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Abnormal emotional experience in schizophrenia

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ABNORMAL EMOTIONAL EXPERIENCE IN SCHIZOPHRENIA

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ABSTRACT

Ambivalence is defined as the state of simultaneously experiencing antithetical emotions towards a single attitude object (Bleuler, 1911/1950). Recent studies have evidenced ambivalence as a prominent aspect of schizophrenia patients' in-the-moment emotional experiences (Cohen & Minor, 2010; Trémeau et al., 2009). The present study extended this line of work through the use of an experimental mood-induction methodology to explore the amount, frequency, and average duration of univalent positive, negative, and ambivalent emotional episodes within individuals with schizophrenia and those without psychiatric disturbance. The results indicate that, when exposed to a film clip stimulus selected for its documented (Larsen & McGraw, 2011) capacity to induce ambivalent emotions, individuals with and without schizophrenia do not reliably differ in any measured dimension of univalent or ambivalent emotional experience. Potential explanations for observed inconsistencies in the schizophrenia emotional experience literature are reviewed and study limitations as well as directions for future research are discussed.

CHAPTER 1. INTRODUCTION

In the same seminal text in which he coined the term *schizophrenia* to describe what he viewed as the resultant syndrome of a fundamental split ('schizein') in the mind ('phren'), Eugen Bleuler (1911/1950) defined 'ambivalence' as the phenomenon of simultaneously experiencing diametrically valenced feelings (e.g., happiness and sadness) towards a single stimulus or object. Beyond merely introducing a novel term however, Bleuler posited ambivalence as one of the four cardinal symptoms of the disorder along with autism, the loosening of associations, and inappropriate affect. Unfortunately, despite the fact that ambivalence has continued to occupy a prominent role within Bleuler's and, more recently, others' (e.g., Meehl, 1962), theories of schizophrenia, several issues have either deterred or obscured empirical efforts to elucidate this phenomenon. First, over time, the concept has been used in an array of contexts to describe a variety of pathological as well as nonpathological mental states (Sincoff, 1990). These appropriations, however valid, have collectively served to stretch the semantic boundaries of the concept such that some argue the term has failed to hold a precise definition (Raulin & Brenner, 1993). And second, a host of methodological difficulties and ensuing debates have ensnared previous attempts to document ambivalence as a scientific construct generally (Schimmack & Colcombe, 1999) and symptom of the schizophrenia spectrum specifically (Raulin, 1984). As with most scientific progressions however, careful conceptual demarcations and technical advancements have enabled researchers to begin to investigate the validity of ambivalence in describing schizophrenic symptomatology. Continuing in this regard, the aim of this project was to examine whether individuals with schizophrenia report experiencing more ambivalence in response to a putatively ambivalent film clip than do those without a history of psychiatric diagnosis.

In order to contextualize this project within the larger body of research on the symptoms of schizophrenia, an overview of several pertinent literatures is provided in the first half of this document. First, current conceptualizations and derivative nosological systems used to identify schizophrenia and its associated features are reviewed; as are those systems used to organize the invariably heterogeneous symptom presentations of individuals diagnosed with the disorder. Next, a brief review of the research on emotion in schizophrenia and the overarching paradigms used to investigate this topic, as well as the problems contained therein, is provided followed by an exposition of research specifically documenting emotional experience in schizophrenia. Then, the concept of ambivalence and the experimental model used in its documentation – the Evaluative Space Model (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997; Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009) – are evaluated with regards to their potential for providing clarification and insights into the aberrant emotional experiences of those with schizophrenia. Following this review of the literature, the aims, hypotheses, and methods of the present study are discussed and a description of the data analytic strategy as well as associated power analysis is provided. In turn, the results of the conducted analyses are provided and the document concludes with a full synthesis of the study findings and implications in the discussion section.

1.1 Schizophrenia

Classified as a psychotic disorder within the Diagnostic and Statistical Manual of Mental Disorders 4th Edition – Text Revision (DSM-IV-TR; American Psychiatric Association, APA, 2000), schizophrenia represents a debilitating disturbance in thought, emotion, and behavior. More specifically, the diagnosis of schizophrenia is indicated in cases in which at least two of the core symptoms – delusions, hallucinations, disorganized speech, catatonic or disorganized

behavior, and/or negative symptoms (i.e., alogia, blunt affect, avolition) – are present for one month with enduring signs of disturbance lasting for at least six months (e.g., enduring negative symptoms). The lifetime prevalence estimates of schizophrenia range from 0.5 to 1.5% (APA, 2000; Perala et al., 2007) however these figures belie the tremendous burden schizophrenia imposes on society given that the combined direct (e.g., hospitalization expenses) and indirect (e.g., lost productivity due to morbidity and/or premature mortality) costs associated with the illness are estimated at nearly $65 billion per year within the United States alone; a prohibitive expenditure that is replicated internationally (Knapp, Mangalore, & Simon, 2004).

Notwithstanding the significant societal impact of the disease, schizophrenia can also have a devastating effect on the lives of those diagnosed, with illness onset usually occurring between the ages of 18 and 25 in men and 18 and 30 in women (Angermeyer & Kuhnz, 1988; Hafner, 1998). Otherwise put, the onset of schizophrenia ordinarily coincides with, and thus may serve as impediment to, a transitional period in life during which individuals typically must navigate crucial educational and vocational junctures. In addition, although there is substantial variability in clinical course and prognoses may be less malignant than previously believed (Harrison et al., 2001; Hegarty, Baldessarini, Tohen, Waternaux, & Oepen, 1994; Jobe & Harrow, 2005), outcome in schizophrenia is, nevertheless, often typified by significant declines in several domains of functioning (e.g., Eack & Newhill, 2007; Folsom et al., 2005).

Taken together, it is clear that schizophrenia exacts significant societal as well as personal and familial costs. It is little wonder, therefore, that an expansive research effort has endeavored to uncover the mechanisms by which the onset of this disease is triggered. Collectively, this body of research has buttressed the diathesis-stress model of schizophrenia such that there is widespread agreement that the emergence of schizophrenia is the result of a

complex interaction between genetic, epigenetic, and environmental variables (e.g., Harrison & Weinberger, 2005; Lenzenweger, 2006; Maki et al., 2005; Norman & Malla, 1993; Petronis, 2004, Tandon, Keshavan, & Nasrallah, 2008). In spite of this consensus however, isolating proximate causes has proven difficult as it remains the case that a host of factors, such as substance use and life stress (e.g., Butzlaff & Hooley, 1998; Corcoran et al., 2003; Phillips et al., 2006), can precipitate initial psychotic episodes although none of these triggers are present in all incidences of the disorder. Indeed, the etiological and developmental diversity uncovered by this research enterprise appears to mirror the considerable symptomatological heterogeneity observed both within and between diagnosed individuals, as is discussed next.

1.2 Heterogeneous Symptomatology within Schizophrenia

As a formal diagnosis, schizophrenia consists of an admixture of positive (i.e., abnormal behavioral excesses; e.g., delusions, hallucinations), negative (e.g., alogia, avolition), and disorganized (e.g., thought disorder) symptoms nuanced by an assortment of associated cognitive, affective, and psychomotor features (APA, 2000; Tandon, Nasrallah, Keshavan, 2009). However, although the DSM-IV-TR presents well-articulated descriptions and demarcations of these symptoms, with the possible exception of nonspecific cognitive deficits (Heinrichs, 2005), there are no symptoms of schizophrenia that hold across all cases of the disorder (Cohen & Docherty, 2005); nor are there any endogenous signatures (e.g., neuroanatomical deformity, pathophysiological process) that may serve as pathognomonic indicators of the disease (Keshavan, Tandon, Boutros, & Nasrallah, 2008). Furthermore, phasic shifts in clinical presentations are common (e.g., florid psychotic symptoms resolve and are replaced by more chronic negative symptoms) thereby adding within-subject variability to the already palpable between-subject symptomatological variance.

To the extent that such diversity perturbs research into specific psychopathological processes and identifying illness trajectories, many investigators have come to construe 'schizophrenia' as a general label for an array of related disorders rather than a single, unified disease entity (e.g., Tandon et al., 2009). Using a more pragmatic approach, other researchers have developed different symptom taxonomies in order to create more homogenous subsets of patients. One of such nosological systems is the one employed in the DSM-IV-TR in which diagnoses are partitioned into paranoid, disorganized, catatonic, undifferentiated, and residual subtypes (APA, 2000). In light of the limited clinical and prognostic utility of these subtypes (e.g., Fenton & McGlashan, 1991; Regier, 2007; Suvisaari et al., 2009), however, more empirically derived systems – the syndrome and symptom-oriented approaches – have gained favor in both research and clinical contexts.

The syndrome approach employs several statistical techniques, notably factor analysis of symptom ratings, to identify those symptoms that frequently co-occur and thus aggregate into distinctive clusters. Although parsimonious, evidence suggests that dichotomous schemes such as the positive versus negative (Andreasen & Olsen, 1982), Kraepelinian versus non-Kraepelinian (Keefe et al., 1988), and deficit versus non-deficit (Carpenter, Heinrichs, & Alphs, 1988) models demonstrate inadequate fit with the data concerning the multifarious clinical expressions of schizophrenia (e.g., Arndt, Alliger, & Andreasen, 1991). A more replicable and thus valid alternative categorizes schizophrenic pathology into three symptom complexes. That is, positive (i.e., delusions and hallucinations), negative (i.e., avolition, alogia, anhedonia, and flat affect), and disorganization (i.e., catatonia, inappropriate affect, and disorganized speech) syndromes (Buchanan & Carpenter, 1994; Grube, Bilder, & Goldman, 1998; Toomey, Faraone, Simpson, & Tsuang, 1998).

In lieu of identifying dissociable symptom clusters or syndromes, as the name suggests, the symptom-oriented approach reduces schizophrenic symptomatology to the level of independent indications of disturbance (i.e., individual symptoms). Perhaps the foremost benefit of this descriptive framework is that it largely bypasses the inherent difficulties of attempting to establish a reliable and valid nomenclature (i.e., categories and/or dimensions) of schizophrenia symptomatology (Costello, 1992). Regardless of whether one applies a syndrome or symptom-oriented approach however, it can be argued that both frameworks have enabled researchers to begin to elucidate those features of schizophrenia that have traditionally received less empirical attention. That is, chiefly, the emotional symptoms of schizophrenia, which is the topic to which I now turn.

1.3 The Affective Sciences and Emotion within Schizophrenia

In spite of the early works of influential theorists Kraepelin (1919/1971), Bleuler (1911/1950), Sullivan (1927, 1962), and Meehl (1962, 1990), in which emotional symptoms were postulated as central and particularly deleterious features of the disorder, prior to the 1990's, emotion in schizophrenia was an understudied topic in comparison to some of the more popularized symptom domains (e.g., formal thought disorder, delusions, and hallucinations). More recently however, a wealth of research has integrated findings, theories, and methodologies from fields as diverse as the basic affective sciences, clinical and cognitive neurosciences, and experimental psychopathology to gain greater insights into the mechanisms and processes underlying the emotional lives of those afflicted by this disorder (see Kohler & Martin, 2006, Kring, 1999, Kring & Caponigro, 2010, Kring & Moran, 2008, and Trémeau, 2006, for review). Unfortunately, an outmoded lexicon, which only serves to further obfuscate the study of this already complex subject, has encumbered these advances. In particular, phrases such as

'emotional deficits' or 'emotional dysfunctions' are commonly used to denote one or more of the negative symptoms – flat affect (i.e., impoverished outward expression of emotion), avolition (i.e., reduced motivation), alogia (i.e., reduced speech or reduced content of speech), asociality (i.e., restricted social interests and contacts), and anhedonia (i.e., inability to experience pleasure). However, confusingly, these terms are not used in reference to other emotional features such as mood or anxiety symptoms *per se*. In other words, although highly comorbid (Potvin, Sepehry, & Stip, 2007) and possessing much phenotypic overlap with schizophrenic symptoms proper (e.g., Addington, Addington, & Maticka-Tyndale, 1993; Kitamura & Suga, 1991), mood- and anxiety-related symptoms are nonspecific psychopathological features that are considered distinct from the core affective aspects of schizophrenia-spectrum illness. Equally confusing as this negation of mood and anxiety symptoms is that nebulous terms such as 'emotional abnormalities' also do not typically refer to the emotional concomitants of psychotic symptoms (Freeman, Garety, & Kuipers, 2001; Nayani & David, 1996); indeed, the interaction of the different emotional symptoms of schizophrenia remains a sorely neglected area of research. Taken together, although all affective symptoms and sequelae involve disruptions in emotional and/or conative systems (Aleman & Kahn, 2005), mood, anxiety, and negative symptoms each involve different pathologies in different aspects of the emotion construct thereby rendering terms such as 'emotional dysfunctions' or 'affective abnormalities' sufficiently ambiguous if not unintelligible.

In order to more fully understand the requisite conceptual distinctions incumbent on any terminology used in the study of emotion in schizophrenia, it is important to introduce some foundational issues inherent to basic emotion research. Generally speaking, 'emotion' as a scientific construct has been plagued by an enduring lack of consensus with regards to both its

definitional expanse and parameters (e.g., Izard, 2010). For example, there is little agreement as to whether the terms "affect" and "emotion" are synonyms or, instead, reflect conceptually distinct phenomena with the former denoting (a) emotive behavioral displays or (b) subjective 'feeling states' and the latter denoting complex cognitive, psychophysiological events (Widen & Russell, 2010; see also Alpert & Rosen, 1990). Related to this issue, there have also been myriad attempts to identify the composite dimensions of the emotion construct (Frijda, 1986). For instance, within the basic emotion literature, 'emotion' has been differentially deconstructed into several domains including (but not limited to) emotion recognition, antecedent events and stimuli, cognitive appraisals, expressions and behaviors, physiologic changes, emotional experiences, motivational changes, consequent changes in cognitive functioning and belief systems, and self-regulatory processes. In addition, each of these domains have been further deconstructed into constituent subdomains – for example, the various physiological (e.g., electrodermal, cardiovascular, and electromyographic) dimensions which researchers use to monitor the visceral correlates of emotional reactions. Clearly, these complex and divergent depictions incite debate and discord however, although there is no consensus as to which, or how many, domains should be considered with regards to the structure of 'emotion', all researchers converge on the construct's invariably multifaceted nature (Izard, 2010; Scherer, 1984).

