.24
	Amnesia	3	4	451.5	.205	.16
	Depersonalization	12	17	398	.053 †	.24
	Absorption	0	2	327	.003*	.37
	Taxon (8 items)	2	5	274	.009*	.32
	DES Total No Overlap	8.1	10.4	196.5	.006*	.33
Perceptual Aberration		2	6.5	167	.001*	.47
	PerAb No Overlap	1	4	156.5	<.0001*	.49
SPQ	**Total**	8.5	25	193.5	<.0001*	.58
	Positive Factor	3	8	194.5	<.0001*	.57
	Negative Factor	4	11	277	<.0001*	.45
	Disorganized Factor	2	8	250	<.0001*	.49
	SPQ Total No Overlap	8	24.5	106	<.0001*	.52

**p* < .05; † *p*<.1; *Note: Not corrected for multiple comparisons*

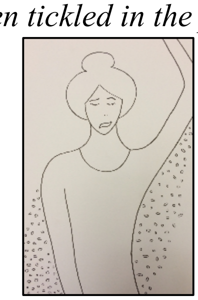
APPENDIX F
BODI 2 New "Normal Body" Control Items

Normal Body Item #1: *"I have suffered from a headache in the past."*

Normal Body Item #2: *"I have scratched an itch in the past."*

Normal Body Item #3: *"I have experienced 'butterflies in the stomach' before."*

Normal Body Item #4: *"I have been tickled in the past."*



Appendix G. Study 2B: BODI 2 Supplementary Data

BODI 2 Summary Item Statistics						
	Mean	Min	Max	Range	Maximum / Minimum	Variance
Item Means	2.247	0.232	7.609	7.377	32.813	5.513
Item Variances	9.025	1.633	20.021	18.388	12.258	24.114
Inter-Item Covariances	1.782	-0.04	5.792	5.832	-144.991	1.328
Inter-Item Correlations	0.207	-0.014	0.487	0.501	-35.019	0.009

BODI 2 Item Statistics		
	Mean	Std. Deviation
#1: unsure of who I am	3.565	4.4745
#2: soul leaves body	0.591	2.1275
#3: bodily disconnection	0.703	2.329
# 4: sleep paralysis	2.388	3.9115
# 5: time perception	3.246	4.0323
CONTROL #1: Headache	7.609	3.4545
#6: feeling of presence	3.047	4.299
#7: felt like somebody else	1.315	3.0675
#8: floating through air	0.696	2.1629
#9: doppelganger	0.525	1.8398
#10: strange face in mirror	2.12	3.5772
CONTROL #2: Itch	7.373	3.3826
#11: spiritual being	0.703	2.2463
#12: OBE	1.178	2.8028
#13: polyopic heautoscopy	0.232	1.278
#14: bodily disconnection	0.627	2.2728
#15: perceptual aberration	1.091	2.7335
CONTROL #3: Butterflies	7.279	3.2572
#16: feeling like animal	0.507	1.9679
#17: inner voice	1.283	3.0475
#18: bodily transformation	1.17	2.9351
#19: body coming apart	1.315	3.4344
#20: human hallucination	0.438	1.7077
#21: thought insertion	1.062	2.8819
CONTROL #4: Tickle	6.116	3.0667

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

BODI 2 Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
#1: unsure of who I am	52.612	1141.147	0.442	0.366	0.855
#2: soul leaves body	55.587	1217.152	0.493	0.452	0.854
#3: bodily disconnection	55.475	1225.028	0.395	0.326	0.856
# 4: sleep paralysis	53.79	1189.33	0.335	0.252	0.859
# 5: time perception	52.931	1133.613	0.534	0.411	0.851
CONTROL #1: Headache	48.569	1188.617	0.396	0.283	0.856
#6: feeling of presence	53.13	1131.328	0.502	0.339	0.852
#7: felt like somebody else	54.862	1202.206	0.391	0.322	0.856
#8: floating through air	55.482	1219.138	0.471	0.382	0.854
#9: doppelganger	55.652	1252.286	0.301	0.228	0.858
#10: strange face in mirror	54.058	1171.626	0.451	0.331	0.854
CONTROL #2: Itch	48.804	1202.536	0.345	0.312	0.858
#11: spiritual being	55.475	1225.901	0.406	0.356	0.856
#12: OBE	55	1198.982	0.454	0.406	0.854
#13: polyopic heautoscopy	55.946	1270.662	0.248	0.246	0.86
#14: bodily disconnection	55.551	1213.434	0.482	0.457	0.854
#15: perceptual aberration	55.087	1193.956	0.495	0.404	0.853
CONTROL #3: Butterflies	48.899	1178.433	0.473	0.386	0.853
#16: feeling like animal	55.67	1242.753	0.348	0.244	0.857
#17: inner voice	54.895	1190.407	0.453	0.424	0.854
#18: bodily transformation	55.007	1198.771	0.431	0.297	0.855
#19: body coming apart	54.862	1181.421	0.431	0.341	0.855
#20: human hallucination	55.739	1249.815	0.349	0.296	0.858
#21: thought insertion	55.116	1175.776	0.561	0.489	0.851
CONTROL #4: Tickle	50.062	1213.745	0.336	0.364	0.858

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Medians and Group Differences for SZ vs. HC participants for BODI 2 items

Variable	Healthy Controls (n = 28)	SZ Patients (n = 19)	*SZ patients vs. Controls*	
			U	*p*
#1: unsure of who I am	0	0	170	.010*
#2: soul leaves body	0	0	244.5	.384
#3: bodily disconnection	0	0	242	.331
#4: sleep paralysis	0	0	202.5	.103
#5: time perception	0	0	256	.762
Control #1: Headache	5	10	188.5	.092 †
#6: feeling of presence	0	0	239.5	.487
#7: felt like somebody else	0	0	248	.501
#8: floating through air	0	0	237	.310
#9: doppelganger	0	0	242	.331
#10: strange face in mirror	0	0	210	.05 †
Control #2: Itch	6	7	260	.896
#11: spiritual being	0	0	175	.003*
#12: OBE	0	0	211	.054 †
#13: polyopic heautoscopy	0	0	256.5	.410
#14: bodily disconnection	0	0	225	.125
#15: perceptual aberration	0	0	229	.167
Control #3: Butterflies	6	6	250.5	.735
#16: feeling like animal	0	0	243.5	.362
#17: inner voice	0	1	152	.002*
#18: bodily transformation	0	0	235.5	.286
#19: body coming apart	0	0	228.5	.236
#20: human hallucination	0	0	242	.331
#21: thought insertion	0	0	194.5	.03*
Control #4: Itch	5	5	238	.541
Total	4	25	134	.004*
Endorsements	1	3	147	.009*
End. With Distress	0	1	120	.0001*
Current End.	0	2	133	.002*
Currently Distressing	0	1	163	.0009*
Frequency	0	3	120	.001*
Distress	1	10	139	.005*
Vividness	1	9	139	.005*
Control Scale	4	3	141	.001*
DD Factor	.5	10	182.5	.058 †
BS Factor	0	11	152	.008*
HA Factor	0	9	155	.012*
BODI 2 Brief (BS + DD)	1.5	20	146	.008*
Factor 1	0	7	171	.024*
Factor 2	2	17	157.5	.016*
Factor 3	0	9	161.5	.012*

**p < .05, † p<.1; Note: Not corrected for multiple comparisons*

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Medians & Group Differences for Low PQ-B, Mid PQ-B, and High PQ-B Groups (BODI 2)

Variable	Low PQ-B (n = 43)	Mid PQ-B (n = 20)	High PQ-B (n = 16)	*Low vs. Mid vs. High*	
				$\chi^2_{(2)}$	*p*
#1: unsure of who I am	0	0	10.5	17.35	<.0001*
#2: soul leaves body	0	0	0	9.12	.010*
#3: bodily disconnection	0	0	0	11.23	.004*
#4: sleep paralysis	0	0	4	6.043	.049*
#5: time perception	0	3	8	9.42	.009*
Control #1: Headache	7	9	11	15.1	.001*
#6: feeling of presence	0	6.5	7	9.04	.011*
#7: felt like somebody else	0	0	6.5	18.2	<.0001*
#8: floating through air	0	0	0	14.2	<.0001*
#9: doppelganger	0	0	0	.14	.932
#10: strange face in mirror	0	0	6.5	11.31	.003*
Control #2: Itch	7	8.5	10.5	7.94	.019*
#11: spiritual being	0	0	0	1.7	.428
#12: OBE	0	0	0	1.96	.375
#13: polyopic heautoscopy	0	0	0	8.12	.017*
#14: bodily disconnection	0	0	0	10.5	.005*
#15: perceptual aberration	0	0	0	2.53	.282
Control #3: Butterflies	7	8.5	9	4.98	.082 †
#16: feeling like animal	0	0	0	2.36	.307
#17: inner voice	0	0	0	2.75	.252
#18: bodily transformation	0	0	0	.837	.658
#19: body coming apart	0	0	0	.251	.882
#20: human hallucination	0	0	0	2.73	.255
#21: thought insertion	0	0	8	.56	.757
Control #4: Tickle	7	6	7	2.97	.227
Total	13	36.5	53.5	20.09	<.0001*
Endorsements	2	4	5.5	15.58	<.0001*
End. With Distress	0	2	5	21.84	<.0001*
Current Endorsements	1	3	4.5	19.02	<.0001*
Currently Distressing	0	1	3	23.57	<.0001*
Frequency	1	5	5	20.68	<.0001*
Distress	1	13	23	23.09	<.0001*
Vividness	5	10.5	17	15.98	<.0001*
Control Scale	4	4	4	.291	.865
DD Factor	4	4	4	14.14	.0009*
BS Factor	6	11.5	20.5	16.81	.0002*
HA Factor	4	9	20.5	11.08	.0039*
BODI 2 Brief (BS + DD)	3	10	10	17.11	.0002*
Factor 1	11	19.5	28.5	3.31	.191
Factor 2	0	4	7.5	22.64	<.0001*
Factor 3	9	18	34.5	11.54	<.0001*

**p < .05; † p<.1; Note: Not corrected for multiple comparisons*

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Medians and Group Differences for Low PQ-B vs. High PQ-B Distress Groups (BODI 2)

Variable	Low PQ-B (n = 43)	High PQ-B (n = 16)	Low PQ-B vs. High PQ-B	
			U	*p*
#1: unsure of who I am	0	10.5	129.5	<.0001*
#2: soul leaves body	0	0	265	.005*
#3: bodily disconnection	0	0	242	.001*
#4: sleep paralysis	0	4	230	.015*
#5: time perception	0	8	185.5	.003*
Control #1: Headache	7	11	116	<.0001*
#6: feeling of presence	0	7	217	.010*
#7: felt like somebody else	0	6.5	167.5	<.0001*
#8: floating through air	0	0	236.5	<.0001*
#9: doppelganger	0	0	340.5	.920
#10: strange face in mirror	0	6.5	190.5	.001*
Control #2: Itch	7	10.5	178.5	.004*
#11: spiritual being	0	0	331.5	.684
#12: OBE	0	0	295	.201
#13: polyopic heautoscopy	0	0	286	.023*
#14: bodily disconnection	0	0	242.5	.001*
#15: perceptual aberration	0	0	284	.144
Control #3: Butterflies	7	9	213.5	.024*
#16: feeling like animal	0	0	309.5	.122
#17: inner voice	0	0	281.5	.117
#18: bodily transformation	0	0	312	.422
#19: body coming apart	0	0	328	.603
#20: human hallucination	0	0	308	.107
#21: thought insertion	0	8	331	.673
Control #4: Itch	7	7	269.5	.199
Total	13	53.5	108	<.0001*
Endorsements	2	5.5	140	<.0001*
Endorsements With Distress	0	5	106	<.0001*
Current Endorsements	1	4.5	106.5	<.0001*
Currently Distressing	0	3	106	<.0001*
Frequency	1	5	99	<.0001*
Distress	1	23	96	<.0001*
Vividness	5	17	134.5	<.0001*
Control Scale	4	4	323	.582
DD Factor	4	4	151.5	.001*
BS Factor	6	20.5	108	<.0001*
HA Factor	4	20.5	174.5	.003*
BODI 2 Brief (BS + DD)	3	10	118.5	<.0001*
Factor 1	11	28.5	248.5	.078†
Factor 2	0	7.5	97	<.0001*
Factor 3	9	34.5	158	<.0001*

*$p < .05$; † $p<.1$

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

BODI 2 Medians and Group Differences for SZ, Risk and Low Risk Subjects

Variable	Low Risk (n = 37)	Risk (n = 26)	SZ Patients (n = 19)	SZ vs. Risk vs. Low Risk	
				$\chi^2_{(2)}$	*p*
#1: unsure of who I am	0	8	0	13.97	.001*
#2: soul leaves body	0	0	0	8.96	.011*
#3: bodily disconnection	0	0	0	5.1	.080†
#4: sleep paralysis	0	0	0	5.2	.075†
#5: time perception	0	8	0	24.5	<.0001*
Control #1: Headache	7	9.5	10	12.6	.002*
#6: feeling of presence	0	7	0	10.3	.006*
#7: felt like somebody else	0	0	0	11.7	.003*
#8: floating through air	0	0	0	9.3	.010*
#9: doppelganger	0	0	0	.18	.914
#10: strange face in mirror	0	6.5	0	16.5	<.0001*
Control #2: Itch	7	11	7	17.6	<.0001*
#11: spiritual being	0	0	0	9.3	.009*
#12: OBE	0	0	0	4.2	.124
#13: polyopic heautoscopy	0	0	0	3.9	.140
#14: bodily disconnection	0	0	0	10.4	.006*
#15: perceptual aberration	0	0	0	12.1	.002*
Control #3: Butterflies	7	9	6	7.2	.028*
#16: feeling like animal	0	0	0	6.2	.045*
#17: inner voice	0	0	1	17.4	<.0001*
#18: bodily transformation	0	0	0	.22	.897
#19: body coming apart	0	0	0	3.9	.139
#20: human hallucination	0	0	0	6.2	.045*
#21: thought insertion	0	0	0	11.2	.004*
Control #4: Tickle	0	0	5	6.4	.041*
Total	10	39	25	22.3	<.0001*
Endorsements	1	4.5	3	10.8	.005*
Endorse With Distress	0	1	1	16.9	<.0001*
Current Endorsements	1	4	2	32.5	<.0001*
Currently Distressing	0	1	1	15.2	<.0001*
Frequency	1	5.5	3	32.7	<.0001*
Distress	4	12.5	10	25.5	<.0001*
Vividness	4	15	9	22.5	<.0001*
Control Scale	4	4	3	18.2	<.0001*
DD Factor	6	17.5	10	27.5	<.0001*
BS Factor	3	12.5	11	24.5	<.0001*
HA Factor	0	10	9	33.9	<.0001*
BODI 2 Brief (BS + DD)	10	29	20	29.8	<.0001*
Factor 1	0	8	7	24.9	<.0001*
Factor 2	10	26	17	34.4	<.0001*
Factor 3	0	7	9	26.2	<.0001*

**p < .05, † p<.1; Note: not corrected for multiple comparisons*

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Spearman correlations with BODI 2 scores in SZ patients

	BODI 2 Variables										
	Total Sum	Endorse Sum	Endorse w/ Dis.	Currently Distress.	Distress Sum	Freq. Sum	Vivid. Sum	Control Sum	DD Factor	BS Factor	HA Factor
BPRS total	.49†	.47†	.51*	.41	.52*	.47†	.53*	.56*	.45†	.59*	.31
SAPS total	.67**	.63**	.41	.41	.67**	.69**	.72**	.48†	.59*	.536*	.599*
SANS total	-.59*	-.48†	-.38	-.38	-.57*	-.54*	-.60*	-.18	-.48†	-.382	-.547*
CPZ-EQ	-.21	-.25	.09	-.28	-.19	-.31	-.26	.16	-.2	-.22	-.19

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: not corrected for multiple comparisons*