It is doubtful that the study of emotion in schizophrenia, in and of itself, will resolve any of the definitional issues endemic to the field of basic emotion research. Nevertheless, the investigation of circumscribed phenomena – namely, that of emotion recognition and emotional responses – has enabled significant progress. Emotion recognition, or emotion perception, encompasses strictly *inter*personal (i.e., social cognitive) phenomena such as, for example, individuals' ability to discern another's facially expressed emotions and decode others'

behaviorally conveyed cues (see Edwards, Jackson, & Pattison, 2002, for review). Here, patients with schizophrenia, relative to both healthy and clinical controls, consistently demonstrate significant impairment in recognizing as well as discriminating between facially expressed emotions (e.g., Kohler & Martin, 2006). Furthermore, several studies indicate that this impairment is not confined to a mere prosopagnosia as individuals with schizophrenia also show marked impairment in prosodic recognition and discrimination (Hoekert, Kahn, Pijnenborg, & Aleman, 2007). Whether these multimodal impairments in processing emotional stimuli represent a specific impairment within schizophrenia or, alternatively, are indicative of the more general neurocognitive defect characteristic of the disorder (Dickinson, Ragland, Gold, & Gur, 2008) remains to be seen. However, regardless of specificity, it is clear that this aspect of the emotion construct is significantly affected within those with schizophrenia.

In comparison to emotion recognition, emotional responses often involve more *intra*personal phenomena that do not necessarily, although often do, involve the processing and encoding of social stimuli. More specifically, emotional responses, as defined in the schizophrenia literature, are comprised of at least three components: (1) expressions, (2) physiologic responses, and (3) experiences (Kring & Moran, 2008). In turn, each of these components can be further broken down into subcomponents for study within individuals with schizophrenia. Regardless of the number of dimensions or sub-dimensions investigated however, and it is noteworthy that many investigations study more than one dimension of emotional responding at the same time, one of the foremost challenges to integrating findings across components of emotional responding is that the different components are typically only modestly correlated (Alpert & Rosen, 1990) and often entirely discordant (e.g., Kring, Kerr, Smith, & Neale, 1993; Kring & Moran, 2008). Consequently, efforts to identify holistic emotional

responding in schizophrenia are confounded by inconsistences across measures thereby leaving open the question of which component(s) most accurately reflects individuals' emotional reactions to various stimuli. Nevertheless, rather than resolving this quandary *per se*, some researchers have circumnavigated this issue by proposing the fragmentation of emotional responding as a central aspect of schizophrenic pathology rather than mere methodological nuisance (e.g., Sass, 2007).

As evidenced by issues such as those stated above, the three-component model of emotional responses may be, and almost certainly is, fraught with inaccuracies and deficiencies. This does not remove that fact however that the model has nonetheless proven to be an invaluable heuristic in the study of emotion in schizophrenia. Explicitly, the first component of emotional responses – emotional expression – has been stratified into behavioral and verbal (i.e., acoustic and lexical) channels and a large number of studies have shown that individuals with schizophrenia are significantly less facially as well as vocally expressive than those without a diagnosis. In particular, using both standardized procedures for coding facial emotions (e.g., Kring & Sloan, 2007) as well as psychophysiological measures of somatic activity, patients with schizophrenia, in comparison to healthy controls as well as a variety of neurologically impaired patients, enact fewer observable gestures and facial expressions in response to a wide array of evocative stimuli (e.g., Berenbaum & Oltmanns, 1992; Kring et al., 1993; Kring & Neale, 1996). As well, apart from the restricted verbal output indicative of alogia, the speech of those with schizophrenia (e.g., Murphy & Cutting, 1990; Ross et al., 2001) and other schizophrenia-spectrum illnesses (Cohen, Iglesias, & Minor, 2009) is often marked by significantly reduced variability in acoustic variables which, together, serve the paralinguistic function of communicating speaker emotional states and intentions. Although this affective flattening or

blunting has long been documented using clinician ratings and interviews (e.g., Andreasen, 1979), by using more behaviorally-based methodologies, these studies confirm constricted emotional expression as a core feature of schizophrenia. Moreover, a further important aspect of this research is that several studies (e.g., Kring et al., 1993; Kring & Earnst, 1999) observed the reductions in emotional expressivity in neuroleptic and otherwise psychotropic naïve patients which thereby rules out these deficits as artifactual or iatrogenic byproducts of pharmacotherapy.

The second component of emotional responses – physiological responses – has been the subject of several elicitation investigations. That is, for example, studies in which psychophysiology equipment is used to log individuals' autonomic responses to emotionally evocative stimuli (e.g., still pictures, film clips). Unlike the abovementioned evidence for expressive deficits however, the evidence for physiological irregularities within schizophrenia is considerably more variable. With regards to electrodermal reactivity, some studies (e.g., Kring & Neale, 1996) report evidence of increased skin conductance responses within those with schizophrenia whereas others (e.g., Hempel et al., 2005; Volz, Hamm, Kirsch, & Rey, 2003) report no differences in skin conductance responses between those with and without the disorder. Additionally, still others (e.g., Schlenker, Cohen, & Hopmann, 1995) report attenuated skin conductance responses within individuals with schizophrenia. Cardiovascular reactivity is another dimension along which aberrant responding in schizophrenia has been investigated. Again, while some studies report differences between those with and without a diagnosis of schizophrenia (e.g., Hempel et al., 2005; Hempel, Tulen, van Beveren, Mulder, Hengeveld, 2007), others do not (e.g., Schlenker et al., 1995). Electromyography, and more specifically facial muscle reactivity, is a yet further dimension of physiological responding that researchers have investigated for evidence of deviation in those with schizophrenia. Although, as noted

above, those with schizophrenia are generally less expressive than their healthy counterparts, several studies (e.g., Earnst, Kring, Kadar, Salem, & Shepard, 1996; Mattes, Schneider, Heimann, & Birbaumer, 1995) find evidence that patients nonetheless enact microexpressions. That is, subtle, unobservable muscle twitches that serve as precursors to perceptible facial expressions. As is consistent with the other facets of psychophysiological responding, evidence for group differences in microexpressive displays is mixed insofar as some studies (e.g., Kring, Kerr, & Earnst, 1999) report amounts of facial muscle responses in patients comparable to healthy controls whereas others report either lesser (e.g., Wolf, Mass, Kiefer, Wiedemann, & Naber, 2006) or more (Wolf et al., 2004) activity in the underlying facial musculature (e.g., zygomaticus major and corrugator supercilium) of individuals with schizophrenia. In summation, although the convoluted and at times conflicting findings are difficult to synthesize, physiological emotional responding appears to be largely intact for many diagnosed individuals. That is, many patients demonstrate expected patterns of autonomic activity that are consistent with the valence of presented stimuli thereby making their resultant psychophysiological profiles difficult to distinguish from those without a diagnosis of schizophrenia. Still, much work remains to be done before claims of unimpaired psychophysiological functioning in schizophrenia can be made with any degree of certainty and thus before determining whether this component of emotional responding stands in contrast to the other debilitating emotional features of the disorder, including, as is discussed next, abnormalities in the third component of emotional responses – emotional experience.

1.4 Abnormal Emotional Experience within Schizophrenia

On the basis of their blunted and oftentimes vacant emotional expressions, it is easy to envision the emotional experiences of those with schizophrenia as commensurately dull. That is,

lives filled with pallid and highly mechanical experiences which are devoid of the cognitive and physiological accompaniments (e.g., state dependent thoughts and arousal levels) that typically furnish the phenomenology or feeling states of undiagnosed individuals. Indeed, this depiction is largely consistent with Kraepelin (1919/1971) who spoke of an "ataxia of the feelings" (p. 32) in referencing the absence of emotional experiences in schizophrenia when he first described the disorder. First blush impressions, with or without historical precedent, and the results of empirical investigations are often at odds however, and one robust finding to emerge over the past two decades is that those with schizophrenia often report experiencing potent emotions, and often to a greater extent and more frequently than their undiagnosed counterparts (e.g., Kring & Moran, 2008; Myin-Gerymeys, Delespaul, & Devries, 2000).

To illustrate, clinician-administered symptom rating scales are often employed in assessment and treatment planning contexts, and often with the aim of documenting the behavioral or affective flattening of schizophrenia. However, in the face of this blunted affect, studies using standardized clinical instruments such as the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1989) or Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962; Lukoff, Nuechterlein, & Ventura, 1986) have at the same time also unveiled the active emotional experiences of patients. That is, several of these studies report pathologically elevated anhedonia (although see below for further discussion) and negative emotions (e.g., anxiety, guilt, hostility) within those with schizophrenia relative to healthy controls (e.g., Aghevli, Blanchard, & Horan, 2003; Mueser, Curran, & McHugo, 1997). In line with these findings, other research using the Minnesota Multiphasic Personality Inventory (i.e., MMPI-A) and other self-report personality inventories have also found that individuals with schizophrenia routinely report increased levels of negative emotional traits and diminished levels of positive

emotional traits (Blanchard, Mueser, & Bellack, 1998; Horan, Subotnik, Reise, Ventura, & Nuechterlein, 2005). Naturalistic studies, such as those using the Experience Sampling Method wherein patients are prompted at various intervals throughout the day to disclose their thoughts, behaviors, and feelings, have also evidenced patients' active emotional experiences. More specifically, several studies using this method have shown that those with schizophrenia, in comparison to controls, report a greater range and intensity of negative emotions relative to positive emotions (e.g., DeVries & Delespaul, 1989; Myin-Germeys et al., 2003).

Given the complexity of the emotional experience construct, an array of methodologies – including the abovementioned symptom ratings scales and client self-report questionnaires – were necessary in order to contribute the finding of the conspicuous disjunction between many patients' outer (i.e., expressive) and inner (i.e., experiential) domains of emotional functioning. These methods continue to be used in order to illuminate patients' phenomenological experiences of emotion and, more specifically, to address the difficulties of providing accurate descriptive accounts of these experiences beyond simply asserting that those with schizophrenia experience emotion. Otherwise put, on the basis of the heretofore reviewed studies, it is clear that individuals with schizophrenia lead active emotional lives with panoramic emotional experiences; the nature of these experiences however, although assumed to be out and out pathological (i.e., depicted by general increases in negative and decreases in positive emotional states; Meehl, 1962; 1990; Rado, 1953), is a more contentious issue.

One obstacle to documenting the nature of emotional experience in schizophrenia is purely methodological. That is, a salient constancy between the commonly used methods of symptom rating scales and questionnaires is that they are largely, if not entirely, reliant on the self-reports of clients. Apart from the subjectivities and inaccuracies typical of autobiographical

recall (e.g., Hyman & Loftus, 1998), as well as the distorting effects of other influences (e.g., dissimulation; Furnham, 1986), the well-documented cognitive impairments of schizophrenia have led many to question whether those with the disorder are capable of producing reliable and valid reports of their emotional experiences (e.g., Jaeger, Bitter, Czobor, & Volavka, 1990). Further confounding this prospect is that many individuals with schizophrenia demonstrate impairments in illness insight (Carroll et al., 1999; Mintz, Dobson, & Romney, 2003) and are thus thought to be unable to reflect upon their emotional experiences. Moreover, many individuals with schizophrenia exhibit elevated levels of alexithymia (i.e., a personality construct literally meaning "no words for feelings" and representing pathological reductions in experiencing, identifying, and describing emotions) as well as communication disturbances (e.g., Docherty & Gordinier, 1999) which, taken together, inhibit patients' abilities to verbally articulate their experiences of the socio-emotional milieu within which they live.

Still, despite the fact that these symptoms, and especially the cognitive deficits of schizophrenia, are ubiquitous and particularly debilitating features of the disorder, as well as the fact that as much as 50-80% of patients are unaware that they suffer from a psychotic disorder and are further unaware of the symptoms and requisite treatment for the disorder (Amador & Gorman, 1998), several studies serve to refute the notion that the self-reported emotional experiences of individuals with schizophrenia are categorically invalid. First, a study by Kring, Barrett, and Gard (2003) found that individuals with schizophrenia and healthy controls share similar cognitive representations of emotional phenomena. That is, both individuals with and without a diagnosis of schizophrenia accessed two dimensional valence-arousal schemas when giving similarity ratings of emotion words (e.g., nervous, fearful, aroused). Accordingly, to the extent that the underlying semantic structures of patients' and nonpatients' affective verbiage

was largely isomorphic, the results of this study support the contention that individuals with schizophrenia are capable of giving at least comparably valid self-reports of their emotional experiences. Second, a collection of longitudinal investigations (e.g., Blanchard et al., 1998; Kring & Earnst, 1999) have measured patients' self-reports of emotional experience and have demonstrated that such measures possess high internal consistency as well as test-retest reliability. In addition, and perhaps more importantly, several of these studies have demonstrated the appreciable reliability of patients' self-reported emotional experiences over within-subject changes in symptom presentations and medication regimens thereby providing incremental evidence that patients' self-reports of emotional experiences are robust to at least some symptomatological factors as well as to the psychological side effects of pharmacotherapy (Kring & Earnst, 1999; Kring & Neal, 1996). Lastly, several authors have argued that, although scientific skepticism of the methods and sources from which data are collected is an indispensable aspect of all research enterprises, the unbridled mistrust of the self-reported emotional experiences of individuals with schizophrenia remains mostly speculative and unfounded by extant research, especially in light of the fact that basal functioning and other inclusionary criteria (e.g., Global Assessment of Functioning scores, APA, 2000) are commonplace elements of most research designs (Strauss, 1994). Furthermore, taken in its extreme form, some researchers have suggested that such skepticism is nonspecific to schizophrenia and is indeed applicable to a host of psychiatric disorders (Kessler, Wittchen, Abelson, & Zhao, 2000) and therefore amounts to nothing more than tacit discrimination and perpetual stigmatization of those with severe mental illness (Kring & Caponigro, 2010).

Altogether, it is clear that the cognitive deficits, communicative disturbances, and lack of illness insight characteristic of many individuals with schizophrenia present significant

misgivings with regards to the veracity of patients' self-reported emotional experiences. In turn, these concerns confound the investigation as to the phenomenological nature of schizophrenia patients' emotional experiences. Nonetheless, insofar as previous research has demonstrated that individuals with schizophrenia are capable of yielding highly reliable self-reports of emotional experience and hold the same knowledge structures of emotion as undiagnosed individuals, the subjective reports of patients' emotional experiences by way of self-report instruments possess sufficient content and construct validity to enable meaningful inter-group comparisons.

Apart from the debate regarding the appropriateness of the self-report methodologies, a further obstacle to describing the nature of emotional experience in schizophrenia is that studies that employ these techniques offer conflicting results that prohibit unilateral characterizations of the abnormalities of patients' emotional phenomenology. Otherwise put, findings from these studies present a perplexing inconsistency between schizophrenia patients' state versus trait reports of experienced emotions such that the nature of these reports appears to vary as a function of whether patients' responses are given in-the-moment in reaction to controlled laboratory stimuli or, alternatively, given to reflect patients' own perceptions of their general affective dispositions irrespective of specific contexts. Explicitly, as previously detailed, numerous studies employing self-report questionnaires such as the MMPI (e.g., Horan et al., 2005), Multidimensional Personality Questionnaire (e.g., Blanchard et al., 1998), and Chapman Anhedonia Scales (Horan, Kring, & Blanchard, 2006) as well as studies which employ interviewer-based symptom rating scales such as the SANS (Aghevli et al., 2003), BRPS (Mueser et al., 1997), and Positive and Negative Syndrome Scales (Kay, Opler, & Lindenmayer, 1988), generally report diminished positive emotions (i.e., anhedonia) in conjunction with elevated levels of negative emotions (e.g., sadness, guilt) in those with schizophrenia relative to

nonpatient controls. By contrast, most mood-induction studies wherein emotionally evocative stimuli (e.g., picture stills, film clips) are presented within highly controlled experimental settings generally do not find significant differences between those with and without schizophrenia in emotional responses to negative, positive, as well as neutral stimuli (Kring & Moran, 2008). Put plainly, relative to nonpatient controls, most studies using self-report or symptom rating instruments depict the emotional experience of individuals with schizophrenia as anhedonic with surpluses of negative emotion whereas many studies using mood-induction methodologies depict the emotional experience of individuals with schizophrenia as relatively normal without significant group-level differences in either positive or negative emotions.

Several theories have been put forth in an effort to explain the inconsistency between patients' trait and state self-reported emotional experiences (see Cohen, Najolia, Brown, & Minor, 2011, for review). First, the construct validity of self-report and symptom rating scales have been questioned on the grounds that they are thought to tap overly-simplistic, partial, or otherwise divergent conceptions of the anhedonia construct (e.g., Dworkin, 1992; Germans & Kring, 2000; Leventhal, Chasson, Tapia, Miller, & Pettit, 2006). According to this theory, then, to the extent that commonly used self-report or interview-based scales measure phenomena other than hedonic emotional experience *per se* (e.g., social-skills deficits), emotional experience within schizophrenia is that which is measured during laboratory mood-induction studies – that is, largely without pathology. A second theory has accrued a larger body of research and postulates that hedonic experience consists of two dissociable components – anticipatory and consummatory pleasure experience – and that it is only the first of these components that is impaired within schizophrenia (Gard, Kring, Gard, Horan, & Green, 2007; Kring, 1999). In essence, this theory states that those with schizophrenia exhibit a severe defect in anticipating

future pleasurable experiences as well as deriving pleasure from such anticipations and therefore decline experiencing positive emotions when not directly perceiving and processing pleasant stimuli. When in the presence of such stimuli however, according to this theory, those with schizophrenia have intact hedonic capacity and thus have emotional experiences that are phenomenologically indistinguishable from those without a diagnosis. The neurocognitive mechanisms, and pathologies therein, discussed by anticipatory-consummatory theorists largely overlap with those considered in two further theories of the state-trait disjunction in schizophrenia patients' self-reported emotional experience. In particular, several researchers (e.g., Burbridge & Barch, 2007; Horan, Green, Kring, & Nuechterlein, 2006) posit that the cognitive deficits of schizophrenia pervade and obscure patients' self-reports of emotional experience in that, for example, specific deficits in working and episodic memory inhibit patients' abilities to effectively encode and pair autobiographical episodes with pleasant feelings. In turn, having never successfully associated stimulus (i.e., event) and response (i.e., pleasure) to begin with, according to proponents of encoding-retrieval and representational deficit theories, individuals with schizophrenia fail to store and retrieve memories of pleasurable experiences when responding to self-report and interview-based measures however demonstrate intact emotional experience in the presence of evocative stimuli.

Before concluding that in-the-moment emotional experience is entirely without abnormality in schizophrenia, it is worth noting several key conceptual and methodological distinctions that are necessary in order fully evaluate the complex construct of emotional experience as it is manifested in controlled mood-induction investigations. Firstly, there is an ostensive difference between asking experimental participants to rate their feelings in reaction to evocative stimuli versus asking participants to rate the affective properties of the stimulus itself –

a distinction that is borne out in neuroimaging research as much as it is in behavioral investigations. For example, although activation of the medial prefrontal cortex (mPFC) is involved in the processing of emotion generally (Phan, Wager, Taylor, & Liberzon, 2002), the rating of feeling states recruits more dorsal-rostral areas of the mPFC and coincides with activation of homeostatic regions such as the secondary somatosensory cortex, cingulate, and hypothalamic and tegmental nuclei (Damasio et al., 2000). By comparison, rating the affective qualities of stimuli recruits more ventral areas of the mPFC and coincides with activation of 'cognitive control' regions such as the anterior cingulate and insula (Ochsner & Gross, 2005; Wager, Phan, Liberzon, & Taylor, 2003). Despite these neuroanatomical differences, across both types of studies, similar results emerge in that individuals with schizophrenia tend to report emotional experiences consistent with the valence of the evocative stimuli which thereby lends credence to the apparently normal, or at least non-disordered, in-the-moment emotional experience of patients. Importantly however, there are also observable stimulus-specific effects and inconsistencies that emerge from these literatures which point to a second conceptual and methodological distinction necessary in order to elucidate the nature of emotional experience in schizophrenia.

As noted in a recent review of emotion in schizophrenia (Kring & Moran, 2008), and consistent with the abovementioned state-trait paradox, over half of all reviewed emotional experience studies reported evidence of comparable in-the-moment self-reports between schizophrenia patients and nonpatient controls. On the other hand however, it is also the case that a full quarter of such studies reported diminished positive emotion (i.e., anhedonia) in those with schizophrenia and a further fifth of studies reported intact or non-diminished positive emotion with increased negative emotions within those with schizophrenia. Moreover, apparently

documenting a subset of patients with the 'deficit syndrome' (Carpenter et al., 1988), a collection of studies report pathological decreases in both positive and negative emotional experiences in those with a diagnosis of schizophrenia (e.g., Kirkpatrick & Buchanan, 1990; Kirkpatrick et al., 1996; Horan & Blanchard, 2003). It is important to note that many of the studies evidencing abnormal emotional experiences in schizophrenia include those in which the experience sampling method was used – a methodology which many researchers (e.g., Bolger, Davis, & Rafaeli, 2003; Csikszentmihalyi & Larson, 1992; Scollon, Kim-Prieto, & Diener, 2003) argue offers a more ecologically valid and therefore meaningful indication of patients' real-time experiences. For example, avoiding the use of putatively artificial laboratory stimuli, Myin-Germeys and colleagues (2003) reported that, over the course of six days and relative to healthy controls, individuals with schizophrenia experienced overall less positive emotion and more negative emotion in reaction to daily life stressors (e.g., social activities, vocational tasks).

Taken together, although these studies disagree as to the direction and extent of deviant emotional experiences in schizophrenia (i.e., whether positive and negative emotional states occur with greater, similar, or lesser frequencies, durations, and intensities), all point to the imperative conceptual and methodological demarcation of positively- and negatively-valenced emotions in investigations of this topic. In fact, it was the implementation of self-report methods which explicitly delineate positive (e.g., happiness) and negative (e.g., sadness) emotions that lend support to an emerging theory of emotional experience in schizophrenia – ambivalence – which is both central to Bleuler's (1911/1950) original theory of schizophrenia as well as the focus of the present study.

1.5 Ambivalence and the Evaluative Space Model

Bleuler (1911/1950) defined ambivalence as the "tendency to endow the most diverse psychisms with both a positive and negative indicator at the same time" (p. 53). In more contemporary parlance, ambivalence represents a state of simultaneously experiencing antithetical feelings in reaction to a single or delimited set of stimuli. Prior to the 1990's, conceptual obscurity and methodological limitations rendered ambivalence a scientifically inaccessible construct (Raulin & Brenner, 1993); however, several, more recent, developments in fields outside of the study of schizophrenia have now made the concept both empirically tenable as well as particularly attractive for offering insights into the in-the-moment emotional experience of patients. Specifically, in two seminal reports, Cacioppo and his colleagues (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997) formulated and persuasively articulated the nuances and supporting evidence for the evaluative space model of emotional phenomena wherein positively- and negatively-valenced aspects of emotion are separable in both experience and measurement. That is, the evaluative space model treats emotional experiences as the dynamic composites of distinct positive and negative emotional substrates which, in turn, are underpin by equally distinct motivational systems. In other words, according to the evaluative space model, emotional experiences are the continually updated conscious products of the complex interactions of two orthogonal arousal systems. Perhaps of greatest importance, to the extent that these systems function independently of one another, the evaluative space model theoretically enables the possibility of ambivalent emotional experiences – operationally defined as the co-activation of both positive and negative emotional substrates.

Apart from its theoretical cogency, there is a developing body of neuroanatomical and neurochemical research that bolsters the precepts of the evaluative space framework in that such

research has delineated structural and functional differences in underlying positive and negative affect neurocircuitry. For example, limbic structures including the amygdala and stria terminalis have been shown to be associated with negative emotional responses, notably fear conditioning (e.g., LeDoux, 2000), whereas mesolimbic structures including the nucleus accumbens and medial forebrain bundle have been shown to be involved in positive emotional responses, and notably in reward-seeking and pleasure (e.g., Berridge, 2000). As well, cortisol and epinephrine have been shown to be largely associated with negative emotionality and stress reactions whereas dopamine and the class of endorphins (i.e., opiods) have been shown to be associated with positive emotionality (e.g., Breedlove, Watson, & Rosenzweig, 2010). Despite its theoretical plausibility and emerging neurobiological support, however, it is notable that there is ongoing debate amongst emotion researchers as to the feasibility of genuine ambivalent emotional states. On the one side of this debate, researchers such as Russell and Carroll (1999) contend that valence is a fundamental aspect of emotional experience and, as such, cannot be split or otherwise reduced into more basic components. By extension, these investigators argue that individuals cannot concurrently experience both positive and negative emotions (i.e., ambivalence) because the two are, unchangeably, antagonistic halves to a single valence continuum (Russell, 2003). Encapsulating this view, Bain (1859; as cited in Larsen & McGraw, 2011) asserted that positive and negative emotion are fundamentally incompatible such that, "the presence of one destroys the property of the other, as an acid neutralizes an alkali [i.e., base]" (p. 1095). Ultimately, drawing parallels to the debate of divided attention in which there is dispute as to whether one is truly capable of attending to more than one stimulus at one time or whether one merely alternates between attentional foci at an expeditious rate (e.g., Schmidtke & Heuer, 1997; Spelke, Hirst, & Neisser, 1976), researchers in this camp contend that seemingly

ambivalent emotional states are in fact the rapid oscillation between positive and negative emotional experiences. To this end, these researchers assert that individuals cannot and do not simultaneously experience positive and negative emotion but instead report doing so as a result of the averaging effects of autobiographical memory (i.e., episodic memories for extremely brief phenomenal intervals are summarized into more generic and/or semantic memory stores; Conway & Pleydell-Pearce, 2000; Conway, 2005).

On the other side of this debate, and in line with the evaluative space model, other researchers contend that antithetical feelings are plausibly experienced concurrently. Several studies, for example, have found that individuals report experiencing both positive and negative emotions in reaction to pictorial stimuli (Schimmack, 2005), particular musical pieces (Hunter, Schellenberg, & Schimmack, 2008), and, especially, major life transitions such as college graduation or residential relocations (Ersner-Hershfield, Mikels, Sullivan, & Carstensen, 2008). To the extent that the debate over emotional ambivalence is a debate regarding the conscious experience of emotions and is therefore often reliant on participants' self-reports, it has been imperative for researchers endeavoring to evidence the veracity of ambivalence to rule out the confounding influences impinging on this method. First, at least two reports have documented ambivalent emotional responses in the face of explicitly controlling for demand characteristics and subject-expectancy effects (Larsen & McGraw, 2011; Larsen, McGraw, & Cacioppo 2001). Second, challenging the possibility that, in lieu of reporting their veridical emotional experiences, participants merely report the affective properties of experimental stimuli, one study found reports of ambivalent emotional experiences in reaction to exclusively negative stimuli (i.e., horror film clips; Andrade & Cohen, 2007). Lastly, as an important final piece of evidence supporting the viability of ambivalence, mixed emotion states have also been demonstrated

within laboratory settings in which continuous, as opposed to static, measures of emotional experience have been employed which thereby serves to contest the 'rapid oscillation' hypothesis (Larsen & McGraw, 2011). Put plainly, this latter research suggests that individuals do not simply vacillate between feeling positive and negative emotions but rather, in reaction to experimentally presented stimuli, experience the concomitant fusion of oppositional valences within a single phenomenal epoch.

Taken together, the debate regarding ambivalence has many features emanating from the aforementioned systemic debate vis-à-vis the structure of emotions and therefore in all likelihood will not be resolved within the near future. Nevertheless, the theoretical possibility of ambivalence, and a corresponding methodology with which to measure it (see below), endowed by the evaluative space model permits investigation of a comparatively novel hypothesis of emotional experience in individuals generally as well as in those with schizophrenia specifically. Indeed, although most of the research conducted within the evaluative space paradigm has involved the study of nonclinical individuals, the concepts of ambivalence and independently operating positive and negative emotion subsystems map onto many of the heretofore-reviewed findings of emotional experience in schizophrenia and therefore may allow for greater insights into the emotional features of this illness.