Spearman correlations with BODI 2 scores in the general population

	BODI 2 Variables							
	Total Sum	Endorse Sum	Endorse w/ Dis.	Currently Distress.	Distress Sum	Freq. Sum	Vivid. Sum	Control Sum
PQ-B Total	.73***	.68***	.61***	.63***	.74***	.75***	.67***	.11
Endorsements	.74***	.71***	.54***	.59***	.72***	.74***	.69***	.15
Distressing End.	.65***	.61***	.64***	.66***	.69***	.61***	.59***	.15
Distress	.71***	.65***	.64***	.64***	.74***	.69***	.64***	.06
Occurrence	.68***	.66***	.49***	.54***	.66***	.76***	.63***	.17
PQ-B No Overlap	.72***	.69***	.55***	.56***	.71***	.73***	.67***	.21
SPQ Total	.67***	.64***	49***	.49***	.66***	.71***	.61***	.16
Cognitive Perceptual	.68***	.65***	.53***	.52***	.68***	.69***	.63***	.17
Interpersonal	.61***	.57***	.45***	.43***	.61***	.61***	.54***	.11
Disorganization	.44*	.41**	.27*	.33**	.41**	.56***	.39**	.16
SPQ No Overlap	.66***	.63***	.48***	.48***	.65***	.71***	.61***	.17
DES-II Total	.62***	.61***	.42***	.41***	.59***	.61***	.61***	.21†
Taxon (8 items)	.61***	.57***	.443***	.52***	.59***	.63***	.58***	.13
Amnesia	.64***	.64***	.51***	.47***	.64***	.61***	.59***	.08
Depersonalization	.65***	.64***	.48***	.49***	.63***	.61***	.64***	.01
Absorption	.56***	.56***	36***	.38***	.53***	.57***	.56***	.22†
DES-II No Overlap	.62***	.61***	.42***	.41***	.59***	.61***	.59***	.11
Perceptual Ab	.68***	.67***	.48***	.54***	.66***	.75***	.62***	.19
Per Ab No Overlap	.59***	.59***	.45***	.52***	.58***	.63***	.54***	.18
TLS Total	.69***	.71***	.48***	.51***	.66***	.65***	.71***	.19
TLS No Overlap	.68***	.69***	.48***	.51***	.65***	.65***	.68***	.13
SELF Total	.62**	.61**	.57**	.45*	.66**	.62**	.62**	.03
Physical Anhedonia	.11	.09	.11	.06	.11	.05	.08	-.12
Hypomanic Scale	.28*	.27*	.143	.25*	.23*	.39**	.29**	.05
AQ total	.41**	.38**	.33**	.34**	.42**	.45***	.36**	.12

**** p<.001; ** p < .01; * p < .05; † p < .1; Note: not corrected for multiple comparisons*

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Spearman correlations with BODI 2 scores in the general population

	BODI 2 Factors						
	DD Factor	BS Factor	HA Factor	Brief (BS, DD)	Factor 1	Factor 2	Factor 3
PQ-B Total	.63***	.58***	.57***	.67***	.45***	.73***	.48***
Endorsements	.65***	.54***	.61***	.67***	.44***	.74***	.53***
Distressing Endorsements	.52***	.56***	.51***	.59***	.34**	.66***	.44***
Distress	.59***	.58***	.54***	.65***	.43***	.71***	.45***
Occurrence	.57***	.53***	.55***	.63***	.45***	.67***	.44***
PQ-B End. – No Overlap	.53***	.53***	.57***	.67***	.44***	.73***	.51***
SPQ Total	.61***	.53***	.45***	.65***	.45***	.67***	.38**
Cognitive Perceptual	.59***	.53***	.55***	.63***	.45***	.69***	.47***
Interpersonal	.53***	.49***	.37**	.59***	.41***	.61***	.33**
Disorganization	.39***	.38***	.23*	.45***	.28*	.43***	.20†
SPQ Total – No Overlap	.59***	.53***	.53***	.65***	.45***	.67***	.37**
DES-II Total	.54***	.49***	.44***	.61***	.47***	.58***	.39***
Taxon (8 items)	.49***	.55***	.39***	.59***	.37**	.59***	.43***
Amnesia	.54***	.54***	.53***	.62***	.53***	.59***	.42***
Depersonalization	.56***	.54***	.49***	.62***	.34**	.62***	.57***
Absorption	.48***	.44***	.42***	.53***	.39***	.54***	.37**
DES-II Total No Overlap	.53***	.48***	.44***	.6***	.47***	.58***	.39***
Perceptual Aberration	.59***	.65***	.47***	.67***	.50***	.64***	.49***
Per Ab Total –No Overlap	.51***	.57***	.45***	.57***	.41***	.57***	.48***
TLS Total	.65***	.51***	.56***	.65***	.38**	.67***	.62***
TLS Total – No Overlap	.65***	.51***	.53***	.66***	.37**	.67***	.57***
SELF Total	.39	.48*	.62**	.51*	.37	.41†	.56*
Physical Anhedonia	.05	.05	.13	.05	.005	.13	-.009
Hypomanic Personality	.27*	.24*	.173	.27*	.12	.29*	.25*
AQ total	.38**	.38**	.16	.45***	.27*	.41***	.22†

Spearman correlations with BODI 2 item total scores in the general population.

BODI 2: ITEM TOTAL SCORES	PQ-B	SPQ	PerAb	DES-II Total	DES-II Taxon	DES-II Amnesia	DES-II Deperson.	DES-II Absorption	TLS	SELF
#1: unsure of who I am	.44***	.44***	.37***	.28**	.43***	.28*	.38**	.31**	.32**	.46*
#2: soul leaves body	.39***	.34**	.45***	.28*	.34**	.38***	.39***	.22†	.41***	.16
#3: bodily disconnection	.38***	.27*	.40***	.44***	.33**	.48***	.43***	.41***	.32**	.39*
#4: sleep paralysis	.32**	.24*	.17	.18	.17	.36**	.33**	.11	.35**	.19
#5: time perception	.57***	.61***	.46***	.49***	.35**	.42***	.32**	.47***	.46***	.413*
Control #1: Headache	.43***	.42***	.31**	.25*	.22†	.15	.109	.25*	.38**	.31
#6: feeling of presence	.44***	.34**	.42***	.34**	.37***	.48***	.33**	.31**	.45***	.25
#7: felt like somebody else	.42***	.37***	.51***	.38***	.43***	.32**	.58***	.32**	.47***	.26
#8: floating through air	.37***	.38***	.35**	.31**	.25*	.33**	.24*	.31**	.34**	.25
#9: doppelganger	-.03	-.05	-.07	.01	-.06	-.07	.038	.06	.02	-.03
#10: strange face in mirror	.45***	.37***	.33**	.38***	.36**	.33**	.55****	.37***	.47***	.01
Control #2: Itch	.47***	.37***	.26*	.34**	.24*	.26*	.17	.36**	.25*	.38†
#11: spiritual being	.33**	.26*	.24*	.37***	.12	.36**	.13	.35**	.15	.26
#12: OBE	.24*	.15	.28*	.08	.16	.12	.25*	.069	.31**	.25
#13: polyopic heautoscopy	.13	.17	.21†	.08	.18	.14	.15	.095	.13	.09
#14: bodily disconnection	.443***	.45***	.44***	.34**	.33**	.38***	.33**	.32**	.41***	.39*
#15: perceptual aberration	.42***	.36**	.34**	.22†	.24*	.25*	.33**	.21†	.26*	.093
Control #3: Butterflies	.35**	.37***	.31**	.42***	.39***	.28*	.27*	.42***	.21†	.39*
#16: feeling like animal	.27*	.21†	.29**	.15	.19†	.134	.26*	.12	.29*	.024
#17: inner voice	.38***	.28*	.31**	.21†	.31**	.25*	.36**	.17	.32**	.39*
#18: bodily transformation	.22†	.28*	.32**	.32**	.21†	.33**	.17	.23*	.26*	-.05
#19: body coming apart	.06	.05	.005	.016	.05	.11	.11	.03	-.011	.51**
#20: human hallucination	.27*	.16	.28*	.15	.17	.27*	.23*	.14	.29**	.35†
#21: thought insertion	.31**	.26*	.28*	.21†	.35**	.31**	.28*	.12	.33**	.52**
Control #4: Tickle	.27*	.23*	.12	.28*	.23*	.23*	.18	.26*	.25*	-.12

**** $p<.001$; ** $p < .01$; * $p < .05$; $^{\dagger}p < .1$; Note: not corrected for multiple comparisons*

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

BODI 2 ITEM BY ITEM CORRELATION MATRIX IN ALL SUBJECTS

	1	2	3	4	5	C1	6	7	8	9	10	C2	11	12	13	14	15	C3	16	17	18	19	20	21	C4
1																									
2	.25																								
3	.05	.21																							
4	.14	.26	.22																						
5	.28	.25	.2	.12																					
C1	.19	.17	.1	.17	.24																				
6	.24	.33	.27	.33	.33	.25																			
7	.37	.19	.17	.14	.23	.18	.22																		
8	.18	.40	.23	.25	.36	.18	.24	.13																	
9	.20	.23	.21	.10	.09	.06	.09	.15	.16																
10	.27	.19	.17	.25	.38	.16	.296	.275	.112	.10															
C2	.20	.03	.10	.11	.30	.33	.17	.2	.149	.105	.243														
11	.21	.25	.23	.11	.21	.11	.246	.141	.252	.121	.144	.137													
12	.15	.49	.17	.29	.27	.21	.386	.074	.373	.212	.272	.105	.237												
13	.18	.26	.11	.05	.13	.15	.118	.122	.178	.152	.023	.113	-.01	.023											
14	.21	.35	.44	.21	.30	.19	.327	.128	.394	.291	.22	.004	.284	.303	.049										
15	.14	.16	.26	.15	.36	.17	.215	.296	.239	.225	.275	.21	.323	.208	.237	.244									
C3	.31	.23	.15	.09	.34	.38	.221	.132	.213	.119	.224	.305	.152	.191	.175	.229	.283								
16	.24	.31	.03	.12	.21	.14	.262	.261	.16	.119	.291	.093	.079	.295	.047	.182	.098	.137							
17	.28	.23	.30	.13	.19	.15	.204	.171	.237	.234	.224	.068	.426	.22	.153	.381	.359	.267	.13						
18	.16	.25	.24	.16	.34	.13	.228	.238	.318	.183	.199	.142	.216	.174	.254	.237	.249	.187	.09	.19					
19	.26	.24	.15	.22	.23	.14	.155	.135	.267	.255	.099	.136	.296	.221	.117	.165	.352	.312	.16	.21	.25				
20	.16	.23	.27	.08	.24	.85	.232	.163	.155	.176	.164	.051	.195	.154	.085	.394	.181	.067	.17	.41	.19	.08			
21	.39	.27	.25	.11	.26	.15	.285	.347	.365	.21	.243	.136	.397	.25	.178	.233	.402	.235	.25	.38	.39	.43	.21		
C4	.15	.19	.21	.05	.21	.35	.171	.136	.098	.068	.229	.371	-.01	.068	.064	.087	.198	.425	.09	.04	.14	.18	.07	.151	

Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)

Spearman correlations with BODI 2 item total scores in both healthy controls (blue) and SZ patients (red)

Item	1	2	3	4	5	C1	6	7	8	9	10	C2	11	12	13	14	15	C3	16	17	18	19	20	21	C4
1	-	.26	.07	.21	.61*	.11	-.11	.42	.19	.46*	.26	.42†	.37	.36	-	.26	.39†	.43†	.13	.66*	.02	.60*	.62*	.70*	.09
2	.21*	-	.60*	.41†	.55*	-.14	.19	.13	.48*	.69*	.71*	.04	.54*	.32	-	.55*	.18	.26	.13	.33	.59*	.45†	.25	.54*	.27
3	.05	.23*	-	.14	.47*	-.04	.14	-.19	.41†	.60*	.29	-.11	.49*	.26	-	.47*	.14	.06	-.19	.12	.51*	.38	.20	.17	.26
4	.12†	.23*	.24*	-	.35	.011	.18	-.17	.64*	.53*	.26	.24	.03	.45†	-	.42†	-.13	.06	.003	.43†	.09	.17	.29	.11	-46*
5	.28*	.25*	.18*	.12†	-	-.09	.34	.17	.35	.81*	.54*	.20	.19	.20	-	.71*	.16	.33	.19	.56*	.47*	.343	.86*	.33	.014
C1	.18*	.18*	.18*	.22*	.30*	-	.27	.45	.03	-.27	.243	.25	.26	.12	-	.16	-.16	.43†	.45	.10	-.45	-006	-.12	.23	.10
6	.26*	.33*	.27*	.33*	.34*	.29*	-	-.03	.32	.19	.14	-.05	.09	.19	-	.62*	-.09	.34	-.02	.10	.28	-009	.26	-.06	-.06
7	.36*	.25*	.23*	.17*	.23*	.15*	.27*	-	-.22	-.19	.44†	.11	.22	-.25	-	.09†	.13	.37	.59*	.26	-.22	.09	.23	.60*	.25
8	.16*	.47*	.23*	.19*	.36*	.18*	.23*	.16*	-	.48*	.19	.11	.15	.80*	-	.67*	.04	.21	-.22	.25	.38	.52*	.10	.29	-.25
9	.17*	.14*	.12†	-003	.04	.08	.05	.02	.10	-	.36	.26	.34	.32	-	.55*	.18	.12	-.19	.52*	.59*	.45	.56*	.22	-.06
10	.25*	.10	.17*	.21*	.37*	.16*	.31*	.25*	.08	.04	-	.15	.25	.05	-	.47*	-.04	.38	.78*	.21	.26	.14	.35	.47*	.28
C2	.18*	.06	.19*	.12*	.32*	.40*	.22*	.23*	.19*	.08	.27*	-	.31	.16	-	-.11	-.12	.15	.10	.15	-.08	.29	.015	.27	-.25
11	.14*	.28*	.21*	.14*	.24*	.05	.29*	.15*	.25*	.012	.10	.14*	-	.37	-	.19	.53*	.43†	-.12	.39	.23	.69*	-.02	.68*	.27
12	.10	.47*	.15*	.29*	.27*	.21*	.42*	.17*	.31*	.13*	.28*	.12†	.24*	-	-	.52*	.33	.44†	-.26	.47*	.23	.69*	.03	.46*	-.12
13	.18*	.32*	.22*	.05	.14*	.16*	.11†	.12†	.21*	.24*	.005	.13*	.08	.07	-	-	-	-	-	-	-	-	-	-	-
14	.19*	.28*	.42*	.12	.29*	.22*	.29*	.19*	.33*	.15*	.17*	.08	.26*	.19*	.10	-	.16	.58*	.10	.53*	.47*	.343	.52*	.28	-.03
15	.08	.24*	.27*	.20*	.39*	.21*	.24*	.29*	.28*	.17*	.29*	.30*	.26*	.20*	.26*	.23*	-	.38	-.22	.50*	.38	.70*	.23	.54*	.15
C3	.27*	243*	.27*	.14*	.39*	.44*	.25*	.14*	.23*	.10	.22*	.37*	.15*	.18*	.20*	.16*	.19*	-	.27	.58*	.20	.46*	.24	.54*	.08
16	.23*	.40*	.08	.14*	.19*	.11†	.27*	.24*	.24*	.21*	.23*	.09	.19*	.37*	.10	.17*	.19*	.11†	-	.009	-.22	-.25	.25	.25	.21
17	.21*	.26*	.29*	.04	.19*	.12†	.21*	.17*	.21*	.16*	.22*	.08	.36*	.18*	.20*	.34*	.34*	.22*	.14*	-	.17	.48*	.52*	.52*	-.11
18	.19*	.26*	.20*	.16*	.32*	.19*	.21*	.30*	.29*	.08	.19*	.16*	.23*	.14*	.27*	.15*	.21*	.17*	.15*	.18*	-	.37	.23	.13	-.01
19	.20*	.25*	.16*	.25*	.24*	.17*	.14*	.11†	.17*	.15*	.08	.14*	.18*	.13*	.16*	.08	.27*	.30*	.26*	.08	.19*	-	.18	.77*	.09
20	.11†	.24*	.27*	.04	.16*	.13*	.22*	.17*	.19*	.16*	.14*	.11†	.22*	.16*	.19*	.37*	.16*	.02	.12†	.39*	.17*	.04	-	.23	-.01
21	.35*	.36*	.25*	.09	.29*	.14*	.34*	.35*	.35*	13*	.23*	.16*	.29*	.22*	.25*	.18*	.37*	.22*	.29*	.30*	.42*	.29*	.25*	-	.30
C4	143*	.18*	.22*	.14*	.23*	.42*	.21*	.13*	.20*	.09	.20*	.46*	.02	.09	.12†	.13*	.22*	.49*	.13*	.09	.18*	.25*	.14*	.19*	-

** $p < .05$, † $p < .1$;*

Note: scores above are not corrected for multiple comparisons;

Since 0% SZ patients endorsed #13 (polyopic heautoscopy), no correlations are available for this item for the SZ patient group