1.6 Ambivalence within Schizophrenia

As reviewed above, the literature regarding the nature of in-the-moment emotional experience within schizophrenia is fraught with non-linear effects if not outright contradictions and paradoxes. In view of the evaluative space model, it is possible, and perhaps likely, that many of these discrepant findings may in part stem from the use of methods which consider positive and negative emotions as mutually exclusive phenomena that exist along a single

approach-avoidance continuum and, consequently, preclude the documentation of ambivalent emotional responding. The results of a recent meta-analysis (Cohen & Minor, 2010) of 26 mood-induction studies are particularly illuminating in this regard. Namely, studies employing bipolar (i.e., representing positive and negative emotions as poles to a single continuum) and those employing unipolar (i.e., separate positive and negative emotion) self-report scales were partitioned and the results of each analyzed separately. The analyses revealed that, in reaction to positively-valenced stimuli, studies using bipolar scales indicated significant "anhedonia" (i.e., less positive ratings) in schizophrenia patients relative to healthy controls whereas studies using separate positive and negative unipolar scales demonstrated comparable positive, but also significantly elevated negative, emotions in schizophrenia patients relative to controls. In addition, the results also showed that in reaction to both negatively-valenced and neutral stimuli, studies using bipolar scales tended to find no or negligible group differences in emotional self-reports whereas those using distinct unipolar scales found moderate increases in positive emotions as well as modest to large increases in negative emotions in individuals with schizophrenia relative to controls.

On the basis of these findings, then, it is conceivable that in-the-moment reports of anhedonia – that is, impoverished pleasure and positive emotion experiences – may actually reflect ambivalence. Here, it is important to discern two different conceptions of ambivalence, both of which are explicable within the framework of the evaluative space model (Cohen, Minor, & Najolia, 2010). On the one hand, as alluded to above, ambivalence may reflect the cross-contamination of schizophrenia patients' non-attenuated positivity by concurrently activated negative emotional states. On the other hand, rather than transient co-activations of negative and positive emotions, ambivalence in schizophrenia may represent an ever-present and

indiscriminate dysregulation of negative emotion. That is, consistent with the well-documented trait negative affect of the disorder (e.g., Horan et al., 2005), ambivalence in schizophrenia may be the result of a pernicious pathophysiological process whereby disinhibited negative emotion establishes a basal negativity within patients and thus positive emotional responses, as well as any emotional response, invariably occur against the backdrop of adversative emotional states. Regardless of which conceptualization is ultimately undergirded by research however, and to the extent that both descriptions are not necessarily mutually exclusive and may in fact be applicable at different stages of illness (e.g., first episode versus stabilized, chronic psychosis) and be moderated by a host of other psychopathological variables (e.g., comorbidity, substance use), the ultimate contention of the ambivalence hypothesis is that negative emotion imbues patients' appraisals of evocative stimuli, irrespective of stimulus valence.

At present, there has been only one experimental study in which the viability of ambivalence as a prime feature of schizophrenia patients' emotional experience and symptomatology was evaluated. In particular, Trémeau et al. (2009) presented a group of schizophrenia patients and healthy controls with standardized sets of pictorial, aural, and lexical, stimuli across three valence (i.e., positive, negative, and neutral) conditions. Following stimulus presentations, participants were prompted to rate how pleasant, unpleasant, and arousing the respective stimuli were using Likert-style self-report scales. The results indicated that, relative to healthy controls, schizophrenia patients tended to report experiencing greater arousal across affective stimuli as well as overall greater ambivalence in the medium to large effect size range – that is, patients reported greater negative emotions in reaction to positive stimuli ($d = 0.81$) as well as greater positive emotion in reaction to negative stimuli ($d = 0.50$). Although providing preliminary support for the ambivalence hypothesis, as with all studies, the work of Trémeau and

colleagues suffered from several key limitations which, collectively, obscure making definitive judgments as to the status of ambivalence as a core symptom of schizophrenia. Most notably, apart from not statistically correcting for multiple pairwise comparisons, this study prompted participants to report on their emotional experience following each six second stimulus exposure and given that, stimulus modality (i.e., visual, auditory, orthographic), but not stimulus valence, was randomized within participants, it is possible that successive self-reported emotional experiences reflected the accrual of affective evaluations over the course of the experiment rather than independent emotional responses to single stimuli. This time-predicated effect may or may not have affected the results of this study however, in light of recent evidence, a more concerning limitation warrants mention. That is, a recent investigation by Kring, Gard, and Gard (2011) demonstrated that individuals with schizophrenia display specific difficulties in maintaining elicited emotional responses for longer than two and a half seconds following stimuli exposure offsets. Applied to the Trémeau et al. study, it is possible that the intervals during which participants were prompted to report their emotional experiences in reaction to elicitation stimuli were sufficiently long so as to require schizophrenia participants' recruitment of cognitive structures not involved in the on-line processing of emotional experiences per se (e.g., negative cognitive schemata; Grant & Beck, 2009). In other words, the self-reports of the schizophrenia patients in this study may not have been 'in-the-moment', at least not in the usual sense of the phrase. It is thus clear that continuous, time-sensitive self-report measures of individuals' emotional experience are important inclusions for further research of ambivalence in schizophrenia.

Lastly, although all laboratory mood inductions are somewhat artificial in nature, there is evidence to suggest that some stimuli approximate more naturally occurring phenomena better

than others. In particular, although there is still much debate (e.g., Droit-Volet, Fayolle, & Gil, 2011), emotion eliciting film clips have been put forth as more naturalistic, and therefore the results of which are more generalizable, than other types of stimuli such as static, inanimate items (e.g., Gross & Levenson, 1995; Rottenberg, Ray, & Gross, 2007). Despite the fact that Trémeau et al. (2009) used an assortment of evocative stimuli spanning a range of sensory modalities and found that results did not vary as a function of stimulus type, the trial-wise presentation of stimuli ensured that, unlike in real-world contexts, participants drew upon comparatively circumscribed aspects of their sensorium when reporting their emotional experience. Given that naturalistic emotional experience are invariably multivariate phenomena, and film clips may serve as adequate multimodal proxies for said phenomena, the use of emotion-eliciting film clips may introduce more ecological validity to the study of ambivalence in schizophrenia and therefore should be included in further research of this topic.

1.7 Purpose

Although, there has been some preliminary evidence that ambivalence represents a pronounced feature of schizophrenia patients' emotional experience, as described above, the only explicit experimental investigation of this phenomenon was limited by at least two salient shortcomings; namely, the use of static and not continuous measures of emotional experience and the somewhat artificial amalgamation of multisensory experimental stimulus sets as opposed to more naturalistic stimuli. Taken together with consideration for the inherent complexity of investigating schizophrenia patients' emotional responses, the present study employed an emotionally evocative film clip as well as a novel methodology in order to explore the in-the-moment emotional experiences of individuals with schizophrenia as well as those without a history of psychiatric illness. Accordingly, the present study had three aims: (1) to replicate

findings of self-reported trait anhedonia in patients with schizophrenia; (2) to compare overall elicited positivity, negativity, and ambivalence between individuals with schizophrenia and healthy control participants; and (3) to explore the nature of elicited ambivalent emotional experience in those with schizophrenia and healthy controls.

1.8 Hypotheses

Emerging from the three-abovementioned aims, three sets of hypotheses were examined in this study. First, (1) a trait anhedonia hypothesis was examined wherein the schizophrenia group was predicted to self-report significantly higher levels of trait negative emotion and significantly lower levels of trait positive emotion than healthy controls using the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988; see below). Second, (2) a three-pronged emotional experience hypothesis was evaluated. In particular, (2a) as a formal manipulation check, the experimental film clip stimulus (see below) was predicted to elicit emotional responses within schizophrenia and healthy control groups individually.[1] As well, (2b) serving as a formal evaluation of whether inattention or perseveration rather than emotional phenomenology led to group differences in self-reported emotional experience (e.g., schizophrenia patients became engrossed by the experimental or some other internal stimulus and consequently did not attend to the Evaluative Space Grid (see below) to update their emotional experience), it was predicted that the schizophrenia and healthy control groups would not significantly differ in the total number of self-reported emotional experiences, irrespective of

[1]That is, within both schizophrenia and healthy control groups independently, the amount of total time spent within the 'HAPPY', 'SAD', or ambivalent cells of the Evaluative Space Grid would be significantly greater than the amount of total time spent within the 'NONE' cell of the Evaluative Space Grid.

valence.[2] As the third component of this emotional experience hypothesis, (2c) self-reported overall emotional experiences (i.e., across the duration of the experimental stimulus) were expected to vary as a function of group in the following pattern.

i. Extrapolating from the findings of Cohen and Minor (2010) as well as those of Trémeau et al. (2009), the schizophrenia and healthy control groups were not expected to significantly differ in total amount of self-reported *positive* emotion across the experimental stimulus.[3]

ii. Also in line with the findings of Cohen and Minor (2010) and Trémeau and colleagues (2009), the schizophrenia group was expected to indeed display a significantly greater total amount of self-reported *negative* emotion than was the healthy control group across the experimental stimulus.[4]

iii. In accordance with the suggestions of both Cohen and Minor (2010) as well as the work of Trémeau et al. (2009), the schizophrenia group was expected to display a significantly greater total amount of self-reported *ambivalent* emotion than was the healthy control group across the experimental stimulus.[5]

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[2]The influence of participants' inattention during the presentation of the experimental stimulus was difficult to control for and, moreover, it is unclear as to whether differences in attention are indeed irrelevant to the conscious experience of emotional states; in any case, this analysis assisted in the identification of putatively non-emotional factors that have the potential to create artifacts in participants' self-reported emotional experiences.

[3]That is, those in the schizophrenia and those in the healthy control group were not expected to differ in the total amount of time spent in the 'HAPPY' cell of the Evaluative Space Grid throughout the duration of the experimental stimulus.

[4]That is, on average, those in the schizophrenia group were expected to spend a greater amount of time in the 'SAD' cell of the Evaluative Space Grid than were those in the healthy control group throughout the duration of the experimental stimulus.

[5]That is, on average, those in the schizophrenia group were expected to spend a greater amount of time in the ambivalent cell of the Evaluative Space Grid than were those in the healthy control group throughout the duration of the experimental stimulus.

Third, as a final set of hypotheses, (3) an exploration of the frequency and duration of ambivalent emotional experiences was conducted. (3a) It was anticipated that those in the schizophrenia group would exhibit a significantly greater number of ambivalent emotional experiences than would those in the healthy control group.[6] Lastly, (3b) it was also expected that those in the schizophrenia group would display ambivalent emotional episodes with longer mean durations than that of those in the healthy control group.

[6]Number of emotional experiences were defined as entries into given cells of the Evaluative Space Grid; here, is it important to note that cell entries lesser than 500 ms in duration were excluded from all analyses in order to rule out erroneously counting fleeting "pass-through" cell entries as transitory emotional experiences when, for example, participants were merely passing through the ambivalent cell to report their univalent or null emotional experience.

CHAPTER 2. METHOD

2.1 Participants

Schizophrenia sample. Twenty-seven individuals (23 males, 4 females; M_{age} = 40.78 years, SD_{age} = 12.82 years) were recruited from outpatient treatment programs operating out of several community mental health clinics located within the Lafayette and Baton Rouge metropolitan areas of southern Louisiana. The sample included 11 Caucasians, 15 African Americans, and one Native American. The average level of education completed for this sample was 10.93 years (*SD* = 1.84 years). At the time of testing, all participants were receiving either combination psychosocial and pharmacotherapy or psychotropic monotherapy under the supervision of a multidisciplinary treatment team. Inclusion criteria for this sample included (1) age between 18 and 65 years, (2) fluency in spoken and written English, and (3) a current or past DSM-IV-TR (APA, 2000) diagnosis of schizophrenia or schizoaffective disorder as determined by structured diagnostic interview using Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2002). Interviews were individually conducted by a team of doctoral students in clinical psychology and all interviews were videotaped and reviewed as part of case conferences led by a licensed clinical psychologist with extensive experience diagnosing psychotic disorders (Dr. Alex S. Cohen). Final diagnostic decisions were based on unanimous agreement between case conference members.

Exclusion criteria for this sample included evidence of (1) neurological insult or head trauma requiring overnight hospitalization; (2) significant visual, auditory, or other sensory deficit that may have affected task performance; (3) DSM-IV-TR (APA, 2000) or otherwise significant substance dependence as indicated by physical symptoms (e.g., uncontrolled tremors); (4) inhalant use or ingestion of volatile vapors (e.g., aerosols) with significant lifetime

frequency (i.e., greater than six times); (5) DSM-IV-TR intellectual disability or other neurological condition which may have unduly compromised cognitive functioning; and (6) Global Assessment of Functioning (APA, 2000) ratings below 30 which denote a symptom disturbance which would have putatively interfered with task performance.

As compensation for their involvement, all participants received an honorarium of $40.00. In accord with the ethics approval granted by the Louisiana State University Institutional Review Board, informed consent was obtained from all participants prior to their participation (see Appendix A). As well, experimenters procured verbal assent from each participant prior to initiating the experimental tasks.

Healthy control sample. Twenty-nine individuals (13 males, 16 females; M_{age} = 39.62 years, SD_{age} = 12.45 years) were recruited from the Baton Rouge, Louisiana community. The sample included 16 Caucasians, 10 African Americans, one Hispanic American, and two individuals who self-identified their respective ethnic backgrounds as 'other'. The average level of education completed for this sample was 14.41 years (SD = 2.37 years). Inclusion criteria for this sample were the same as with the schizophrenia sample with the exception that structured clinical interviews using SCID-I protocols (First et al., 2002) were administered in order to confirm the absence of current and past histories of schizophrenia or other psychotic disorders, mood disorders, and substance use disorders. Both the exclusion criteria and informed consent protocols used in the schizophrenia sample were used within the control sample and all control participants received the same remuneration as their diagnosed counterparts.

2.2 Measures

Positive and Negative Affect Schedule (PANAS). Trait positive and negative emotions were measured using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988).

The PANAS is a 20-item self-report scale of emotional dispositions in which participants are presented with 10 negative (e.g., irritable, ashamed, hostile) and 10 positive (e.g., excited, enthusiastic, inspired) valence adjectives and are asked to use a five-point Likert scale, ranging from "very slightly or not at all" to "extremely", to rate the extent to which they *generally* feel the specified emotion. The PANAS yields distinct Positive Affect and Negative Affect subscale scores and has been shown to have acceptable test-retest reliability over intervals of eight weeks and longer with temporal stability coefficients of .68 and .71 for the positive and negative affect subscales, respectively (Watson et al., 1988). In addition, Watson and colleagues have provided support for the internal consistencies of the PANAS with alpha coefficients of .88 and .87 for the respective positive and negative affect subscales. Within the present study sample ($N = 56$), alpha coefficient were .84 and .88 for the positive and negative affect subscales. Other research has further demonstrated robust content and construct validity of the PANAS insofar as the two-factor structure has been replicated across a host of clinical and non-clinical samples (e.g., Crawford & Henry, 2004; Watson & Tellegen, 1985; Watson et al., 1988) and the respective affect subscales correlate, in expected directions, with other personality scales and measures of psychopathology and distress (e.g., Watson, Clark, & Carey, 1988; Watson, et al., 1988).

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I). The SCID-I (First et al., 2002) is a semi-structured, clinician-administered, broadband instrument that closely maps onto DSM-IV-TR criteria for psychiatric disorders and thus serves a means of formally operating DSM diagnostic algorithms. The SCID-I has been shown to have moderate to excellent test-retest ($k = 0.44$ - 0.78; Zanarini et al., 2000) and interrater ($k = 0.56$ - 0.96; Lobbestael, Leurgans, & Arntz, 2011) reliability estimates across several diagnostic categories including schizophrenia and the psychotic disorders. In addition, although debatable as to what constitutes

the standard against which assessment methods including the SCID-I should be compared so as to evaluate construct and criterion-related validities, several studies have demonstrated that the SCID-I outperforms other structured and unstructured interviews in terms of ascertaining DSM-IV-TR diagnoses (e.g., Basco et al., 2000; Fennig, Craig, Lavelle, Kovasznay, & Bromet, 1994).

2.3 Design

Using a quasi-experimental design, the present study included five training and one experimental trial for a total of six trials. Within each trial, participants were concurrently presented with a film stimulus and on-screen matrix with which to report their emotional experience in reaction to the particular stimulus. Trial presentation order was invariant across participants such that each participant was sequentially exposed to (1) the introduction trial followed by distinct (2) positive, (3) negative, (4) neutral, and (5) ambivalence training trials. Finally, participants were exposed to the (6) experimental trial (see below for a description of the film stimuli employed within each trial).

2.4 Apparatus

The emotional experience task utilized Dell XPS M1210 and Dell XPS M1330 laptop computers fitted with Affect Matrix Experiment Software (*unpublished instrument*, Texas Tech University) to present elicitation stimuli and record participants' in-the-moment emotional experiences. The Affect Matrix Experiment Software provides a digitized reproduction of the Evaluative Space Grid (ESG; Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009) and allows for greater flexibility in tailoring the ESG to fit the particular experimental design parameters than does previously used paper-and-pencil formats (Larsen & McGraw, 2011). In particular, consistent with the evaluative space model (Cacioppo & Berntson, 1994; Cacioppo et al., 1997), the ESG enables participants to simultaneously rate the positive and negative components of

their emotional reactions to an experimental stimulus by using a computer mouse cursor to navigate an on-screen graphical interface anchored by orthogonal x- and y-axes (see Figure 1).

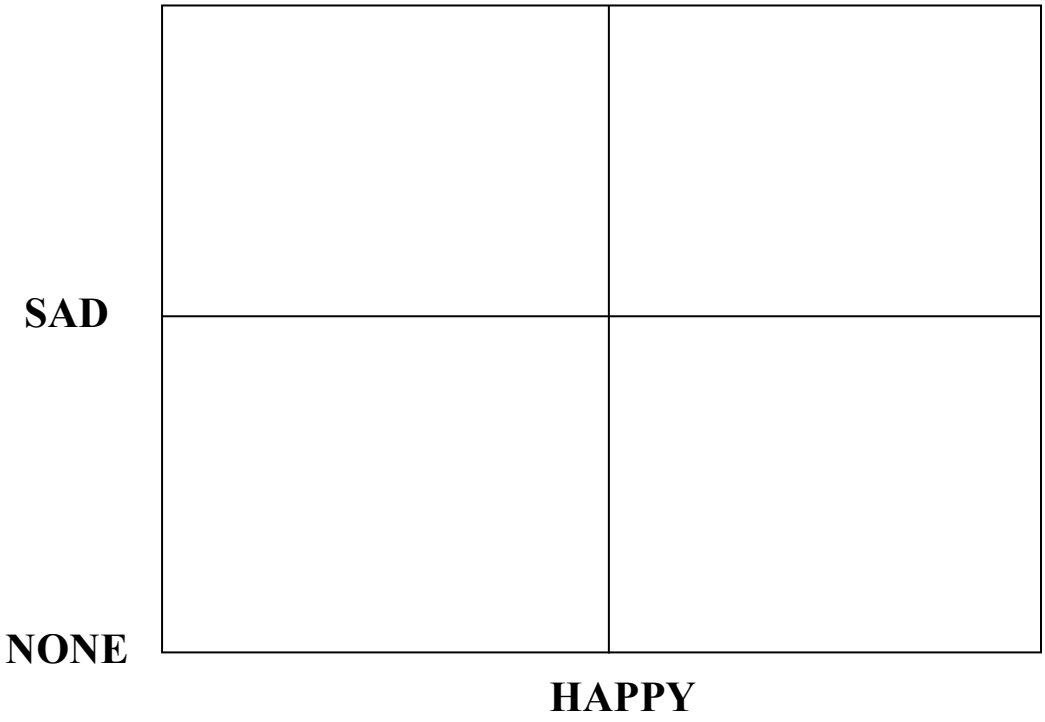

Figure 1. The Evaluative Space Grid (ESG). Positive emotion or 'HAPPY' is plotted along the x-axis and negative emotion or 'SAD' is plotted along the y-axis. After receiving instructions on how to use the ESG, the participant is presented with a stimulus and uses the computer mouse cursor to navigate to one of the grid's four cells corresponding to the valence(s) of their experienced emotion. The bottom-left cell corresponds with null or negligible emotional experience; the bottom-right cell corresponds with univalent pleasant or otherwise positive emotional experience; the top-left cell corresponds with univalent unpleasant or otherwise negative emotional experience; and the top-right cell corresponds with mixed or ambivalent emotional experience.

Along the x-axis of the grid rests positivity such that experienced positive emotion is reported by displacing the cursor to the right away from the origin (i.e., the point at which the x- and y-axes meet) and y-axis. Along the y-axis of the grid rests negativity such that experienced negative emotion is reported by displacing the cursor up, away from the origin and x-axis. By fixating the mouse cursor toward the origin (i.e., within the bottom-left quadrant of the grid), participants are able to report null or negligible emotion whereas by concurrently displacing the

cursor away from both the x- and y-axes (i.e., within the top-right quadrant of the grid) participants are able to report mixed or ambivalent emotional experience. In line with previous work using this instrumentation (e.g., Larsen et al., 2009; Larsen & McGraw, 2011), Affect Matrix Experiment Software was programmed with a 20 Hz sampling rate such that reported emotional experiences (i.e., quadrant in which the cursor is located) were logged automatically every 500 ms. This protocol was beneficial in at least two main respects. First, given that cursor positions were sampled automatically at predetermined intervals, cognitive load incumbent on participants was reduced inasmuch as participants were not required to click on delimited grid cells nor were they required to ensure the accuracy of mouse clicks during stimulus presentations. Second, consonant with Davidson's (1998) explication of affective chronometry, the 20 Hz/500 ms sampling rate enabled sufficient temporal resolution of the resultant data so to provide meaningful estimates of individuals' real-time emotional experiences.

As depicted in Figure 2, both ESG and elicitation stimuli were presented on-screen simultaneously, allowing participants to continually report (i.e., update) their emotional experiences as stimuli unfolded in time. Dell XPS M1210 and Dell XPS M1330 display monitors measure 13.3 in. and all participants sat approximately 23 in. away from the screen. Accompanying audio components of all elicitation stimuli were administered through SigmaTel High Definition Audio speakers.

2.5 Elicitation Stimuli

Training stimuli. Five film clips were selected for this study for use in the five training trials. As a means of introducing the experimental display and ESG, the introduction stimulus was a 216 s film clip of an opaque black screen. The positive valence stimulus for use in the first training trial consisted of an excerpt from the contemporary television series *The Office* and

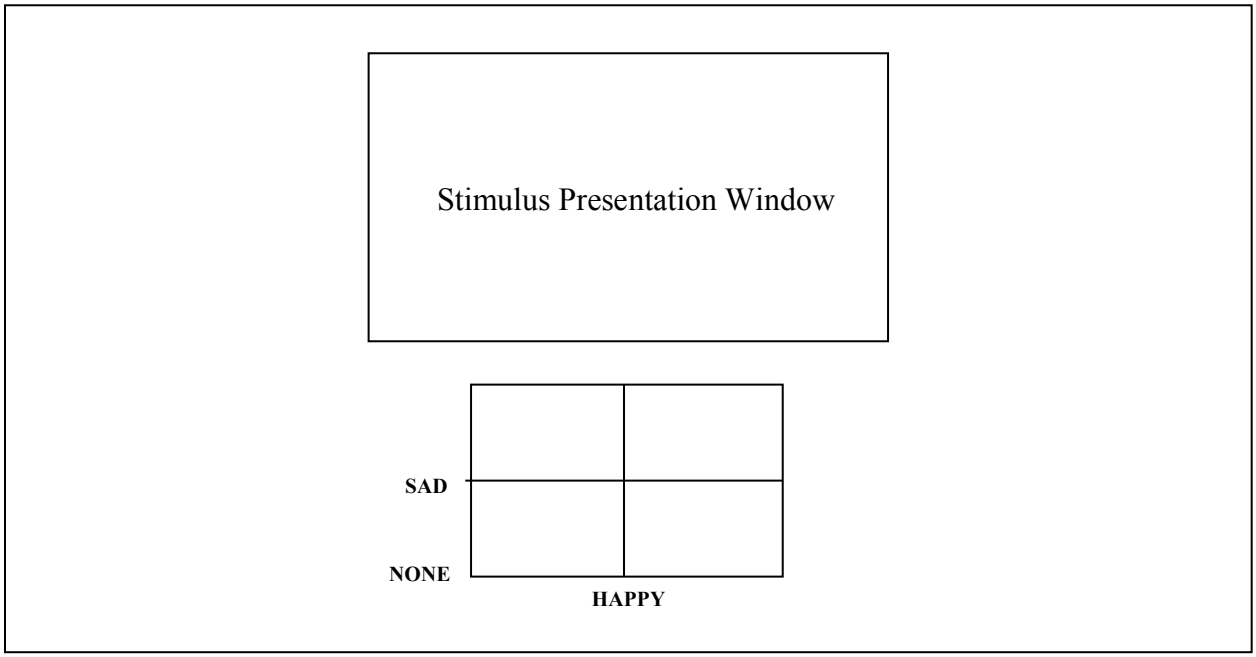

Figure 2. Screenshot of experimental display. The ESG is situated below the stimulus presentation window, wherein elicitation stimuli are presented, and remains on-screen throughout the duration of stimulus exposures.

Lasted 145 s whereas the negative valence stimulus for use in the second training trial consisted of an excerpt from the film *The Green Mile* which lasted for 83 s. The neutral valence stimulus selected for use in the third training trial consisted of a 30 s wildlife scene from a commercially available nature documentary. Lastly, the ambivalent stimulus selected for use in the fourth training trial was a 184 s excerpt from the film *Father of the Bride*.

Experimental stimulus. As used in prior research with the ESG in which the stimulus was found to elicit ambivalent emotional responses in healthy undergraduate participants (Larsen & McGraw, 2011), the experimental film clip selected for this study was an excerpt from the traumatic comedy *Life is Beautiful*. The film is set in the late-1930s to mid-1940s Nazi Germany and follows the story of a Jewish-Italian family who, under the rule of the German Reich at the outbreak of World War II, are interned at a concentration camp. The father (Guido) and son (Joshua) are separated from the mother (Dora) and the film documents Guido's perilless efforts

to shelter his son from the abject nature of their situation by using humor and an elaborate stratagem to convince Joshua that their internment is a game in which the reunion with Dora is to be won. The clip selected as the experimental stimulus in the proposed study was the final 390 s of the film wherein Guido is executed so to ensure the survival of his son and, in turn, Joshua is reunited with his mother and reflects upon the devotion and sacrifices of his father.

2.6 Procedure

As part of a larger investigation into schizophrenia psychopathology, experimental sessions were held within quiet, idle settings of participants' residences and across two 2-hour testing periods; the first of which was used to obtain informed consent and have participants perform a number of tasks such as the recording of natural speech, the completion of several questionnaires including the PANAS (Watson et al., 1988) and a demographics questionnaire, as well as participating in the structured clinical interview. Structured interviews were recorded by JVC Everio HDD 35x Optical Zoom video cameras situated between interviewer-interviewee dyads so to capture participants' verbal and behavioral responses to interviewer queries. During the second testing period, and in addition to the emotional experience task, participants' performed a series of tasks including completing a battery of measures probing neurocognitive and social functioning as well as completing a further set of self-report questionnaires.

To begin the emotional experience task specifically, participants were seated in front of the experimental computer whereon Affect Matrix Experiment Software (*unpublished instrument*, Texas Tech University) was used to initiate the first of the five training trials. Concurrently, experimenters used a set of standardized instructions (see Appendix B), adapted from those of Larsen and colleagues (2009) as well as Russell, Weiss, and Mendelson (1989), to familiarize participants with the experimental apparatus and explain task parameters. It is

important to note that, during the series of training trials wherein introduction and training stimuli were presented, examiners guided or otherwise aided participants in reporting their emotional experiences in reaction to stimuli using the on-screen ESG.[7] Here, it is also important to note that this assistance was included as part of the standardized instructions and that all experimenters participated in didactic training prior to data collection so to ensure an acceptable level of proficiency in administering task directives.