<u>**Appendix G. Study 2B: BODI 2 Supplementary Data (Continued)**</u>

BODI 2 Inter-Item Covariance Matrix																									
	1	**2**	**3**	**4**	**5**	**C1**	**6**	**7**	**8**	**9**	**10**	**C2**	**11**	**12**	**13**	**14**	**15**	**C3**	**16**	**17**	**18**	**19**	**20**	**21**	**C4**
1	20																								
2	2.4	4.5																							
3	0.5	1.0	5.4																						
4	2.4	2.2	1.9	15																					
5	5.1	2.2	1.9	1.9	16																				
C1	2.9	1.2	1.2	2.4	3.4	11																			
6	4.6	3.0	2.7	5.6	5.8	3.8	18																		
7	5.1	1.3	1.2	1.7	2.8	1.9	2.9	9.4																	
8	1.7	1.9	1.1	2.1	3.1	1.4	2.3	0.7	4.7																
9	1.7	0.9	0.9	0.8	0.7	0.4	0.7	0.1	0.7	3.3															
10	4.3	1.5	1.4	3.5	5.6	1.9	4.5	3.0	0.8	0.7	12														
C2	3.0	0.2	0.8	1.5	4.2	3.9	2.5	2.1	1.1	0.7	2.9	11													
11	2.1	1.2	1.2	1.1	1.9	0.9	2.4	0.9	1.2	0.5	1.2	1.1	5.1												
12	1.9	2.9	1.2	3.3	3.1	2.1	4.6	0.6	2.3	1.1	2.7	0.9	1.5	7.9											
13	1.0	0.7	0.3	0.3	0.7	0.7	0.6	0.5	0.5	0.4	0.1	0.5	-.1	0.1	1.6										
14	2.2	1.7	2.3	1.9	2.7	1.5	3.2	0.9	1.9	1.2	1.8	0.02	1.5	1.9	0.14	5.2									
15	1.7	0.9	1.6	1.6	3.9	1.6	2.5	2.5	1.4	1.1	2.7	1.9	1.9	1.6	0.8	1.5	7.5								
C3	4.1	1.6	1.2	1.2	4.6	4.4	3.1	1.3	1.5	0.7	2.6	3.4	1.1	1.74	0.7	1.7	2.5	10.6							
16	2.1	1.3	0.1	0.9	1.7	1.0	2.2	1.6	0.7	0.4	2.1	0.6	0.4	1.6	0.2	0.8	0.5	0.8	3.9						
17	3.8	1.5	2.2	1.6	2.3	1.6	2.7	1.6	1.6	1.3	2.4	0.7	2.9	1.9	0.6	2.6	2.9	2.6	0.8	9.3					
18	2.1	1.6	1.6	1.8	4.1	1.4	2.8	2.1	2.1	0.9	2.1	1.4	1.4	1.4	0.9	1.5	2.0	1.8	0.6	1.7	8.6				
19	4.1	1.8	1.3	3.1	3.3	1.7	2.3	1.4	1.9	1.6	1.2	1.6	2.3	2.1	0.5	1.3	3.3	3.5	1.1	2.3	2.5	11.8			
20	1.3	0.8	1.1	0.5	1.6	0.5	1.7	0.8	0.6	0.6	1.0	0.3	0.7	0.7	0.2	1.5	0.8	0.3	0.6	2.1	.97	.49	2.9		
21	5.1	1.7	1.7	1.3	3.1	1.5	3.5	3.1	2.3	1.1	2.5	1.3	2.6	2.1	0.6	1.5	3.2	2.2	1.5	3.4	3.4	4.3	1.2	8.3	
C4	1.9	1.3	1.5	0.6	2.6	3.7	2.2	1.2	0.6	0.4	2.5	3.8	-.1	0.6	0.3	0.61	1.6	4.3	0.6	0.4	1.3	1.9	0.4	1.34	9.4

Appendix H. Study 2C Supplementary Data

BODI 1 (blue) vs. BODI 2 (red)
ITEM BY ITEM CORRELATION MATRIX IN ALL SUBJECTS

	1	2	3	4	5	C1	6	7	8	9	10	C2	11	12	13	14	15	C3	16	17	18	19	20	21	C4
1	-	.17	.33	.22	.34	-	.48	.418	.221	.126	.595	-	.119	.295	.079	.416	.553	-	.32	.37	.12	.25	.32	.46	-
2	.25	-	.08	.18	.16	-	.3	.27	.08	.04	.33	-	.17	.33	.21	.18	.37	-	.21	.27	.28	.08	.26	.38	-
3	.05	.21	-	.35	.15	-	.41	.52	.19	.28	.45	-	.19	.14	.13	.37	.29	-	.25	.36	.32	-.07	.42	.29	-
4	.14	.26	.22	-	.18	-	.40	.18	.22	.11	.38	-	.05	.143	.09	.10	.28	-	.19	.28	.26	.14	.38	.08	-
5	.28	.25	.2	.12	-	-	.343	.45	.32	.22	.56	-	.19	.40	.48	.15	.48	-	.35	.37	.37	.36	.26	.343	-
C1	.19	.17	.1	.17	.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	.24	.33	.27	.33	.33	.25	-	.31	.15	.25	.54	-	.29	.19	.26	.33	.33	-	.31	.55	.27	.21	.56	.43	-
7	.37	.19	.17	.14	.23	.18	.22	-	.31	.18	.51	-	.19	.32	.17	.57	.41	-	.32	.39	.37	.06	.43	.48	-
8	.18	.40	.23	.25	.36	.18	.24	.13	-	.28	.30	-	.07	.48	.08	.18	.43	-	.08	.07	.04	.05	.13	.15	-
9	.20	.23	.21	.10	.09	.06	.09	.15	.16	-	.19	-	.11	.33	.46	.10	-.01	-	.13	.19	.12	.06	.19	.24	-
10	.27	.19	.17	.25	.38	.16	.296	.275	.112	.10	-	-	.31	.40	.32	.38	.53	-	.59	.43	29	.28	.55	.53	-
C2	.20	.03	.10	.11	.30	.33	.17	.2	.149	.105	.243	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	.21	.25	.23	.11	.21	.11	.246	.141	.252	.121	.144	.137	-	.25	.41	.06	.09	-	.41	.34	.08	.24	.29	.43	-
12	.15	.49	.17	.29	.27	.21	.386	.074	.373	.212	.272	.105	.237	-	.39	.1	.37	-	.27	.28	-.02	.48	.27	.26	-
13	.18	.26	.11	.05	.13	.15	.118	.122	.178	.152	.023	.113	-.01	.023	-	-.05	.02	-	.51	.25	.30	.39	.23	.30	-
14	.21	.35	.44	.21	.30	.19	.327	.128	.394	.291	.22	.004	.284	.303	.049	-	.33	-	.12	.31	.24	.17	.39	.58	-
15	.14	.16	.26	.15	.36	.17	.215	.296	.239	.225	.275	.21	.323	.208	.237	.244	-	-	.17	.43	.26	.27	.23	.35	-
C3	.31	.23	.15	.09	.34	.38	.221	.132	.213	.119	.224	.305	.152	.191	.175	.229	.283	-	-	-	-	-	-	-	-
16	.24	.31	.03	.12	.21	.14	.262	.261	.16	.119	.291	.093	.079	.295	.047	.182	.098	.137	-	.39	.24	.19	.55	.43	-
17	.28	.23	.30	.13	.19	.15	.204	.171	.237	.234	.224	.068	.426	.22	.153	.381	.359	.267	.13	-	.28	.30	.57	.48	-
18	.16	.25	.24	.16	.34	.13	.228	.238	.318	.183	.199	.142	.216	.174	.254	.237	.249	.187	.09	.19	-	.09	.12	.25	-
19	.26	.24	.15	.22	.23	.14	.155	.135	.267	.255	.099	.136	.296	.221	.117	.165	.352	.312	.16	.21	.25	-	.08	.22	-
20	.16	.23	.27	.08	.24	.85	.232	.163	.155	.176	.164	.051	.195	.154	.085	.394	.181	.067	.17	.41	.19	.08	-	.35	-
21	.39	.27	.25	.11	.26	.15	.285	.347	.365	.21	.243	.136	.397	.25	.178	.233	.402	.235	.25	.38	.39	.43	.21	-	-
C4	.15	.19	.21	.05	.21	.35	.171	.136	.098	.068	.229	.371	-.01	.068	.064	.087	.198	.425	.09	.04	.14	.18	.07	.151	-

Note: BODI 1 does not contain control items

Appendix H. Study 2C Supplementary Data (Continued)

In the table below, we compared proportions of BODI endorsement by version and by group by using the "N – 1" Chi-squared test as recommended by Campbell (2007) and Richardson (2011).

% Endorsements of Individual BODI Items by Group & Version

BODI Item	BODI 1	BODI 2	BODI 1 VS. BODI 2	Conclusion
Item 1: unsure of who I am	**Total N**: 27% **SZ**: 43% **HC**: 23% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 40% **SZ**: 47% **HC**: 20% $\chi^2_{(1)}$: *SZ > HC*†	**Total N**: $\chi^2_{(1)} = 5.7$, $p = .017$* **SZ**: $\chi^2_{(1)} = 0.07$, $p = .79$ **HC**: $\chi^2_{(1)} = 0.35$, $p = .55$ *SZ v. HC: Equal 1, Trend 2*	**Total N: 1 < 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 2: soul leaves body	**Total N**: 8% **SZ**: 17% **HC**: 4% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 7% **SZ**: 16% **HC**: 7% $\chi^2_{(1)}$: *SZ = CO*	**Total N**: $\chi^2_{(1)} = 0.12$, $p = .74$ **SZ**: $\chi^2_{(1)} = 0.008$, $p = .93$ **HC**: $\chi^2_{(1)} = 0.96$, $p = .33$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1>2*
Item 3: bodily disconnection	**Total N**: 7% **SZ**: 17% **HC**: 4% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 10% **SZ**: 16% **HC**: 10% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.85$ $p = .36$ **SZ**: $\chi^2_{(1)} = 0.008$, $p = .93$ **HC**: $\chi^2_{(1)} = 2.9$, $p = .08^{\dagger}$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1>2*
Item 4: sleep paralysis	**Total N**: 25% **SZ**: 39% **HC**: 23% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 32% **SZ**: 47% **HC**: 24% $\chi^2_{(1)}$: *SZ > HC*†	**Total N**: $\chi^2_{(1)} = 1.8$, $p = .18$ **SZ**: $\chi^2_{(1)} = 0.28$, $p = .59$ **HC**: $\chi^2_{(1)} = 0.03$, $p = .85$ *SZ v. HC: Equal 1, Trend 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1=2*
Item 5: time perception	**Total N**: 25% **SZ**: 39% **HC**: 19% $\chi^2_{(1)}$: *SZ > HC*†	**Total N**: 43% **SZ**: 21% **HC**: 21% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 10.7$, $p = .001$* **SZ**: $\chi^2_{(1)} = 1.6$, $p = .20$ **HC**: $\chi^2_{(1)} = 8.6$, $p = .003$* *SZ v. HC: Trend 1, Equal 2*	**Total N: 1 < 2** **SZ: 1 = 2** **HC: 1 < 2** *SZ v HC:1=2*
Item 6: feeling of presence	**Total N**: 33% **SZ**: 61% **HC**: 24% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 36% **SZ**: 37% **HC**: 27% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.3$, $p = .58$ **SZ**: $\chi^2_{(1)} = 2.5$, $p = .12$ **HC**: $\chi^2_{(1)} = 0.29$, $p = .59$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1>2*
Item 7: felt like somebody else	**Total N**: 13% **SZ**: 17% **HC**: 13% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 18% **SZ**: 16% **HC**: 10% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 1.4$, $p = .24$ **SZ**: $\chi^2_{(1)} = 0.008$, $p = .93$ **HC**: $\chi^2_{(1)} = 0.59$, $p = .44$ *SZ v. HC: Equal 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1=2*
Item 8: floating through air	**Total N**: 15% **SZ**: 17% **HC**: 15% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 10% **SZ**: 21% **HC**: 10% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 1.9$, $p = .16$ **SZ**: $\chi^2_{(1)} = 0.11$, $p = .74$ **HC**: $\chi^2_{(1)} = 1.6$, $p = .21$ *SZ v. HC: Equal 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1=2*
Item 9: doppelganger	**Total N**: 13% **SZ**: 17% **HC**: 13% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 10% **SZ**: 16% **HC**: 10% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.73$, $p = .39$ **SZ**: $\chi^2_{(1)} = 0.008$, $p = .93$ **HC**: $\chi^2_{(1)} = 0.59$, $p = .44$ *SZ v. HC: Equal 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1=2*
Item 10: strange face in mirror	**Total N**: 26% **SZ**: 48% **HC**: 20% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 29% **SZ**: 26% **HC**: 7% $\chi^2_{(1)}$: *SZ > HC*†	**Total N**: $\chi^2_{(1)} = 0.35$, $p = .56$ **SZ**: $\chi^2_{(1)} = 2.2$, $p = .14$ **HC**: $\chi^2_{(1)} = 11.6$, $p = .0007$ *SZv.HC:GroupDif.1,Trend 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 > 2** *SZ v HC:1 > 2*

BODI Item	BODI 1	BODI 2	BODI 1 VS. BODI 2	Conclusion
Item 11: spiritual being	**Total N**: 14% **SZ:** 30% **HC**: 10% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 11% **SZ:** 37% **HC**: 3% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: $\chi^2_{(1)} = 0.67$, $p = .41$ **SZ:** $\chi^2_{(1)} = 0.24$, $p = .63$ **HC**: $\chi^2_{(1)} = 6.9$, $p = .009$ *SZ v. HC: Group Dif. 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 > 2** *SZ v HC:1 = 2*
Item 12: OBE	**Total N**: 13% **SZ:** 22% **HC**: 10% $\chi^2_{(1)}$: *SZ > HC†*	**Total N**: 18% **SZ:** 26% **HC**: 7% $\chi^2_{(1)}$: *SZ > HC†*	**Total N**: $\chi^2_{(1)} = 1.4$, $p = .24$ **SZ:** $\chi^2_{(1)} = 0.095$, $p = .76$ **HC**: $\chi^2_{(1)} = 0.8$, $p = .37$ *SZ v. HC: Trend 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 13: polyopic heautoscopy	**Total N**: 4% **SZ:** 13% **HC**: 1% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 4% **SZ:** 0% **HC**: 3% $\chi^2_{(1)}$: *SZ = CO*	**Total N**: $\chi^2_{(1)} = 0.0$, $p = 1.0$ **SZ:** $\chi^2_{(1)} = 2.6$, $p = .11$ **HC**: $\chi^2_{(1)} = 1.02$, $p = .32$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 > 2*
Item 14: bodily disconnection	**Total N**: 7% **SZ:** 9% **HC**: 6% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: 7% **SZ:** 21% **HC**: 7% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.0$, $p = 1.0$ **SZ:** $\chi^2_{(1)} = 1.3$, $p = .26$ **HC**: $\chi^2_{(1)} = 0.09$, $p = .75$ *SZ v. HC: Equal 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 15: perceptual aberration	**Total N**: 13% **SZ:** 26% **HC**: 10% $\chi^2_{(1)}$: *SZ > HC†*	**Total N**: 16% **SZ:** 21% **HC**: 7% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.55$, $p = .46$ **SZ:** $\chi^2_{(1)} = 0.15$, $p = .70$ **HC**: $\chi^2_{(1)} = 0.8$, $p = .37$ *SZ v. HC: Trend 1, Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 16: feeling like animal	**Total N**: 10% **SZ:** 30% **HC**: 5% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 7% **SZ:** 16% **HC**: 7% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.9$, $p = .32$ **SZ:** $\chi^2_{(1)} = 1.15$, $p = .28$ **HC**: $\chi^2_{(1)} = 0.4$, $p = .52$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 > 2*
Item 17: inner voice	**Total N**: 21% **SZ:** 61% **HC**: 10% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 17% **SZ:** 53% **HC**: 14% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: $\chi^2_{(1)} = 0.84$, $p = .36$ **SZ:** $\chi^2_{(1)} = 0.28$, $p = .59$ **HC**: $\chi^2_{(1)} = 0.89$, $p = .35$ *SZ v. HC: Group Diff. 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 18: bodily transformation	**Total N**: 14% **SZ:** 35% **HC**: 9% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 16% **SZ:** 21% **HC**: 10% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.24$, $p = .62$ **SZ:** $\chi^2_{(1)} = 1.02$, $p = .31$ **HC**: $\chi^2_{(1)} = 0.07$, $p = .79$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 > 2*
Item 19: body coming apart	**Total N**: 7% **SZ:** 13% **HC**: 5% $\chi^2_{(1)}$: *SZ > HC†*	**Total N**: 15% **SZ:** 26% **HC**: 14% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 4.5$, $p = .03$* **SZ:** $\chi^2_{(1)} = 1.2$, $p = .27$ **HC**: $\chi^2_{(1)} = 4.9$, $p = .027$* *SZ v. HC: Trend 1, Equal 2*	**Total N: 1 < 2** **SZ: 1 = 2** **HC: 1 < 2** *SZ v HC:1 = 2*
Item 20: human hallucination	**Total N**: 10% **SZ:** 26% **HC**: 6% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 7% **SZ:** 16% **HC**: 7% $\chi^2_{(1)}$: *SZ = HC*	**Total N**: $\chi^2_{(1)} = 0.97$, $p = .32$ **SZ:** $\chi^2_{(1)} = 0.63$, $p = .43$ **HC**: $\chi^2_{(1)} = 0.09$, $p = .75$ *SZv.HC:GroupDif.1,Equal 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*
Item 21: thought insertion	**Total N**: 16% **SZ:** 35% **HC**: 11% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: 14% **SZ:** 37% **HC**: 10% $\chi^2_{(1)}$: *SZ > HC**	**Total N**: $\chi^2_{(1)} = 0.25$, $p = .62$ **SZ:** $\chi^2_{(1)} = 0.019$, $p = .89$ **HC**: $\chi^2_{(1)} = 0.07$, $p = .79$ *SZ v. HC: Group Diff. 1 & 2*	**Total N: 1 = 2** **SZ: 1 = 2** **HC: 1 = 2** *SZ v HC:1 = 2*

* $p < .05$; † $p < .1$

Appendix I. Comparison of Individual BODI Items by Version

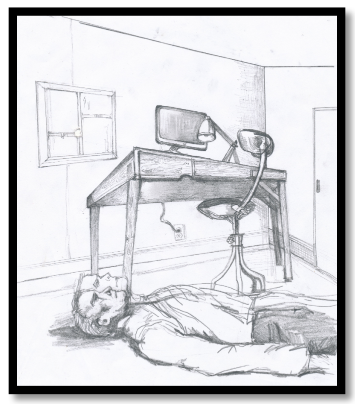
BODI 1 #1

BODI 2 #1

Item #1: I feel unsure of who I am at times.
Spanish translation: A veces me siento inseguro de quien soy.
French translation: Parfois, je ne suis pas sûr(e) de qui je suis.