Pursuant to the completion of the training trials, experimenters provided the following short narrative in order to provide context for the experimental stimulus prior to directing Affect Matrix Experiment Software to implement the experimental trial:

> This movie is set in Nazi Germany during World War II. Of the many horrible things that took place during this time, one of the worst was that many families were broken apart. People were taken from their loved ones and imprisoned in concentration camps where they faced slavery and the constant threat of death. Despite this horrific reality facing many of those who experienced these camps, some people persevered and lived remarkable lives. (see Appendix B)

Experimental trials lasted for the duration of the experimental stimulus (i.e., 390 s). At any point during the experimental trials, when experimenters perceived that participants were not attending, unduly perseverating, or were otherwise exerting perfunctory effort towards the on-screen presentation, experimenters encouraged participants with nonpunitive prompts in order to

[7]Although experimenter assistance during training trials was necessary to ensure that participants generally, and those patients with cognitive deficits specifically, comprehended the experimental apparatus and task, it is notable that these interventions precluded meaningful analysis of emotional experiences to training stimuli and the evaluation of any affective priming effects. That is, although not quantified in the present study, it is likely that the social interactions of explicit corrective assistance provided by experimenters effectively introduced noise or error variance into participants' reported emotional experiences to training stimuli. Moreover, apart from these artifacts, 13 participants in the schizophrenia group were administered at least one training stimulus more than once due to inattention, distraction, or other difficulties with task comprehension. The invariant valence sequence of training trial administration across participants was a purposeful methodological control for differential affective priming effects between experimental groups however it is a regrettable acknowledgment that the present experimental design was not conducive for examining the affective priming issue statistically.

maximize the internal validity of the resultant data (i.e., "Remember, focus on the movie clip and how it makes you feel and select the square that most accurately characterizes your feelings," "Remember, how you feel may change throughout the clip so it's important that you update how you feel by selecting the appropriate square."). Overall, including all training and experimental trials, the emotional experience task took approximately 20 minutes to administer. Afterwards, participants were thanked for their participation, rewarded with the aforementioned recompense, and debriefed regarding the study hypotheses, rationale, applications, and anticipated results.

2.7 Analyses

Data analysis for the present study was conducted in eight steps and all analyses were completed using IBM SPSS Statistics Version 20 (2011). First, descriptive statistics for all variables were computed and a review of derivative histograms, skew and kurtosis statistics, as well as a series of Kolmogorov-Smirnov, Shapiro-Wilk, and Levene's tests were used to evaluate the assumptions of parametric data. Second, a series chi-square, Fisher's exact, Mann-Whitney *U*, and Kruskal-Wallis tests as well as a collection of bivariate correlations, were used in order to evaluate the presence of potentially confounding variables. Third, in order to evaluate the trait anhedonia hypothesis, a pair of Mann-Whitney *U* tests were used to compare the schizophrenia and healthy control groups on trait positive and negative affect subscale scores of the PANAS, respectively. Fourth, as a means of determining whether the experimental film clip stimulus indeed evoked emotional responses in both the schizophrenia and healthy control groups, a pair of Wilcoxon signed-rank tests were used whereby the summed amount of total time spent within the 'HAPPY', 'SAD', and ambivalent cells of the ESG were compared with the amount of total time spent within the lone 'NONE' cell of the ESG. Fifth, as a means of examining whether inattention or perseveration confounded the self-reported emotional experiences of participants, a

Mann-Whitney *U* test was used to compare the mean number of total emotional experiences, independent of valence, for the schizophrenia and healthy control groups. Sixth, in order to evaluate the emotional experience hypothesis proper, overall self-reported emotional experiences (i.e., total time spent within the respective ESG cells across the duration of the experimental stimulus) was submitted to an omnibus 2 (Group: schizophrenia, healthy control) x 3 (Emotion: 'HAPPY', 'SAD', ambivalent) mixed design ANOVA; wherein Group was the between-subjects factor and Emotion was the within-subjects factor.[8] In turn, a series of *a priori* pairwise comparisons (i.e., Mann-Whitney *U* tests) were conducted wherein the schizophrenia and healthy control groups were compared on the total amount of time spent experiencing positive, negative, and ambivalent emotions. Insofar as these comparisons were planned contrasts and thus may have been used in place of the omnibus mixed design ANOVA, no correction for the inflation of the familywise Type I error rate was applied.[9] Lastly, seventh, in order to evaluate the frequency and average duration of ambivalent emotional experiences in the schizophrenia and healthy control groups, two pairwise contrasts were conducted. Specifically, (1) a Mann-Whitney *U* test was used to compare the frequency or number of ambivalent emotional experiences (see Footnote 6) between the schizophrenia and healthy control groups. Subsequently, (2) a further Mann-Whitney *U* test was used to compare the mean durations of self-reported ambivalent emotional experiences for the schizophrenia and healthy control groups.

[8]In an effort to control for linear dependency inherent to the data derived from the 2x2 Evaluative Space Grid, apart from the abovementioned manipulation check, null emotional experience was excluded from all analyses.

[9]Although not cited as part of the formal hypotheses of the present study, a further set of exploratory pairwise contrasts examining group differences in frequency and mean duration of univalent positive and univalent negative emotional experiences were conducted and are reported in the *Positive and Negative Valence Emotional Experience* section below.

2.8 Power Analysis

Power analyses and computation of nonparametric effect sizes were completed using G*Power 3.1.2 software (Faul, Erdfelder, Lang, & Buchner, 2009). All analyses were non-directional, two-tailed tests with significance levels set at .05 (i.e., $\alpha = .05$) and, in accordance with Cohen (1992), respective statistical powers (1-β) approximating .80. Mapping these parameters onto the Mann-Whitney *U* tests intended to evaluate the trait anhedonia hypothesis, the power analysis revealed that a sample size of 54 individuals (*n*s = 27) was required in order to detect group differences at a large effect size or greater ($d = 0.80$; Cohen, 1992). This sample size represents an upper-bound of *N* for all tests intended to evaluate both the trait anhedonia and the emotional experience hypotheses given that the *a priori* pairwise contrasts adhered to the same directionality, alpha-level, and targeted effect size parameters of the trait anhedonia hypothesis tests. Moreover, by virtue of the statistical power gained in using repeated measures approaches, the two Wilcoxon signed-rank tests intended as manipulation checks (i.e., to examine the effectiveness of the experimental stimulus in inducing emotional responses in schizophrenia and healthy control groups) required fewer participants to obtain commensurate power to detect statistical differences of the same $d = 0.80$ effect size. Indeed, an additional power analysis revealed that a sample size of 30 individuals would have been sufficient to detect within-subject differences in emotional experience at a large effect size or greater, according to Cohen's suggested conventions. Overall, then, the sample ($N = 56$) obtained in this study enabled adequate power to detect group differences of at least a large effect size magnitude.

Given the novelty of the proposed research employing the ESG within a sample of individuals with schizophrenia, conducting an *a priori* power analysis for the proposed omnibus mixed design ANOVA as part of the evaluation of the emotional experience hypothesis posed a

significant difficulty. In particular, it was unclear as to the best strategy one should use in ascertaining a judicious estimate of the correlation between participants overall self-reported emotional experience (i.e., proportion of time spent within the respective ESG cells). Accordingly, a conservative strategy was adopted in order to conduct a final power analysis wherein the requisite sample size for the ANOVA was computed for an entirely between-subjects factorial model. Similar to the results of the abovementioned power analysis for the pairwise tests, the results of this approach indicated that, with significance levels set at .05, statistical power approaching .80, and the specification of two experimental groups, a minimum sample size of 52 individuals (*n*s = 26) was required in order to document main and interaction effects at a large effect size or greater (f = .40; Cohen, 1992). Thus, insofar an obtained sample of 56 participants – 27 of which met DSM-IV-TR (APA, 2000) criteria for schizophrenia with the remaining 29 not meeting criteria for a DSM-IV-TR psychotic, mood, or substance use disorder – was employed in this study, the herein discussed analyses may be considered adequately powered to document large effect size group differences.

CHAPTER 3. RESULTS

3.1 Exploring the Demographic, PANAS, and Emotional Experience Variables

A visual inspection of the individual histogram graphs generated for each of the demographic, PANAS, and emotional experience variables indicated that all variables in the present study failed to meet the normality assumption for parametric statistics. This indication was further confirmed by a review of respective *z*-score converted skew and kurtosis statistics as well as a series of Kolmogorov-Smirnov and Shapiro-Wilk tests. In particular, with the exception of education level with $z_{skewness} = 1.27$ and $z_{kurtosis} = 0.65$, all computed skewness and kurtosis *z*-scores were beyond the 1.96 absolute value cutoff for $p < .05$. As well, according to the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality, all demographics, including education level, departed from a normal distribution within the full study sample ($N = 56$; $ps \leq .03$), as did each of the PANAS and emotional experience variables within the respective schizophrenia ($n = 27$) and healthy control ($n = 29$) samples ($ps \leq .02$).

A visual inspection of the histograms further revealed either (a) no outliers within variable distributions or (b) no outlying participant that was atypical across more than one of the PANAS or emotional experience variables and could therefore be defensibly excluded in order to adjust for skewness. Although debatable (e.g., Glass, Peckham, & Sanders, 1972, as cited in Field, 2009), several data trimming and transformation procedures were considered. However, regarding the former, it was determined that, although the use of a trimmed mean may address persistent issues of non-normality, as per select Levene's tests, this manipulation would not broadly address heterogeneity of variance issues. Regarding the former, it was determined that data transformations would unduly complicate the interpretations of any derived results and, in any case, a trial-and-error exploration of square, square root, and reciprocal transformations

indicated that none of these methods adequately corrected for skewness. Accordingly, then, given the distributions of the variables included in this study, non-parametric tests were utilized throughout.[10]

3.2 Confound Analyses

Given the quasi-experimental design of the present study, select demographic variables were examined between groups as a preliminary means of identifying experimental confounds. The results of these analyses revealed three potential confounds in that the schizophrenia and healthy control groups differed on sex ($\chi^2[1] = 9.92$, $p < .01$, Cramer's V = 0.42), ethnicity (Fisher's exact test, $p < .01$, Cramer's V = 0.32), and education level ($U = 87.00$, $p < .01$, $d = 1.43$[11]), but not on age ($U = 369.50$, $p = .72$, $d = 0.08$) characteristics. In order to evaluate whether pre-existing group differences in sex, ethnicity, and education level affected or were otherwise related to the dependent variables of the present study, a series of point-biserial correlations, Kruskal-Wallis tests, and Spearman's rho correlations were conducted. These tests indicated that there were no associations between sex and any dependent measure that crossed the conventional $\alpha = .05$ level of statistical significance (r_{pb} range = -.09 to .25, $ps \geq .06$). At trend levels, sex was correlated with both the total amount of self-reported positive emotion ($r_{pb} = .24$, $p = .08$) and mean duration of self-reported positive emotional experiences ($r_{pb} = .25$, $p = .06$). However, in light of both the number of point-biserial correlations computed which, without adjusting the $\alpha = .05$ level, inflated the likelihood of committing a Type I error as well as the relatively small effect sizes of the two associations, it was determined that there was little to

[10]In an effort to safeguard against Type II errors, all analyses were concurrently conducted using equivalent or proxy parametric tests. However, unless otherwise noted, final results do not differ between non-parametric and parametric methods.

[11]Although there is no consensus effect size estimate for use with nonparametric statistics, Grissom and Kim (2012) recommended a *d* like estimator calculated by taking the difference between the group median scores and dividing by the pooled standard deviation.

warrant including sex as a confound in the ensuing analyses involving total amount and mean duration of positive emotional experiences. The series of Kruskal-Wallis tests indicated that there were no statistically reliable ethnicity differences across the range of PANAS and emotional experience variables (H[4] range = 0.22 to 5.70, ps $\geq$ .22, mean η^2 = .07). Further, the bivariate Spearman's correlations indicated that educational level was not significantly related to any PANAS or emotional experience dependent measure (ρ range = -.22 to .22, ps $\geq$ .10). Taken together, on the basis of these investigations, the below analyses were conducted without attempting to partial out the influence of any demographic variable.

3.3 Trait Anhedonia Hypothesis

Contrary to the trait anhedonia hypothesis, using the PANAS, individuals in the schizophrenia (Mdn = 37.00) and healthy control (Mdn = 36.00) groups tended to report similar levels of trait positive emotion (U = 360.00, z = -0.52, p = .61, d = 0.15[12]). However, consistent with the abovementioned trait anhedonia hypothesis, those in the schizophrenia group (Mdn = 19.00) indeed reported greater trait negative emotion than did those in the healthy control group (Mdn = 15.00), U = 208.00, z = -3.02, p < .01, d = 0.62.

3.4 Emotional Experience Manipulation Check

Evidencing the effectiveness of the experimental mood induction procedure, a Wilcoxon signed-rank test indicated that, within the schizophrenia group, participants spent a greater amount of time within one of the valenced cells of the ESG (i.e., 'HAPPY', 'SAD', or ambivalent; Mdn = 332.50 s) relative to time spent within the null emotion (i.e., 'NONE'; Mdn = 58.50 s) cell of the ESG across the duration of the experimental stimulus (T = 43.00, p < .01, d =

[12]The calculation of *a posteriori* or observed power was considered for this and all reported null findings however, as per Hoenig and Heisey (2001), and insofar as these estimates have been found to be routinely low (Zumbo & Hubley, 1998) and therefore likely to mislead, the decision was made to omit these statistics.

2.81). A further Wilcoxon signed-rank test indicated that, within the healthy control group, the experimental mood induction was effective in that participants also spent a greater amount of time within one of the valenced cells of the ESG (*Mdn* = 303.50 s) relative to the amount of time spent within the null emotion cell (*Mdn* = 87.50 s; $T = 28.00$, $p < .01$, $d = 2.76$).

3.5 Between-Group Differences in Inattention or Perseveration

A Mann-Whitney *U* test indicated that, regardless of valence, participants in the schizophrenia (*Mdn* = 7.00) and healthy control (*Mdn* = 11.00) groups did not report significantly different numbers of discrete emotional episodes ($U = 334.50$, $p = .35$, $d = 0.55$). This indicated that inattention and/or perseverative responding to the experimental stimulus was similar, or at least not appreciably dissimilar, between the groups.

3.6 Overall Emotional Experience

Figures 3 through 6 present time course graphs depicting the proportion of individuals in the respective schizophrenia and healthy control groups who reported the specified subjective emotional experiences plotted across the 390 s duration of the experimental stimulus[13]. A mixed designed factorial ANOVA, with Group entered as the between-subjects factor and Emotion (i.e., total amount of rank-transformed[14] positive, negative, and ambivalent emotional experience) entered as the within-subjects factor, failed to find a statistically significant two-way Group by Emotion interaction, $F(2,108) = 2.17$, $p = .12$, $\omega^2 = 0.04$, nor significant main effects for Group, $F(1, 54) = 1.43$, $p = .24$, $\omega^2 = 0.03$, or Emotion, $F(2, 108) = 1.79$, $p = .18$, $\omega^2 = 0.03$.

[13]Data displayed in Figures 3 through 6 are used for descriptive purposes only and are not included in any of the included inferential statistical analyses.

[14]Following Conover (1999), the recommended procedure in experimental designs for which no nonparametric test exists is to use the parametric method on both rank-transformed and non-transformed data. The results of the mixed design ANOVA using non-transformed variables fully replicated the null findings of the herein discussed analyses.

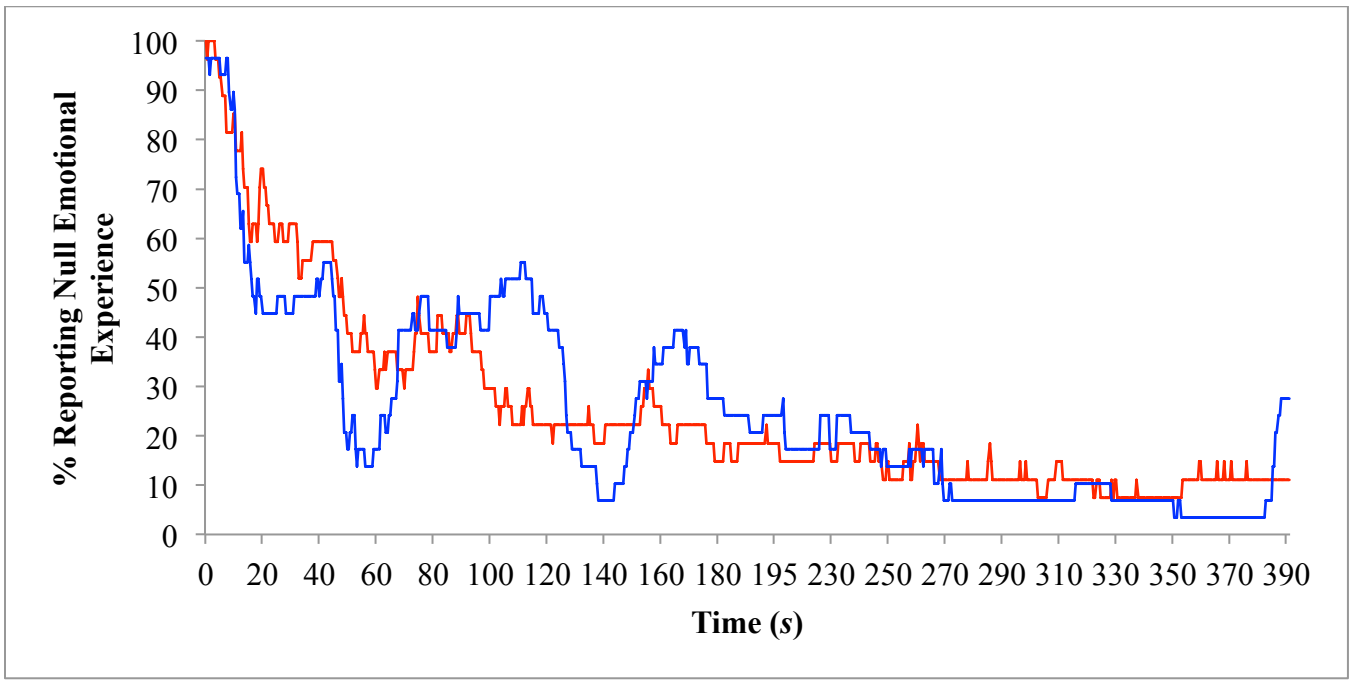

Figure 3. Time course graph depicting the proportion of participants in the schizophrenia (red) and healthy control (blue) groups reporting null subjective emotional experience across the duration of the experimental stimulus.

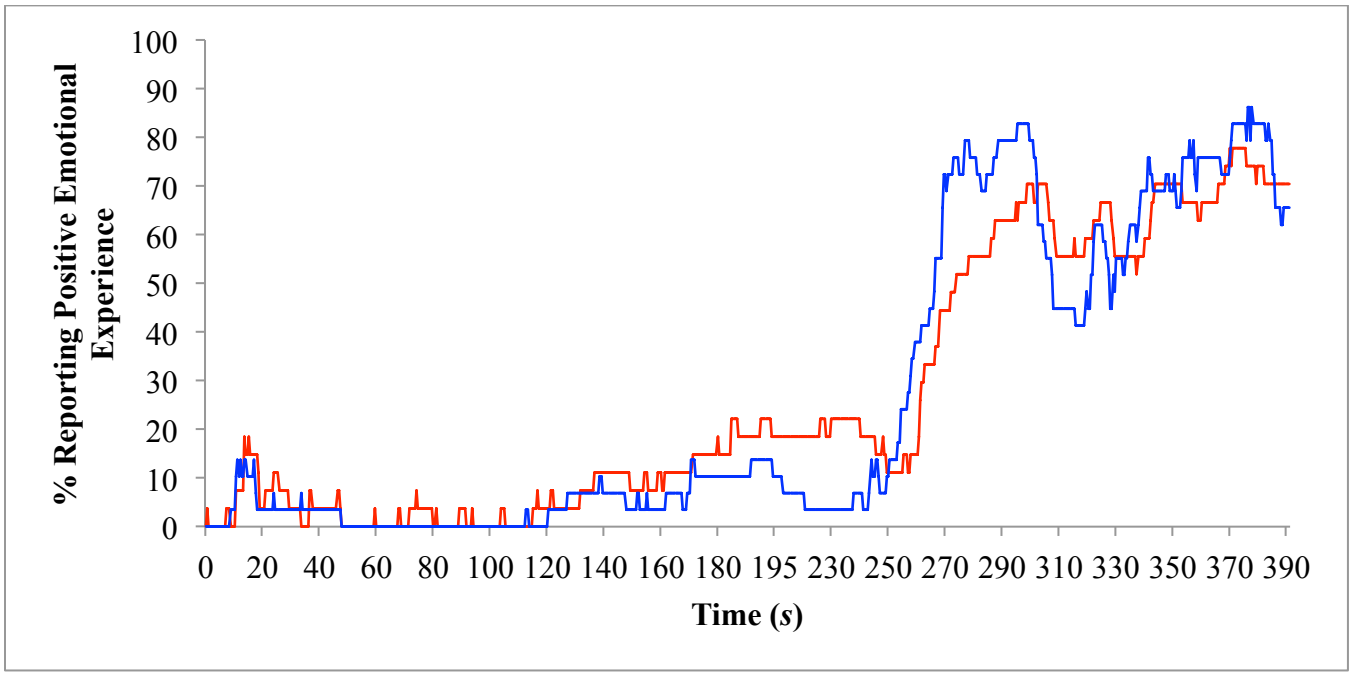

Figure 4. Time course graph depicting the proportion of participants in the schizophrenia (red) and healthy control (blue) groups reporting univalent positive subjective emotional experience across the duration of the experimental stimulus.

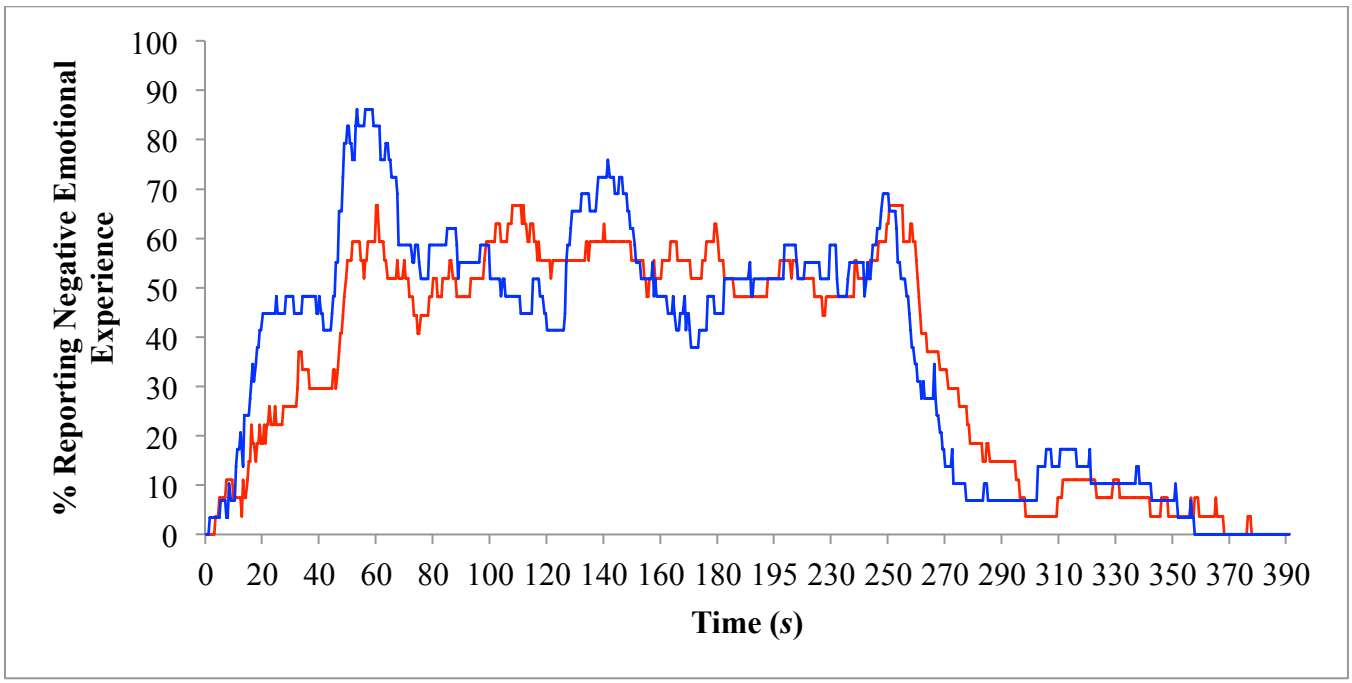

Figure 5. Time course graph depicting the proportion of participants in the schizophrenia (red) and healthy control (blue) groups reporting univalent negative subjective emotional experience across the duration of the experimental stimulus.

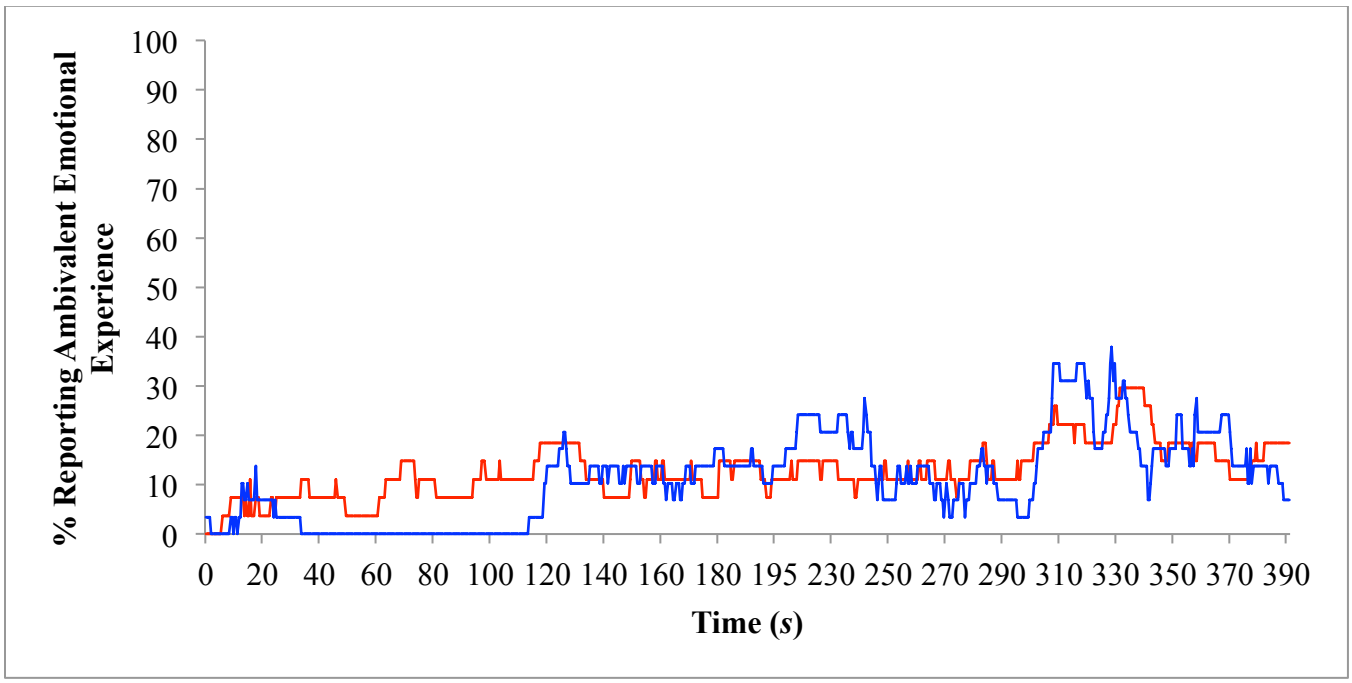

Figure 6. Time course graph depicting the proportion of participants in the schizophrenia (red) and healthy control (blue) groups reporting ambivalent subjective emotional experience across the duration of the experimental stimulus.

3.7 Positive and Negative Valence Emotional Experience

Along with other descriptive statistics, Table 1 displays the group-wise mean total amounts of univalent positive and negative (and null) subjective emotional experience reported across the experimental stimulus. A series of planned contrasts confirmed the above null findings in that those in the schizophrenia and healthy control groups tended to report similar total amounts of positive ($U = 384.50$, $z = -0.12$, $p = .91$, $d = 0.18$) and negative ($U = 390.50$, $z = -0.02$, $p = .99$, $d = 0.04$) emotional experience throughout the experimental stimulus. Although not part of the cited hypotheses of this study, a set of exploratory analyses indicated that there were no statistically reliable group differences in frequency or average duration of univalent emotional episodes (see Table 1). That is, whether in the schizophrenia or healthy control group, all participants tended to report comparable incidence of positive ($U = 348.00$, $z = -0.73$, $p = .47$, $d = 0$) and negative ($U = 383.50$, $z = -0.13$, $p = .89$, $d = 0$) emotional experiences. As well, individuals in each group tended to report positive ($U = 337.00$, $z = -0.89$, $p = .37$, $d = 0.33$) and negative ($U = 377.00$, $z = -0.24$, $p = .81$, $d = 0.13$) emotional episodes of similar mean durations.