BODI 1 #2

BODI 2 #2



Item #2: My soul sometimes leaves my body.
Spanish translation: Mi alma a veces deja mi cuerpo.
French translation: Parfois, mon âme quitte mon corps.

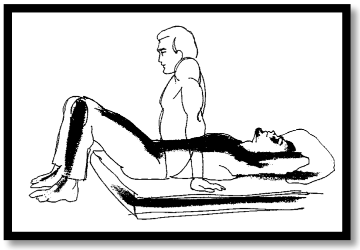
BODI 1 #3

BODI 2 #3

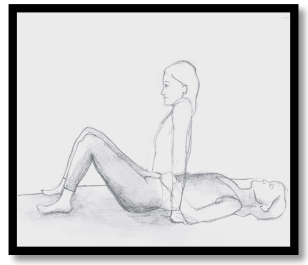
Item #3: I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.
Spanish translation: A veces he tenido la sensación de que uno de mis brazos o piernas se desconecta del resto de mi cuerpo.
French translation: J'ai parfois le sentiment qu'un de mes bras ou qu'une de mes jambes est déconnecté(e) du reste de mon corps.

Appendix I. Comparison of Individual BODI Items by Version (Continued)

BODI 1 #4



BODI 2 #4

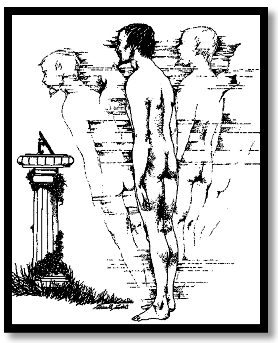


Item #4: Sometimes when falling asleep or when waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings.

Spanish translation: A veces, cuando me estoy quedando dormido o al despertar del sueño, experimento un breve período durante la cual soy incapaz de moverme, a pesar de que estoy despierto y consciente de mi entorno.

French translation: Parfois lorsque je suis en train de m'endormir ou lorsque je suis en train de me réveiller, je suis incapable de bouger pendant un bref moment, bien que je sois éveillé(e) et conscient(e) de mon environnent.

BODI 1 #5



BODI 2 #5

Item #5: Do you ever find that your experience of time changes dramatically?

Spanish translation: ¿Alguna vez su experiencia del tiempo cambia dramáticamente ?

French translation: Avez-vous parfois l'impression que votre expérience du temps change radicalement ?

BODI 1 #6

BODI 2 #6

Item #6: Have you ever had the feeling of the presence of another being, even if you know that no one is there?

Spanish translation: ¿Alguna vez ha tenido la sensación de la presencia de otro ser, incluso si sabe que no hay nadie ahí?

French translation: Avez-vous déjà ressenti la présence d'un autre être, bien que vous sachiez que personne n'était là ?

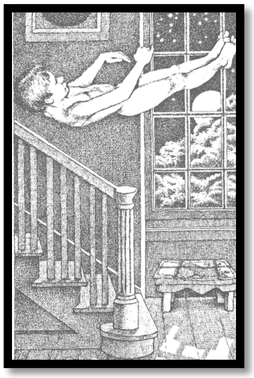
Appendix I. Comparison of Individual BODI Items by Version (Continued)

BODI 1 #7

BODI 2 #7

Item #7: I have had experiences when I felt as if I were someone else.
Spanish translation: He tenido experiencias cuando me sentí como si fuera otra persona.
French translation: J'ai déjà eu l'impression d'être quelqu'un d'autre.

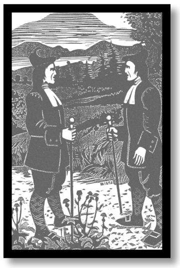
BODI 1 #8



BODI 2 #8

Item #8: I have had experiences (not related to drugs) where I felt as though I was floating through the air or being transported through time.
Spanish translation: He tenido experiencias (no relacionado con drogas) donde me sentí como si estuviera flotando en el aire, o siendo transportado a travez del tiempo.
French translation: J'ai déjà éprouvé (bien que je ne sois pas sous l'emprise de drogues) le sentiment que je flottais en l'air ou que je me faisais transporter à travers le temps.

BODI 1 #9



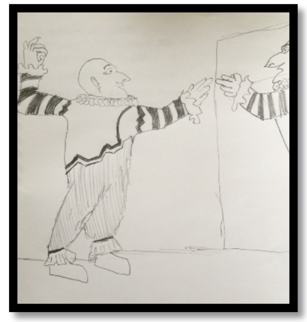
BODI 2 #9

Item #9: Have you ever experienced or seen your "doppelganger" or "double"?
Spanish translation: ¿Alguna vez ha visto su " doppelganger " o "doble " ?
French translation: Avez-vous déjà ressenti ou vu votre 'sosie' ou votre 'double'.

Appendix I. Comparison of Individual BODI Items by Version (Continued)

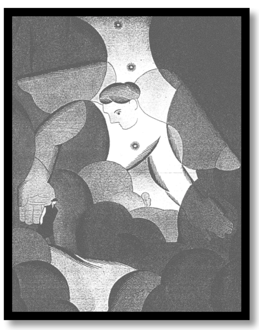
BODI 1 #10

BODI 2 #10

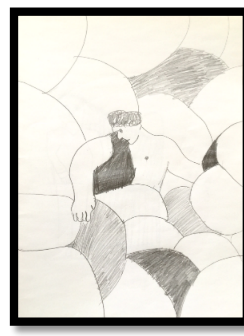


Item #10: Have you ever felt that you looked unreal when you looked at yourself in the mirror?
Spanish translation: ¿Alguna vez ha sentido que se veía irreal cuando se miraba a sí mismo en el espejo?
French translation: Avez-vous déjà eu le sentiment de paraitre irréel(le) lorsque vous vous regardiez dans le miroir

BODI 1 #11

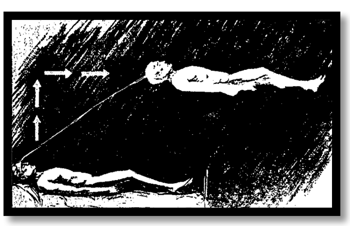


BODI 2 #11

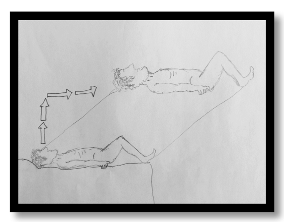


Item #11: I have been visited by Spiritual Beings.
Spanish translation: He sido visitado por seres espirituales.
French translation: J'ai déjà reçu la visite d'êtres spirituels.

BODI 1 #12



BODI 2 #12



Item #12: I have had an "out of the body" experience during which my mind seems to or actually has, left my body.
Spanish translation: He tenido un experiencia "fuera del cuerpo " durante la cual mi mente parece, o verídicamente, a salido de mi cuerpo.
French translation: J'ai déjà eu une expérience de 'sortie-du-corps' pendant laquelle mon esprit semblait avoir, ou avait, quitté mon corps.

Appendix I. Comparison of Individual BODI Items by Version (Continued)

BODI 1 #13

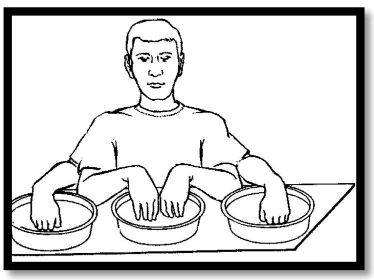
BODI 2 #13

Item # 13: Have you ever felt like you could see multiple duplicates of yourself (or someone else)?

Spanish translation: ¿Se ha sentido alguna vez como que podía ver varios duplicados de sí mismo (u otra persona)

French translation: Avez-vous déjà eu l'impression de pouvoir voir plusieurs copies de vous-même (ou de quelqu'un d'autre)?

BODI 1 #14



BODI 2 #14

Item #14: Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?

Spanish translation: ¿Alguna vez ha tienido la sensación de que sus miembros (brazos, piernas) podrian no ser suyos o que no estan conectado correctamente a su cuerpo?

French translation: Avez-vous déjà eu la sensation que vos membres pouvaient ne pas être a vous, ou ne pas être correctement attachés à votre corps ?

BODI 1 #15

BODI 2 #15

Item #15: Do you ever find the appearance of things or people seems to change in a puzzling way, eg, distorted shapes or sizes or color?

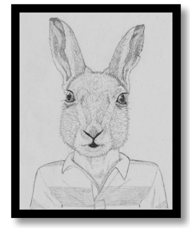
Spanish translation: ¿Ha tenido la sensacion de que las cosas o personas parece cambiar de una manera desconcertante, por ejemplo , formas o tamaños o color distorsionadas?

French translation: Avez-vous parfois l'impression que l'apparence des choses ou des gens change d'une façon déroutante, ex: déformation des formes, des tailles, ou des couleurs ?

Appendix I. Comparison of Individual BODI Items by Version (Continued)

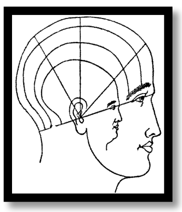
BODI 1 #16

BODI 2 #16

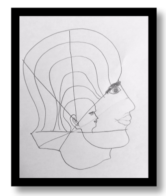


Item #16: I've had the momentary feeling that I might not be human.
Spanish translation: He tenido la momentánea sensación que puede ser que no sea humano.
French translation: J'ai déjà eu le sentiment passager que je n'étais peut-être pas humain(e).

BODI 1 #17

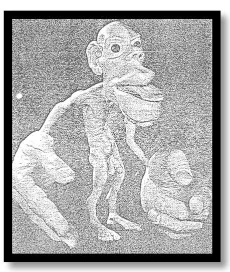


BODI 2 #17

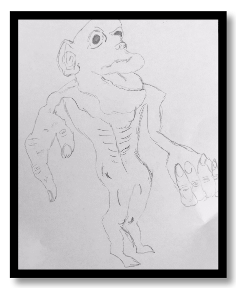


Item #17: I have heard an inner voice call my name.
Spanish translation: He oído una voz interior llamar a mi nombre
French translation: J'ai déjà entendu une voix interne appeler mon nom.

BODI 1 #18



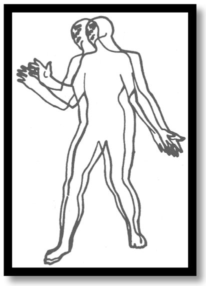
BODI 2 #18



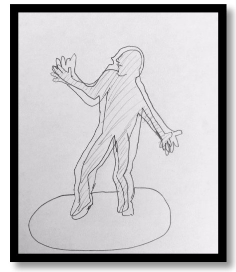
Item #18: Do you ever have the sensation that your body, or a part of it, is changing or has changed shape?
Spanish translation: ¿Alguna vez ha tenido la sensación de que su cuerpo , o una parte de ella , está cambiando o ha cambiado de forma ?
French translation: Avez-vous déjà eu la sensation que votre corps, ou une partie de votre corps, changeait ou avait changé de forme?

Appendix I. Comparison of Individual BODI Items by Version (Continued)

BODI 1 #19



BODI 2 #19



Item #19: At times I have felt as if I were coming apart.
Spanish translation: A veces me he sentido como si me estuviera descomponiendo.
French translation: J'ai parfois l'impression que je tombe en morceaux.

BODI 1 #20

BODI 2 #20

Item #20: On occasions I have seen a person's face in front of me when no one was in fact there.
Spanish translation: En ocasiones he visto la cara de una persona frente a mí cuando en verdad no había nadie alli.
French translation: J'ai quelque fois vu le visage de quelqu'un en face de moi alors que personne n'était là.

BODI 1 #21

BODI 2 #21

Item #21: Have you ever felt that thoughts were being put inside your head by some outside force?
Spanish translation: ¿Alguna vez sintió que alguna fuerza exterior estaba poniendo pensamientos en su cabeza?
French translation: Avez-vous déjà eu l'impression que des pensées étaient implantées dans votre tête par une force extérieure ?

Appendix J. BODI Comments by Version and Group

BODI 1:

-SZ Patients:

-Bringing insecure thoughts and incomplete composures into reality without blemishes
-I jump at seeing my own shadow sometimes. I quickly dismiss it as anything other than that
-People's influence over me adds up over time
-I sometimes feel my hands are huge, or my legs have gotten longer
-THERE WERE TIMES LONG AGO WHEN I HEARD VOICES…BUT THEY WERE TALKING TO ME BESIDE OR BEHIND MY BODY
-Objects do seem to change in size from when I first seen them
-SOMETIMES I THINK BEINGS HAVE POSSIBLY DONE SOME THINGS WITH MY BODY BUT NOT VERY OFTEN DO I THINK THIS
-face-to-face with a mirror, reflection of self in the mirror with encouragement, invertly asking someone else the value of my self reasoning, meditation to alter bad pool of karma
-I don't believe in monsters, but, do feel they are waiting for me behind closed doors
-I feel disconnected from myself at times

-Healthy Controls/ General Population

-I think what I experience is a normal amount of self-doubt for a college student trying to pull together who I am at this point in my life.
-yes now I've had that feeling where I've worked soooo hard that's how my body felt, I guess thats what I get for not furthering my education. stay in school
-When my hand or leg goes numb it feels like it is not controlled by my body
-I've had those out of body experiences only in my dreams

BODI 2:

-SZ Patients:

-can't stop laughing *(tickle item)*
-I like to imagine that I am someone else
-I feel like I am living someone else's memories
-I thought a crime suspect in the news looked like me. It freaked me out.
-I sometimes imagine who I would be if my life had turned out differently.
-This image makes me feel fat.
-I'm currently researching John Dams Scotas, who wrote about divine and free will. His writing on transcendence sent my mind to a place beyond my body.

-Healthy Controls/ General Population:

-very ticklish, very aversive
-After going home for fall break, I'm no longer sure who my friends are or how to speak with them on the same level, which makes me wonder who I was before I left and who I am now.
-These pictures are making me anxious!
-This is creepy…
- It's more of an identity crisis rather than anything mystical or supernatural. I just wonder who I am and need to reorient the world around me on rare occasions
-Stress speeds time up
-It was basically a jump scare for me. I feel very disconcerted by it even after the initial shock settled down. Also the Van Gogh picture next to me also start to produce similar effect.

Appendix K: SZ Inpatient Case Study with BODI 2

"Sarah" is a 53-year old right-handed Caucasian woman with 12 years of education who has been hospitalized for most of her adult life, beginning at age 18, when she was first hospitalized for an acute manic episode. She has remained in hospitals due to her self-injurious behaviors. Her DSM-V diagnoses include 1) Schizoaffective Disorder (Bipolar Type), 2) PTSD, 3) Borderline Personality Disorder, 4) Depersonalization Disorder, 5) Major Vascular Neurocognitive Disorder (Vascular Dementia). She also suffers from a number of medical complications, including seizure disorder (and pseudoseizures), COPD, toxoplasmosis, sleep apnea (OSA), obesity, hyperlipidemia, bilateral moderate-severe sensory hearing loss, and more. She is a complicated case. She has been compliant with taking several antipsychotics (Thorazine, Clozaril) daily, and she was never once psychotic during the year that I worked with her. She did, however, experience moments of depersonalization and dissociative amnesia often.

I administered the BODI 2 to many therapy clients over the course of my internship at a state hospital as a way to obtain useful clinical information, particularly if I thought they were experiencing distressing dissociative experiences that they could not quite verbalize readily. Those scores will not be reported here as there was no consent form or compensation for their time, and it was simply part of their therapy treatment planning. Sarah's scores are the only ones I'll report because she gave me explicit permission to do so.

Sarah's scores on the Dissociative Experiences Scale (DES-II; Carlson & Putnam, 1993) were in the elevated range, as expected by her diagnosis of a DSM-V dissociative disorder (Depersonalization Disorder). Specifically, her DES-II total score = 49, which means that she endorsed having dissociative experiences 49% of the time. Her DES-II Amnesia Factor score = 26, DES-II Depersonalization Factor score = 32, and DES-II Absorption Factor = 40, all of which far surpass the DES-II cutoff scores that were proposed in Study 1A to help predict SZ status (i.e., DES total > 22, Amnesia > 10, Depersonalization > 6, and Absorption > 25), and the official DES-II cutoff score of 30 for total score.

"Sarah" also completed the second version of the BODI, and her scores are compared to the other populations that were tested and described above in Study 2B. As one can see in the table below, Sarah's scores were far greater than the other groups, providing some validity for the utility of the BODI 2 as a scale that accurately captures anomalous bodily self-experiences in severe psychiatric populations. Further, she scored well above the cutoff value of 22 for the BODI 2 total scale, in addition to the Distress score cutoff of 8 that were proposed in Study 2B. Thus, her scores provide the BODI 2 with a bit of unofficial criterion validity for accurately classifying schizophrenia-spectrum diagnoses. It is noteworthy that 100% of her 8 endorsements were found to be distressing to her. She also seemed to find even the control items of the BODI 2 distressing (e.g., itch, tickling) and seemed almost uncomfortable to even think about these items as she was completing the scale. However, her control scale score was in the normal range, albeit slightly elevated compared to the SZ outpatient sample presented above.

Case Study Patient "Sarah" BODI 2 Scores Compared to SZ Patient Sample

BODI 2 Variable	**"Sarah" Score**	**SZ Median**	**HC Median**	**Total N Median**
Total	**87**	25	4	18
Endorsements	**8**	3	1	2
Endorsements with Distress	**8**	1	0	1
Current Endorsements	**8**	2	0	2
Currently Distressing Endorsements	**8**	1	0	0
Distress	**40**	10	1	7
Frequency	**12**	3	0	2
Vividness	**27**	9	1	6
Control Items	**4**	3	4	4
DD Factor	**23**	10	.5	8
BS Factor	**20**	11	0	6
HA Factor	**44**	9	0	4

"Sarah" has an extensive trauma history, is desperate for social connection, and finds comfort and relief in occupational therapeutic sensory interventions such as a weighted blanket, weighted stuffed animals, frozen oranges, and ice masks. She also enjoys punching mattresses when distressed.

“Sarah” is an ideal case for the BODI 2 because she has comorbid diagnoses of disorders that all are known to dissociate (Depersonalization Disorder, PTSD, Borderline Personality Disorder, and Schizoaffective Disorder). Further, all of her psychiatric symptoms seem to be closely linked with her body. For example, she somaticizes when stressed (e.g., pseudoseizures, tremors when anxious, and so on), and her self-injurious behaviors include intentionally breaking bones (e.g., punching the wall repeatedly to break fingers) rather than swallowing objects like her other hospitalized peers with Borderline Personality Disorder. While at the state hospital, I was struck by how many somatic hallucinations and delusions were present in the patient population. Common comments included “someone is cutting off my legs”, “my legs are bread, because a shark ate them and left me with these breadsticks”, “blood is coming out of my eyes”, “the shadows are stabbing me in the neck.” Sarah and the other state hospital inpatients that completed the BODI 2 gave me confidence that the BODI 2 can be used in intensive inpatient hospital settings as both a clinically useful assessment tool and as a means to collect valuable data on patients who are in severe distress and in desperate need of support.

“Sarah” represents a case in which several diagnoses and etiologies come together to create an individual who reliably endorses these unusual self experiences frequently, vividly, and as distressing. For seriously mentally ill people, such as inpatients in a state hospital, where a single diagnosis is a rarity, I think the BODI 2 is helpful clinically because it helps to quantify and describe their experiences when they might not be able to do so themselves.

While we have shown that the BODI 2 can be helpful in predicting psychosis-proneness and SZ status in our samples, I think the BODI 2 can still be useful without having to be too specific for predicting any one particular diagnostic category. Distressing bodily self-disturbances are relevant for multiple disorders, and the BODI 2 has the potential to help with research and clinical assessments for more than just people on the schizophrenia-spectrum.

Appendix L: Pinocchio Illusion Questionnaire

Self-report rating statements for the Pinocchio Illusion (Michael & Park, 2016):

1. I felt like my nose was pushing my finger forward.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

2. My nose felt like it was becoming longer.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

3. My nose felt like it was becoming wider.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

4. My nose and my index finger felt disconnected from my hand and arm.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

5. I felt a pulsation in my nose and/or index finger.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

6. I felt a pulsation in my arm.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

7. I felt "tingliness" in my nose and or index finger.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

8. I felt "tingliness" in my arm.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

9. My arm felt like it was extending forward.
   (Not at all) 0-----25-----50-----75-----100 (Definitely)

10. My arm, index finger, or nose felt like it became warmer or colder.
    (Not at all) 0-----25-----50-----75-----100 (Definitely)

11. My nose felt like it was becoming smaller.
    (Not at all) 0-----25-----50-----75-----100 (Definitely)

PI Question Subscales (Proposed in Study 3 above)
-Physical Items: 5, 6, 7, 8, 10
-Perceptual Aberration Items: 1, 2, 3, 4, 9, 11

Appendix M: Study 3 Supplementary Data

Medians and Kruskal Wallis Group Comparisons of Questionnaire Results by PQ-B Distress Group

Questionnaires		Total N Median	"Low" PQ-B Median	"Mid" PQ-B Median	"High" PQ-B Median	$\chi^2_{(2)}$	*p*
SPQ	**Total**	21	14	25.5	38.5	26.8	<.0001*
	Cognitive Perceptual Factor (+)	6	4	7	14.5	23.2	<.0001*
	Interpersonal Factor (-)	10	5	14.5	18	24.9	<.0001*
	Disorganized Factor	6	4	6	12	12.6	.002*
	Ideas of References	3	2	2.5	7	21.6	<.0001*
	Excessive Social Anxiety	4	2	5	6.5	18.4	<.0001*
	Odd Beliefs/Magical Thinking	0	0	1	1	5.3	.07†
	Unusual Perceptual Experiences	1	1	2	3	16.8	<.0001*
	Odd/ Eccentric Behavior	2	1	2	5	6.9	.032*
	No Close Friends	2	1	3	3.5	14.3	.001*
	Odd Speech	4	2	4	7	16.1	<.0001*
	Constricted Affect	2	1	3	3	19.1	<.0001*
	Suspiciousness	2	1	3	5	21.5	<.0001*
DES-II	Total	11.43	8.9	15.7	18.6	13.4	.001*
	Taxon (8 critical items)	2.5	2	4	4	12.2	.002*
	Amnesia Factor	3	3	3	8	6.3	.043*
	Depersonalization Factor	0	0	1	2	17.3	<.0001*
	Absorption Factor	16	12	23	27	14.4	.001*
AQ	Total	17	13	19	23	15.6	<.0001*
	Social Skill	2	2	3	4.5	13	.002*
	Attention Switching	5	4	5.5	6	11.5	.003*
	Attention to Detail	5	5	5	6.5	4.9	.086†
	Communication	2	2	2.5	4	8.2	.017*
	Imagination	2	2	3	2.5	5.6	.06†
	Perceptual Aberration Scale	3	1	3.5	5	20.7	<.0001*
	Temporal Lobe Scale	9	7	10	11	19.5	<.0001*
	Physical Anhedonia Scale	11	10	11	10.5	5.8	.056†
	Hypomanic Personality Scale	18	17	19	23.5	2.9	0.241
	Adverse Childhood Events (ACE)	1	0	2	1	5.5	0.063 †
	Perceived Stress Scale	18	16	20	24	20.4	<.0001*
	UCLA Loneliness Scale	40	35	46	54	19.5	.0001*

**p* <.05; † *p* <.1; *Note: not corrected for multiple comparisons*

APPENDIX B: BODI 1.0 (Benson et al., in prep)

Directions: For all of the questions in this survey, please do not include experiences that occur only while under the influence of alcohol, drugs or medications that were not prescribed to you.

Picture 1. Consider the picture below when answering the following questions:

I feel unsure of who I am at times.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

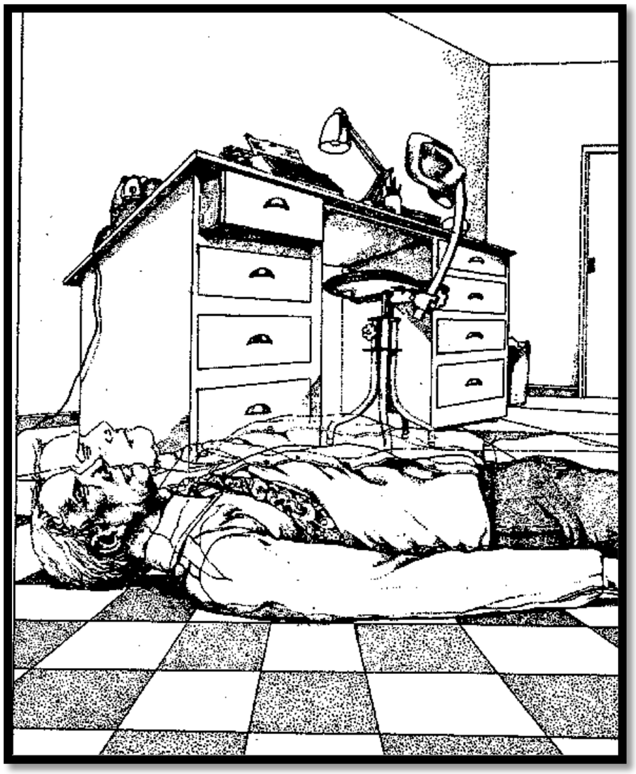
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 2. Consider the picture below when answering the following questions:



My soul sometimes leaves my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

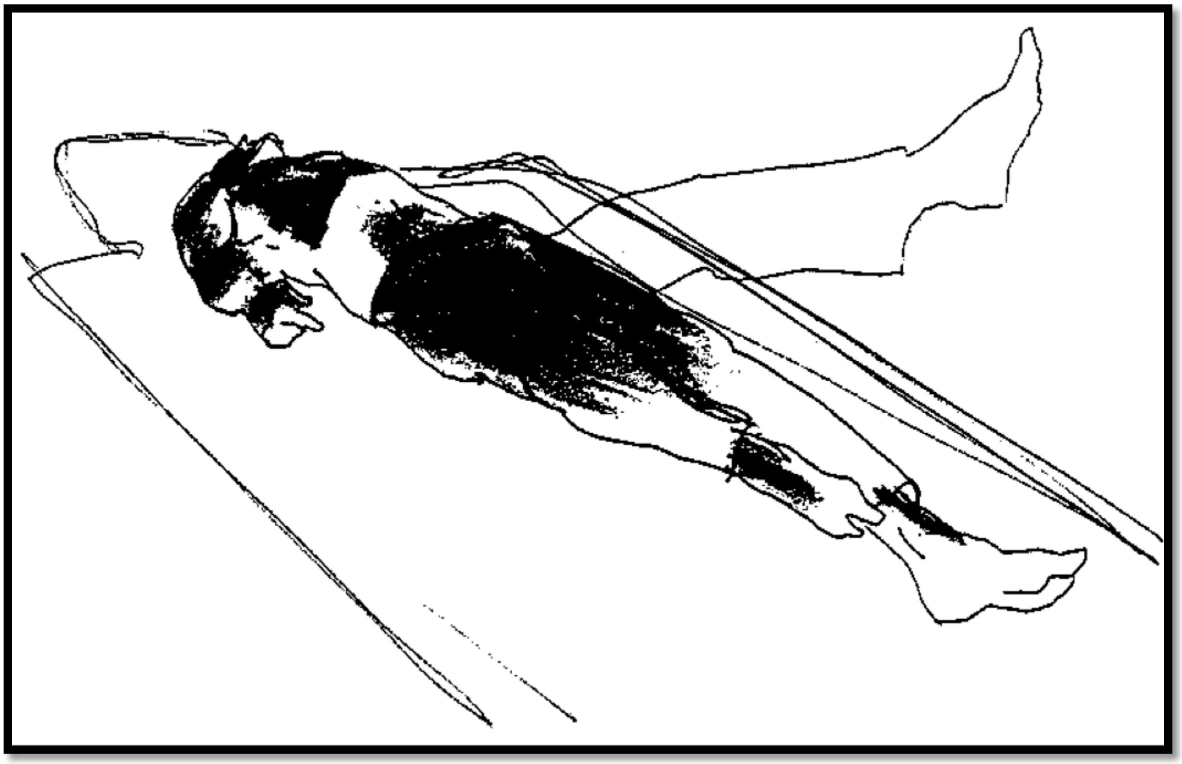
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 3. Consider the picture below when answering the following questions:



I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

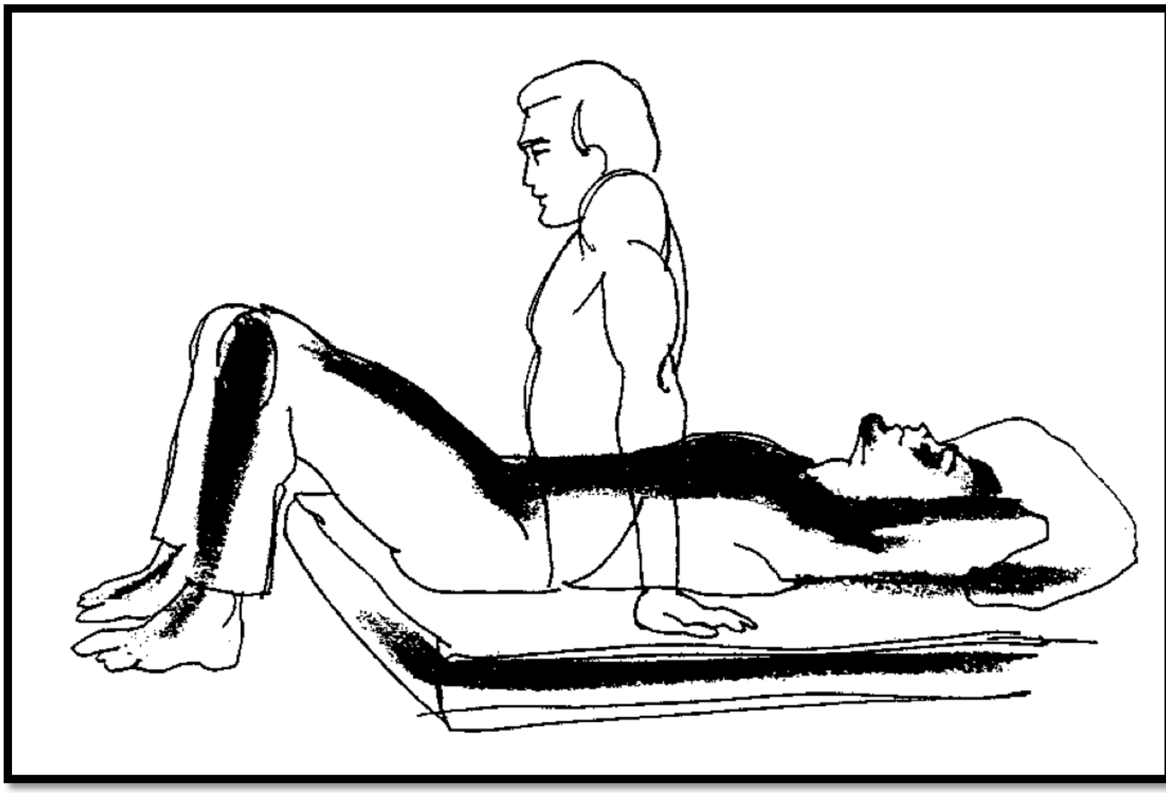
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 4. Consider the picture below when answering the following questions:



Sometimes when falling asleep or when waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

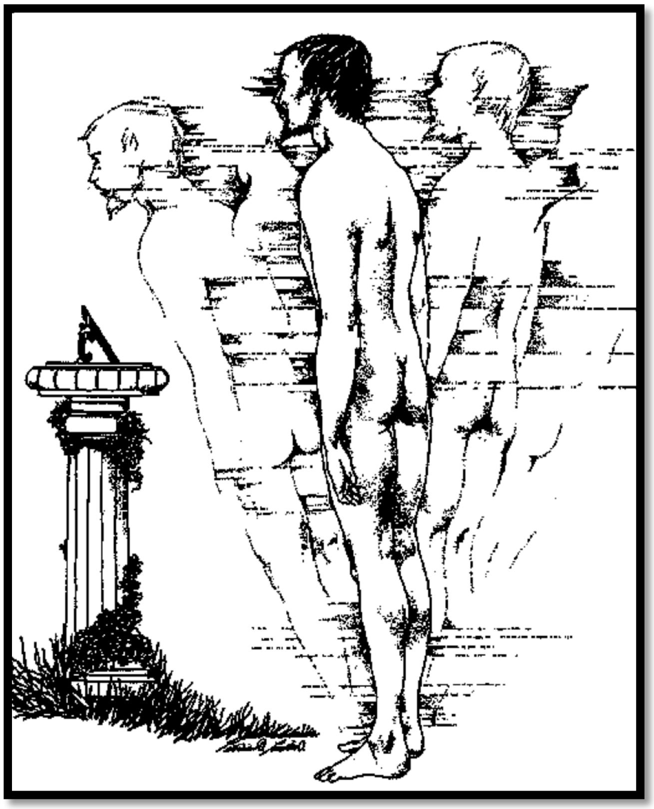
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 5. Consider the picture below when answering the following questions:



Do you ever find that your experience of time changes dramatically?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 6. Consider the picture below when answering the following questions:

Have you ever had the feeling of the presence of another being, even if you know that no one is there?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

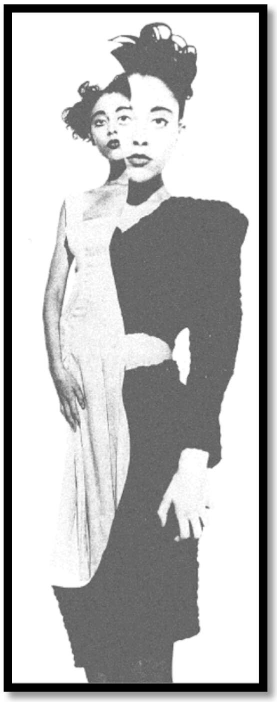
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 7. Consider the picture below when answering the following questions:



I have had experiences when I felt as if I were someone else.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

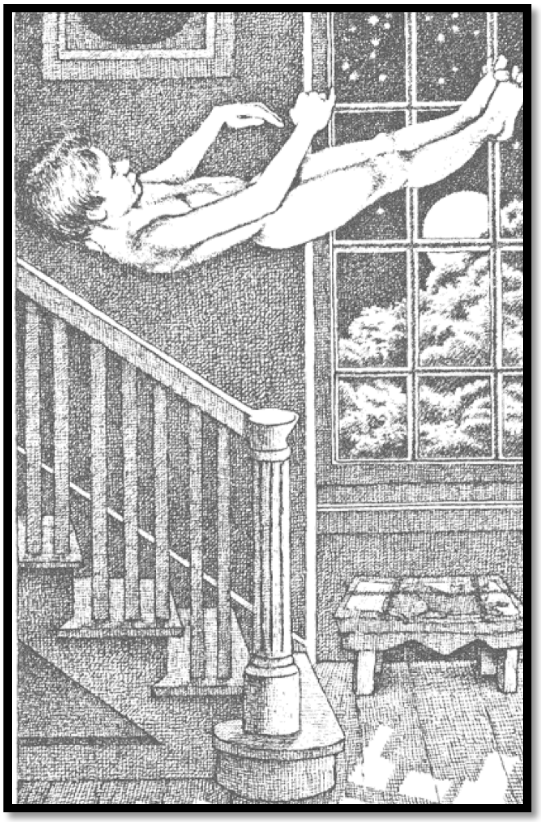
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 8. Consider the picture below when answering the following questions:



I have had experiences (not related to drugs) where I felt as though I was floating through the air or being transported through time.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

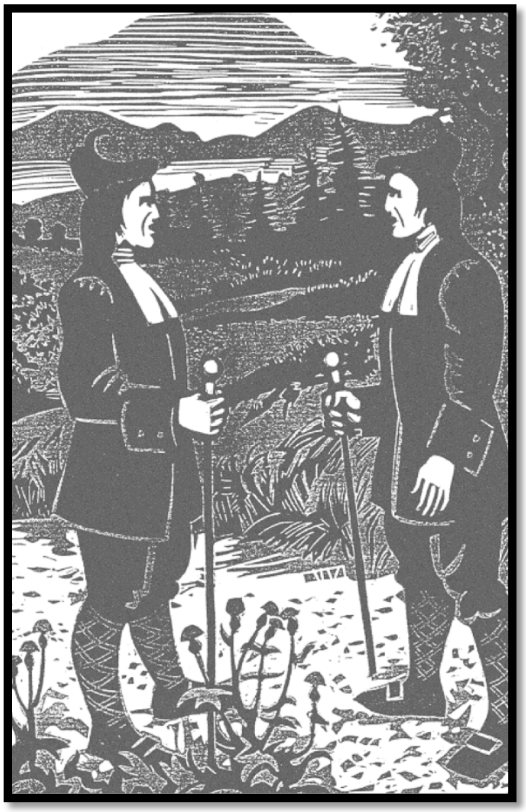
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 9. Consider the picture below when answering the following questions:



Have you ever experienced or seen your "doppelganger" or "double"?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 10. Consider the picture below when answering the following questions:

Have you ever felt that you looked unreal when you looked at yourself in the mirror?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

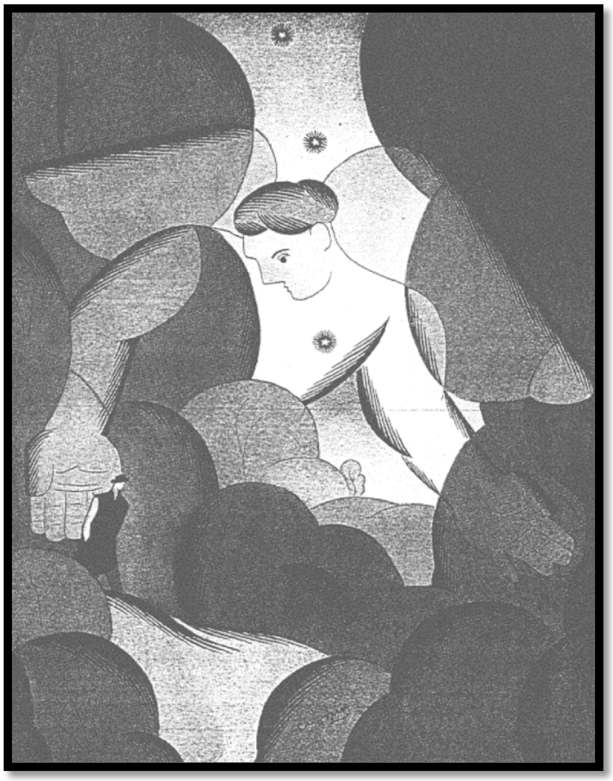
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 11. Consider the picture below when answering the following questions:



I have been visited by Spiritual Beings.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

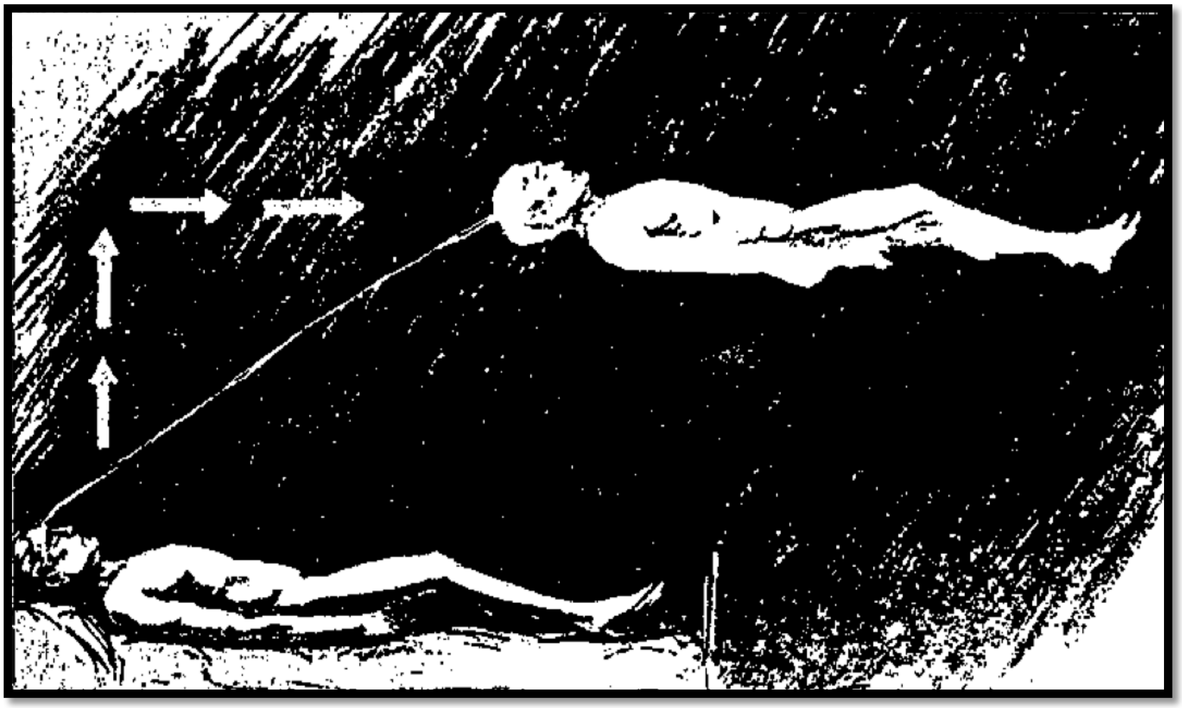
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 12. Consider the picture below when answering the following questions:



I have had an "out of the body" experience during which my mind seems to or actually has, left my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

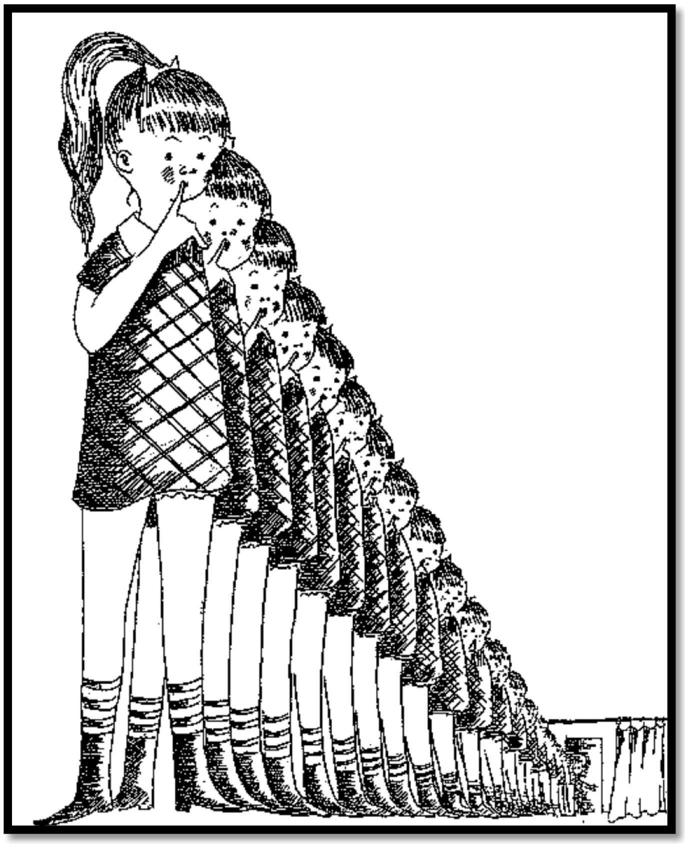
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 13. Consider the picture below when answering the following questions:



Have you ever felt like you could see multiple duplicates of yourself (or someone else)?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

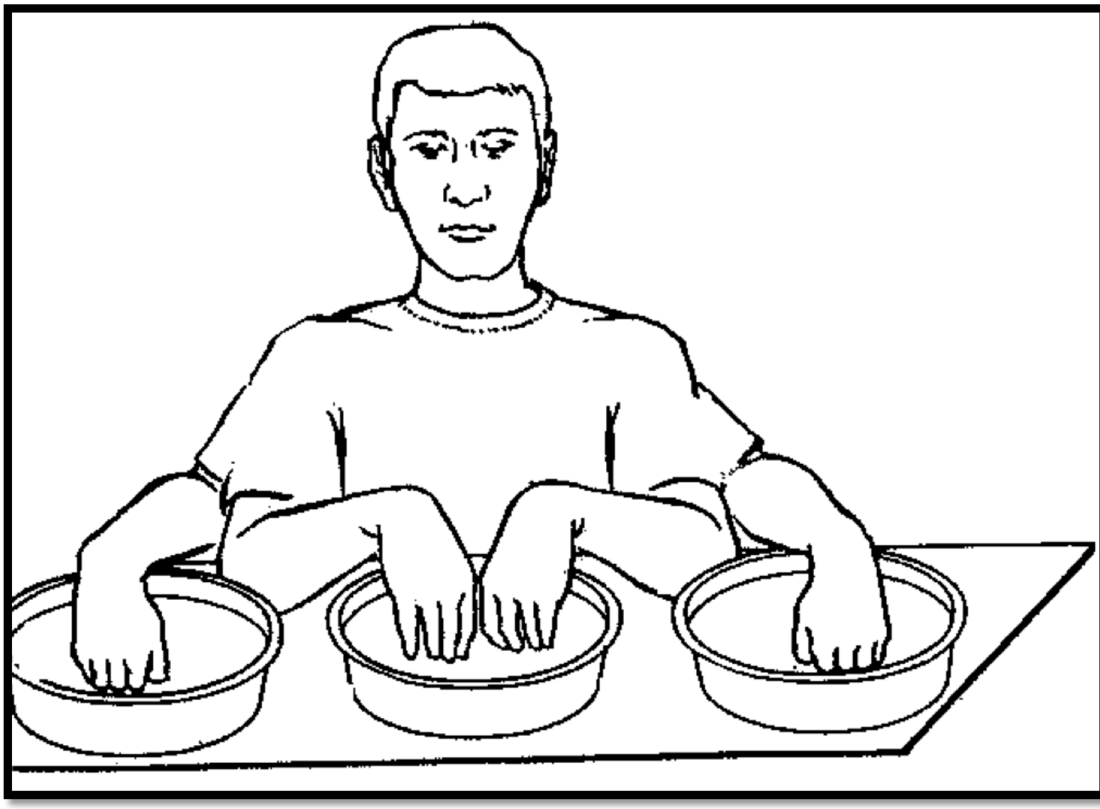
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 14. Consider the picture below when answering the following questions:



Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

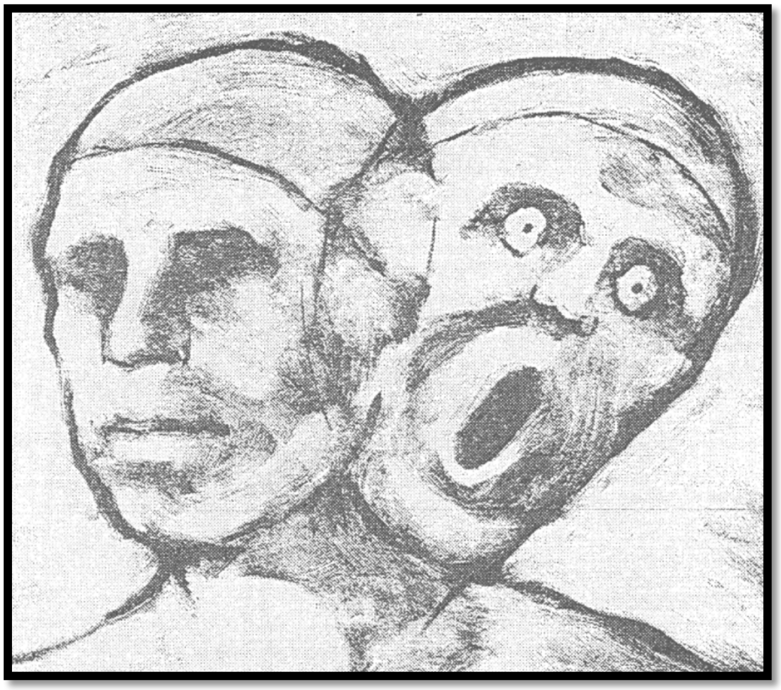
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 15. Consider the picture below when answering the following questions:



Do you ever find the appearance of things or people seems to change in a puzzling way, eg, distorted shapes or sizes or color?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 16. Consider the picture below when answering the following questions:

I've had the momentary feeling that I might not be human.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

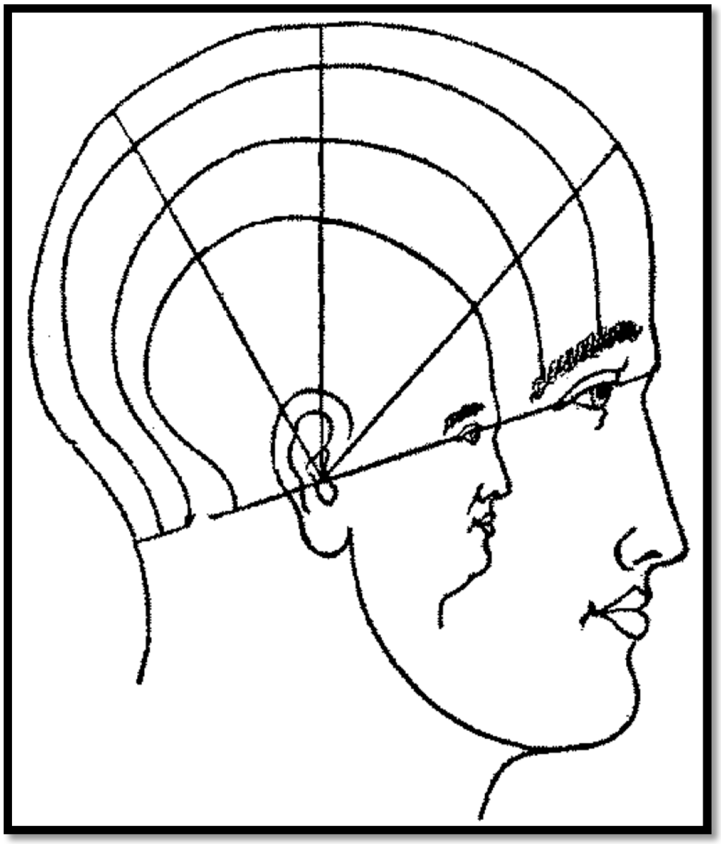
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 17. Consider the picture below when answering the following questions:



I have heard an inner voice call my name.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

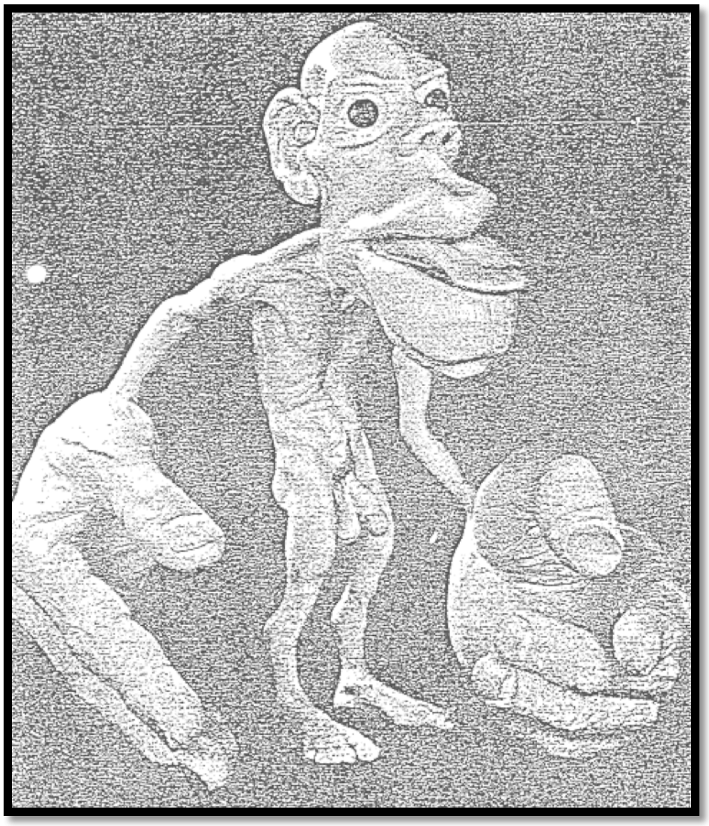
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 18. Consider the picture below when answering the following questions:



Do you ever have the sensation that your body, or a part of it, is changing or has changed shape?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

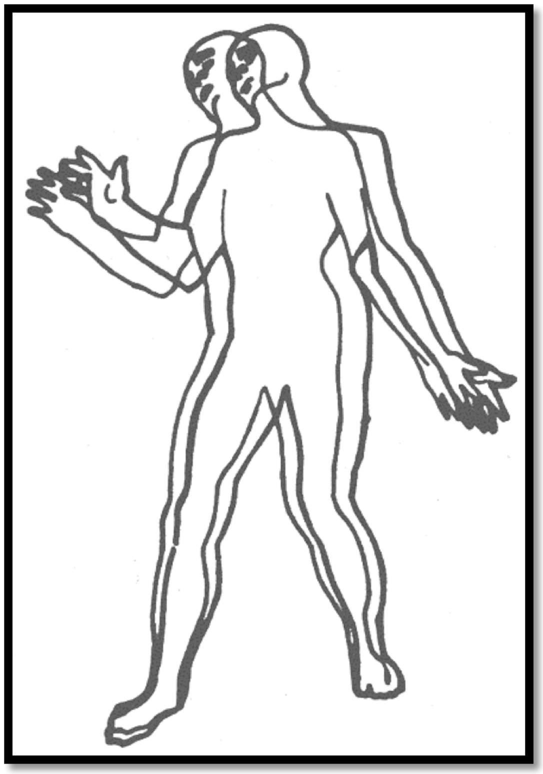
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 19. Consider the picture below when answering the following questions:



At times I have felt as if I were coming apart.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 20. Consider the picture below when answering the following questions:

On occasions I have seen a person's face in front of me when no one was in fact there.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 21. Consider the picture below when answering the following questions:

Have you ever felt that thoughts were being put inside your head by some outside force?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

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APPENDIX O. BODI 2 (Benson et al., in prep)

Directions: For all of the questions in this survey, please do not include experiences that occur only while under the influence of alcohol, drugs or medications that were not prescribed to you.

Picture 1. Consider the picture below when answering the following questions:

I feel unsure of who I am at times.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

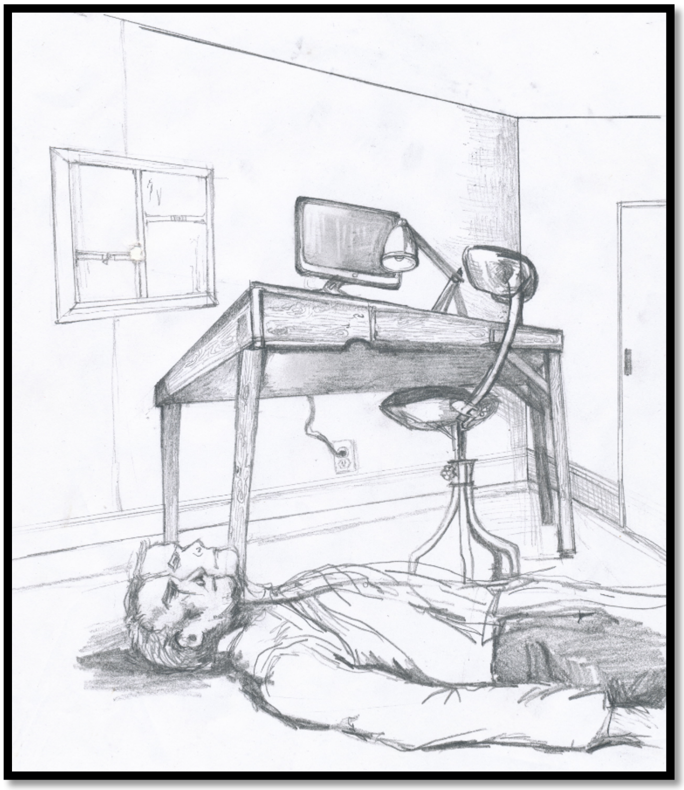
How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

Picture 2. Consider the picture below when answering the following questions:



My soul sometimes leaves my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

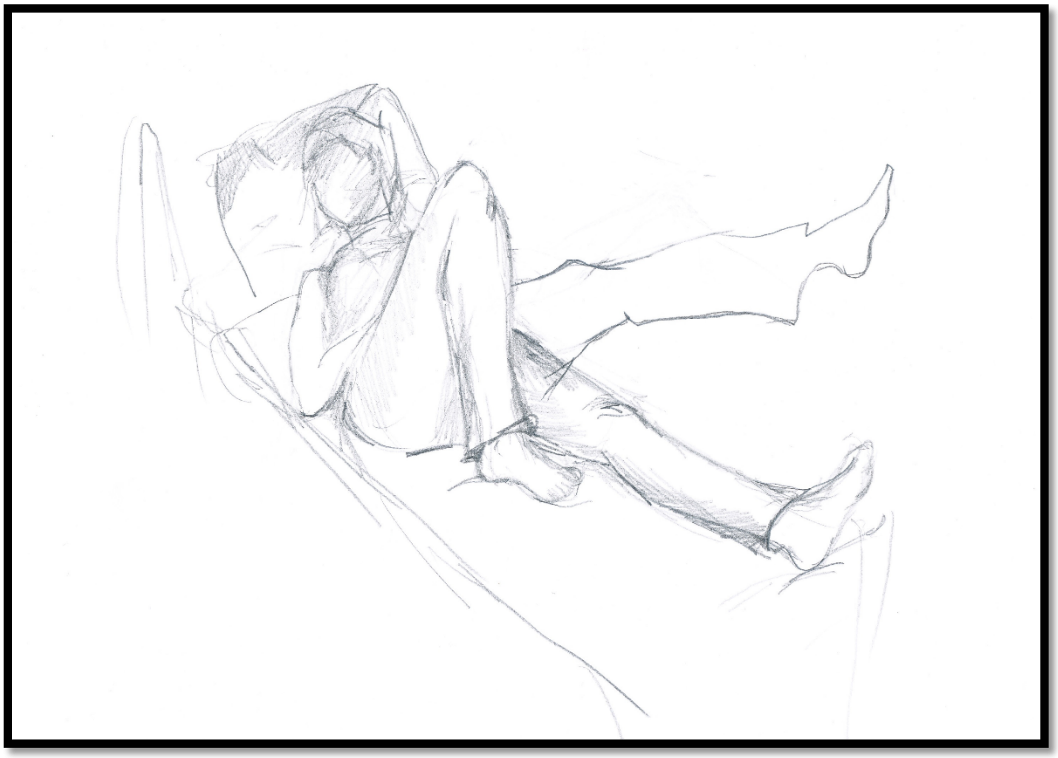
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 3. Consider the picture below when answering the following questions:



I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

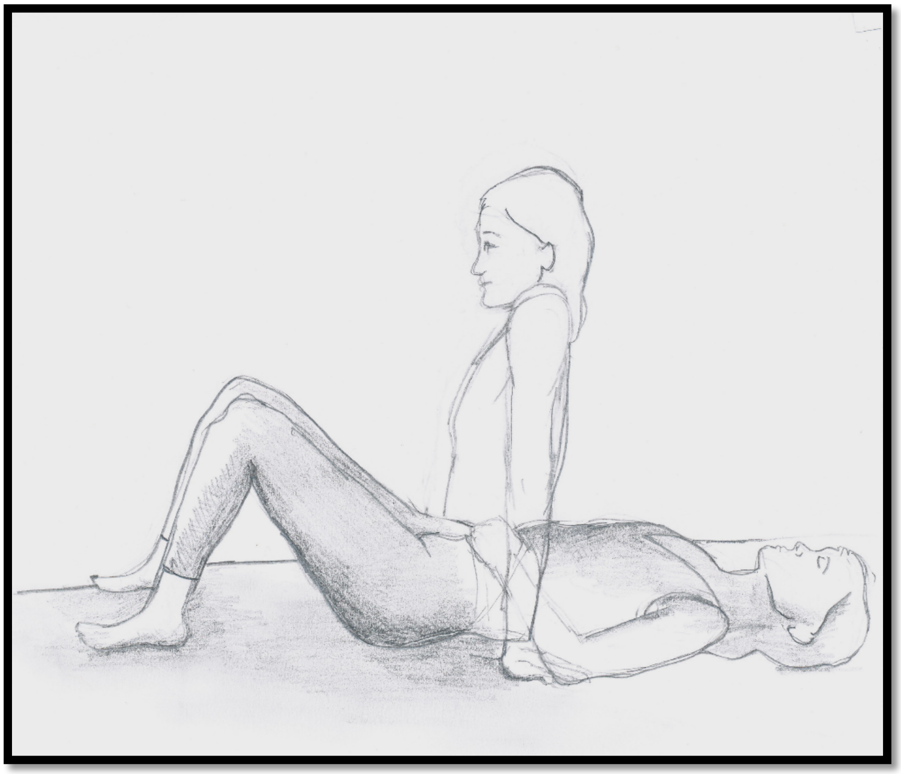
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 4. Consider the picture below when answering the following questions:



Sometimes when falling asleep or when waking from sleep, I experience a brief period during which I am unable to move, even though I am awake and conscious of my surroundings.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

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____

Picture 5. Consider the picture below when answering the following questions:

Do you ever find that your experience of time changes dramatically?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 6. Consider the picture below when answering the following questions:

I have suffered from a headache in the past.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 7. Consider the picture below when answering the following questions:

Have you ever had the feeling of the presence of another being, even if you know that no one is there?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 8. Consider the picture below when answering the following questions:

I have had experiences when I felt as if I were someone else.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

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Picture 9. Consider the picture below when answering the following questions:

I have had experiences (not related to drugs) where I felt as though I was floating through the air or being transported through time.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

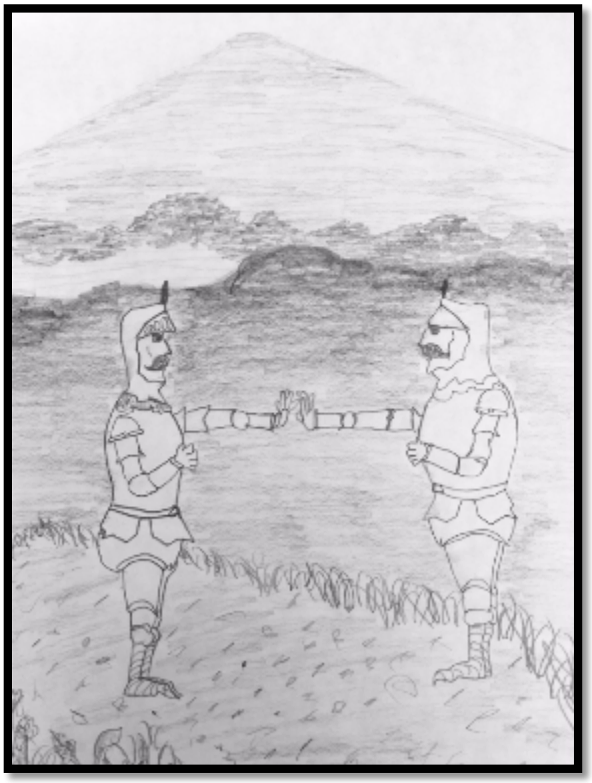
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 10. Consider the picture below when answering the following questions:



Have you ever experienced or seen your "doppelganger" or "double"?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

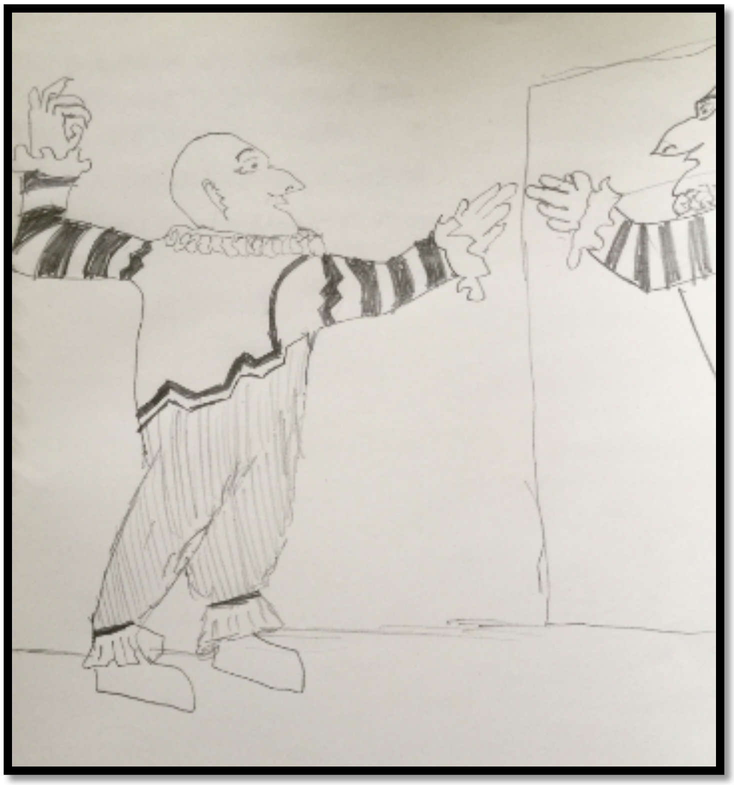
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 11. Consider the picture below when answering the following questions:



Have you ever felt that you looked unreal when you looked at yourself in the mirror?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 12. Consider the picture below when answering the following questions:

I have scratched an itch in the past.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 13. Consider the picture below when answering the following questions:

I have been visited by Spiritual Beings.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

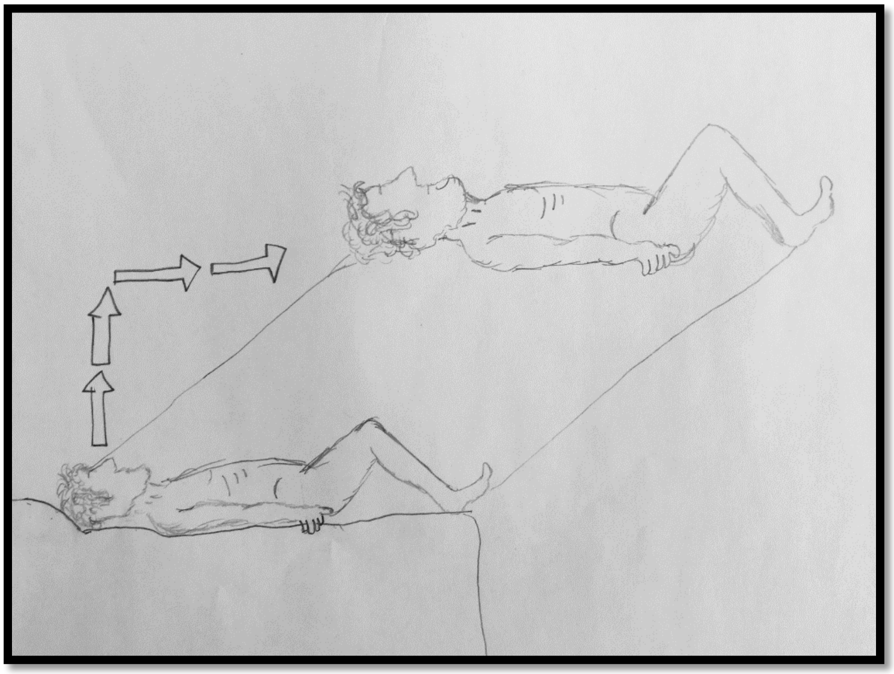
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 14. Consider the picture below when answering the following questions:



I have had an "out of the body" experience during which my mind seems to or actually has, left my body.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

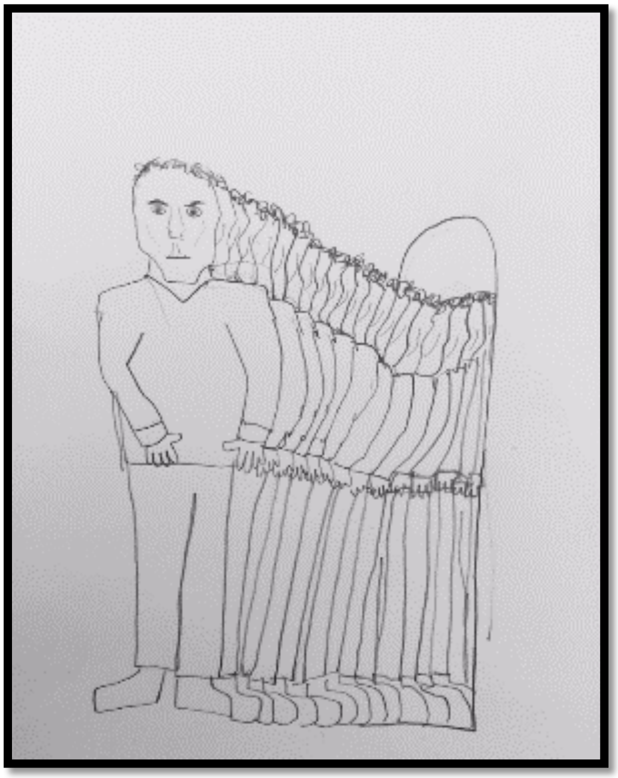
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 15. Consider the picture below when answering the following questions:



Have you ever felt like you could see multiple duplicates of yourself (or someone else)?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

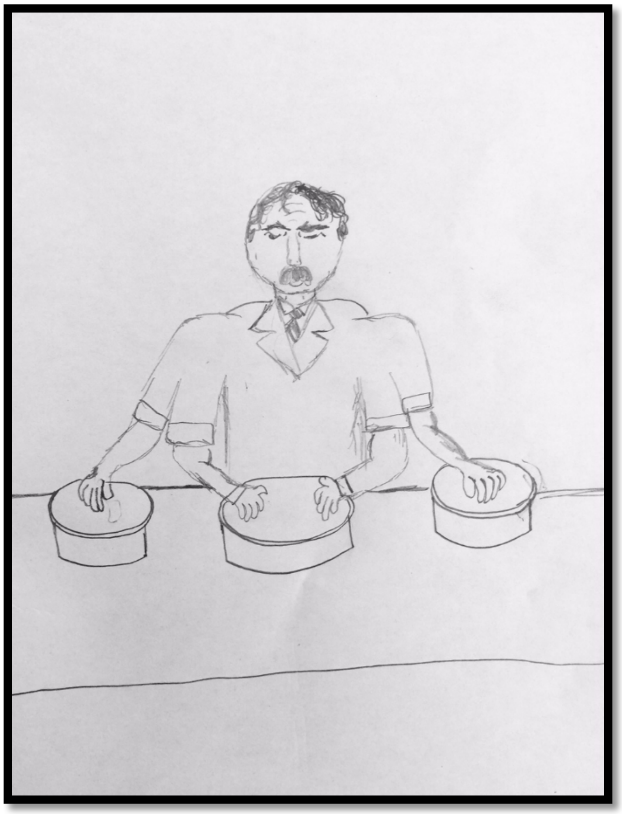
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 16. Consider the picture below when answering the following questions:



Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 17. Consider the picture below when answering the following questions:

Do you ever find the appearance of things or people seems to change in a puzzling way, eg, distorted shapes or sizes or color?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 18. Consider the picture below when answering the following questions:

I have experienced “butterflies in the stomach” before.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

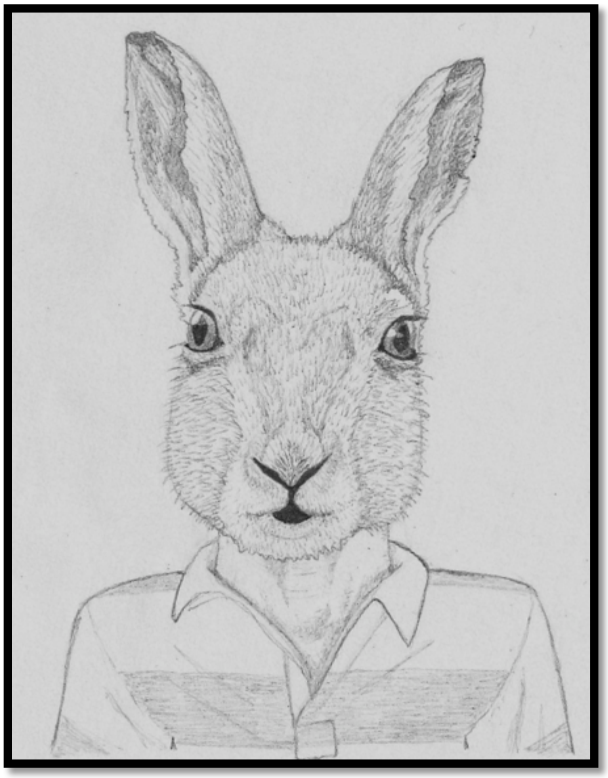
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 19. Consider the picture below when answering the following questions:



I've had the momentary feeling that I might not be human.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

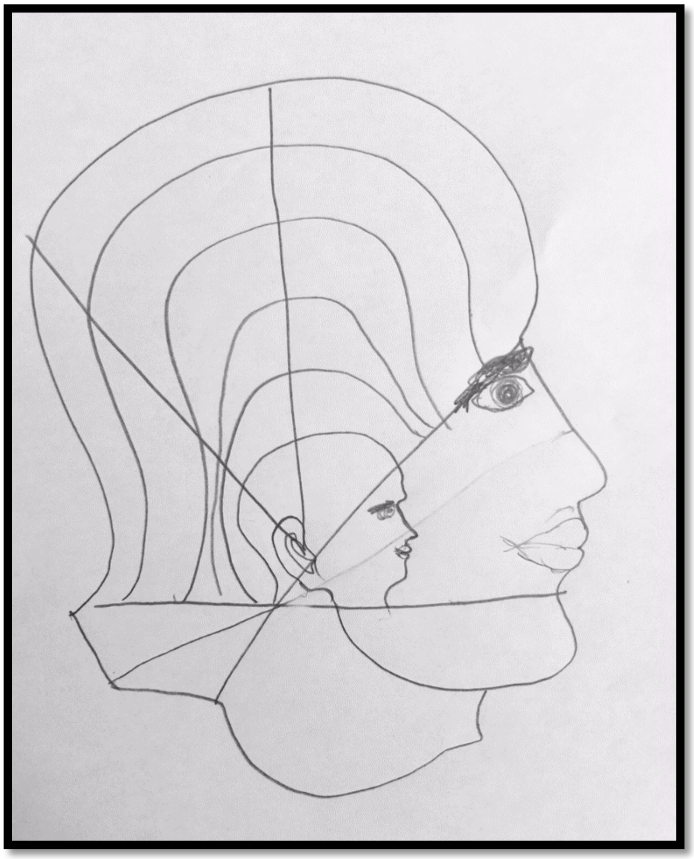
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 20. Consider the picture below when answering the following questions:



I have heard an inner voice call my name.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

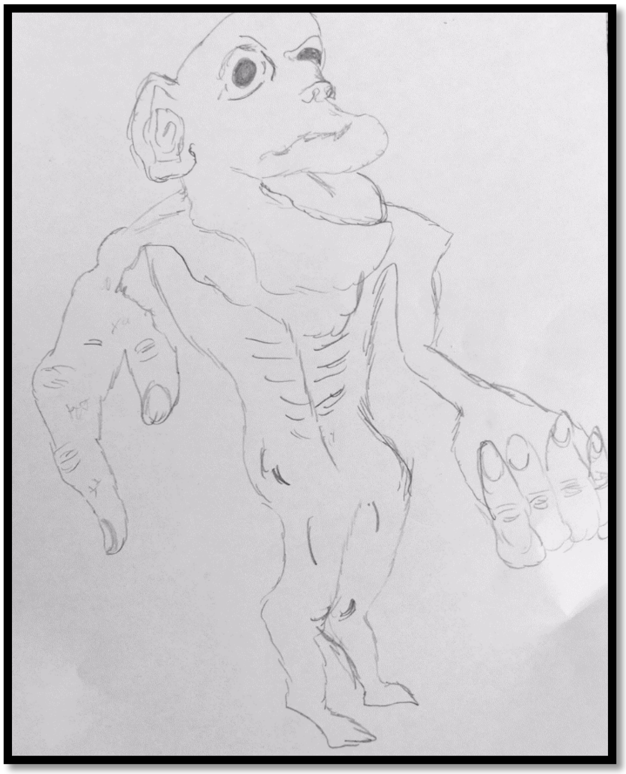
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 21. Consider the picture below when answering the following questions:



Do you ever have the sensation that your body, or a part of it, is changing or has changed shape?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

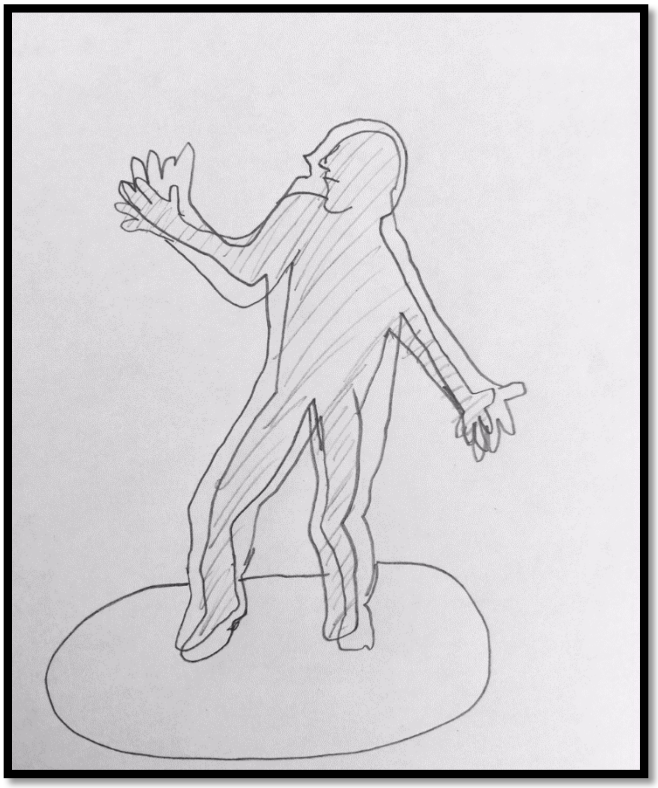
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 22. Consider the picture below when answering the following questions:



At times I have felt as if I were coming apart.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 23. Consider the picture below when answering the following questions:

On occasions I have seen a person's face in front of me when no one was in fact there.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

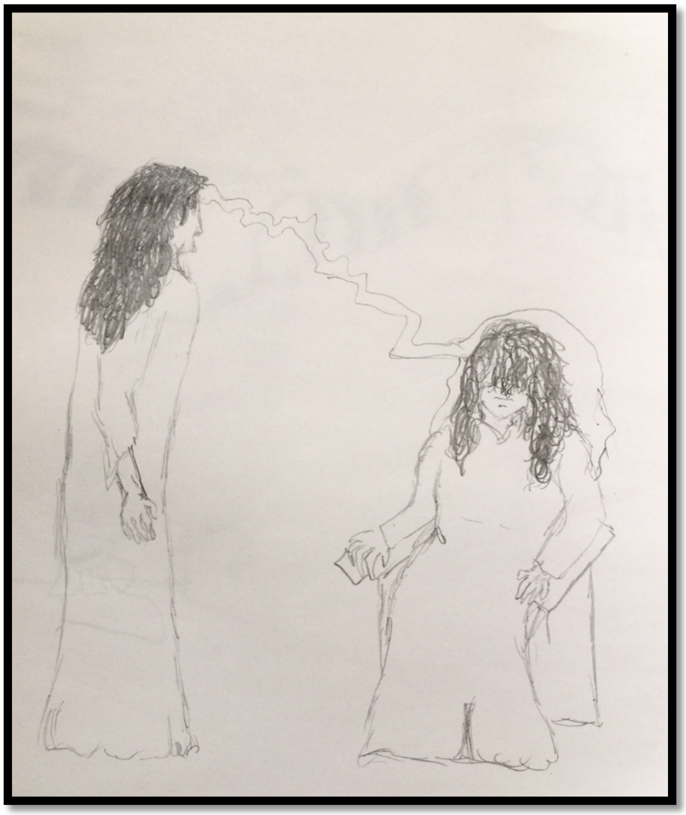
0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____

Picture 24. Consider the picture below when answering the following questions:



Have you ever felt that thoughts were being put inside your head by some outside force?

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

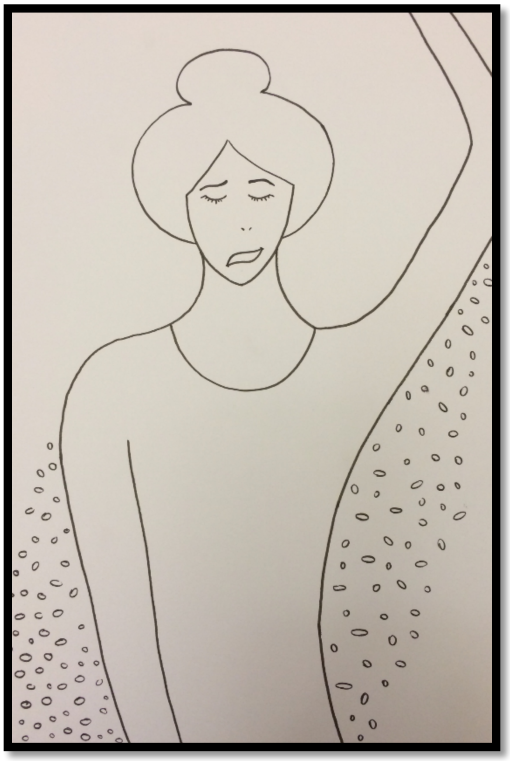
Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

Picture 25. Consider the picture below when answering the following questions:



I have been tickled in the past.

True // False

In the past month, how often have you had an experience like this?

Never |1-2 times in the past month | once per week | a few times per week | daily

When this happens, I feel frightened, concerned, or it causes problems for me:

Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree| Not Applicable

How vividly do you recall the image of this experience?

0% (not at all) | 25% | 50% | 75% | 100% (very) | Not Applicable

Do you have any comments/additional thoughts on this image/experience? (optional)

____

____