3.8 Ambivalent Emotional Experience

Table 2 contains descriptive statistics regarding the range of indices of ambivalent emotional experience examined in this study. In addition, group-wise total amounts of ambivalent emotional experiences reported throughout the duration of the experimental stimulus are displayed in Figure 7. Consonant with the abovementioned mixed design ANOVA, a Mann-Whitney U test indicated that those in the schizophrenia ($Mdn = 15.00$ s) and healthy control ($Mdn = 35.50$ s) groups tended to report comparable amounts of subjective ambivalence, $U = 339.00$, $z = -0.87$, $p = .39$, $d = 0.38$. As graphically displayed in Figure 8, a further test indicated that the schizophrenia ($Mdn = 1.00$) and healthy control ($Mdn = 2.00$) groups did not report

Table 1

Indices of Univalent Positive and Negative and Null Emotional Experience for Schizophrenia and Healthy Control Participant

	Schizophrenia ($n = 27$)			Healthy Control ($n = 29$)		
	Mean (*SD*)	Median	Range	Mean (*SD*)	Median	Range
Total Amount of Positive Emotion (s)	104.76 (62.63)	101.00	0 – 215.50	104.31 (53.52)	111.50	0 – 213.50
Total # of Positive Emotion Episodes	2.22 (1.65)	2	0 – 7	2.62 (1.99)	2	0 – 9
Average Duration of Positive Emotion Episodes (s)	61.79 (53.45)	50.00	0 – 215.50	47.08 (37.93)	35.00	0 – 145.50
Total Amount of Negative Emotion (s)	137.19 (81.58)	133.00	0 – 310.00	143.03 (83.02)	130.00	0 – 340.00
Total # of Negative Emotion Episodes	2.85 (2.30)	2	0 – 9	2.72 (1.91)	2	0 – 8
Average Duration of Negative Emotion Episodes (s)	78.42 (83.26)	52.50	0 – 280.50	82.65 (94.18)	40.50	0 – 340.00
Total Amount of Null Emotion (s)	98.67 (97.62)	58.50	7.50 – 390.00	96.97 (78.20)	87.50	11.50 – 358.00
Total # of Null Emotion Episodes	3.15 (2.01)	3.00	1 – 9	3.38 (1.99)	3.00	1 – 9
Average Duration of Null Emotion Episodes (s)	48.03 (75.97)	20.00	3.17 – 390.00	33.98 (36.31)	26.00	5.75 – 179.00

Table 2

Indices of Ambivalent Emotional Experience for Schizophrenia and Healthy Control Participants

	Schizophrenia ($n = 27$)			Healthy Control ($n = 29$)		
	Mean (*SD*)	Median	Range	Mean (*SD*)	Median	Range
Total Amount of Ambivalent Emotion (s)	49.54 (69.13)	15.00	0 – 268.50	46.07 (40.11)	35.50	0 – 129.00
Total # of Ambivalent Emotion Episodes	1.82 (2.00)	1	0 – 6	3.14 (4.46)	2	0 – 24
Average Duration of Ambivalent Emotion Episodes (s)	22.34 (31.90)	7.50	0 – 119.50	19.34 (23.49)	13.50	0 – 117.00

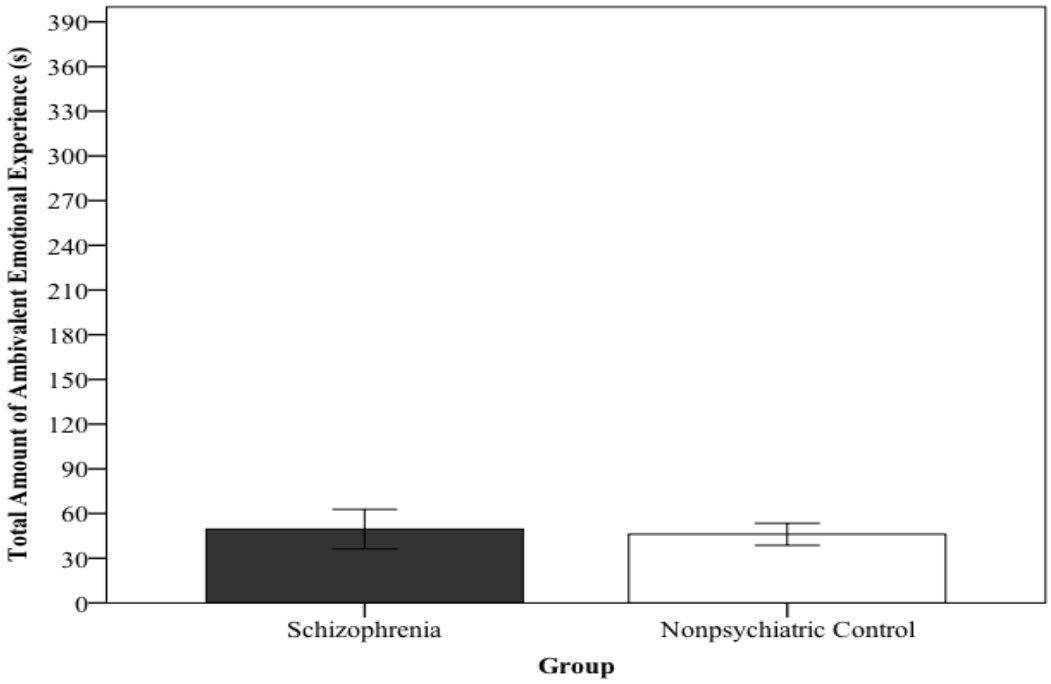

Figure 7. Average total amount of subjective ambivalent emotional experience reported for each group across the 390 s duration of the experimental stimulus. Error bars denote +/- one standard error of the mean.

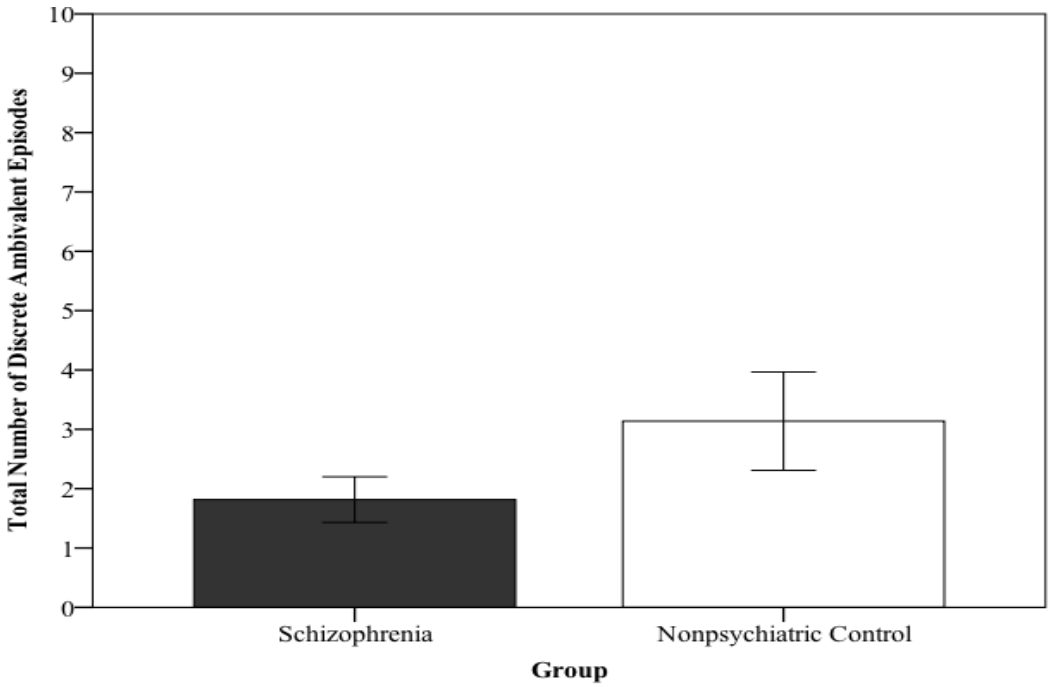

Figure 8. Average total number of discrete ambivalent emotional episodes reported for each group throughout the entire 390 s duration of the experimental stimulus. Error bars denote +/- one standard error of the mean.

reliability different frequency counts of discrete ambivalent emotional episodes, $U = 289.00$, $z = -1.72$, $p = .09$, $d = 0.31$. Lastly, a final *a priori* Mann-Whitney U test indicated that individuals in the schizophrenia ($Mdn = 7.50$ s) and healthy control ($Mdn = 13.50$ s) groups reported ambivalent emotional episodes with comparable average lengths or durations, $U = 358.50$, $z = -0.54$, $p = .59$, $d = 0.21$ (see Figure 9)[15].

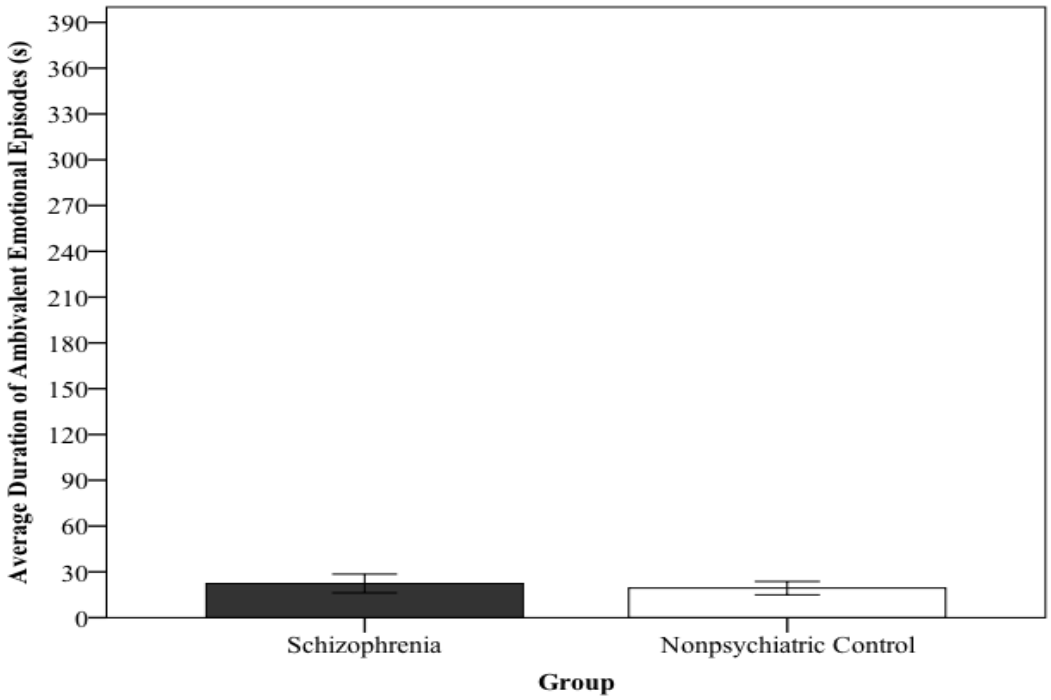

Figure 9. Average duration of discrete ambivalent emotional episodes reported for each group. Error bars denote +/- one standard error of the mean.

[15]Given the susceptibility of the arithmetic mean statistic to the influence of outliers (i.e., inordinately brief or prolonged ESG cell entries), which could feasibly reflect participant error (e.g., inattentive [ff.] perseveration in a given ESG cell) or artifact of the time-limited nature of the experimental stimulus (e.g., late onset episodes of ambivalence truncated due to the automatic termination of the ESG upon experimental stimulus conclusion), median episode durations were also computed as indices of central tendency. These indices were analyzed for group differences however, without exception, the schizophrenia and healthy control groups did not demonstrate differential median durations of positive, negative, or ambivalent emotional episodes (*p*s > .10).

CHAPTER 4. DISCUSSION

Although there remains much debate as to the viability of experiencing veridical ambivalence (e.g., Larsen & McGraw, 2011; Russell, 2003), previous research points to this phenomenon as the potential mental state that predominates schizophrenia patients' phenomenological experiences of the world (Cohen & Minor, 2010; Trémeau et al., 2009). However, evidence for this assertion has to this point been indirect, inconsistent, or entirely novel and therefore pending replication. Furthermore, prior research has been limited by several methodological constraints, which thus limits drawing any definitive conclusions as to the status of ambivalence as a pronounced feature of schizophrenia patients' emotional experience. Accordingly, this study attempted to provide a more sensitive test of whether patients with schizophrenia, relative to healthy controls, experience inordinate ambivalence by having participants use the ESG to report their in-the-moment emotions in reaction to a controlled laboratory film clip stimulus.

4.1 Summary of Findings

As a means of replicating prior work documenting trait-like anhedonia within schizophrenia (e.g., Blanchard et al., 1998), this investigation used the 20-item PANAS (Watson et al., 1988) to examine participants' trait positive and negative emotion. Contrary to the hypothesized diminution of positive emotion within patients with schizophrenia, however, participants from both experimental groups tended to report similar amounts of dispositional or trait-like positivity. Conversely, reports of trait-like negative emotion were in line with prior research in that those with schizophrenia endorsed greater trait negative emotion than did healthy control participants. A more extensive discussion of these findings is detailed below however it is worth noting here that the null difference between schizophrenia and healthy control

participants' self-reported trait positive emotion, though inconsistent with a majority of studies, is consistent with Gurrera, Nestor, and O'Donnell (2000) as well as Akdag and colleagues (2003); both of which investigations included samples comparable to that of the present study with regards to schizophrenic illness chronicity and sex distributions within groups.

Regarding in-the-moment emotional experience, as measured by the ESG, a formal manipulation check indicated that the use of the *Life is Beautiful* stimulus effectively produced emotional responses within both experimental groups. Moreover, as no between-group differences were observed in aggregate numbers of discrete emotional episodes, it is unlikely that inattention or other putative emotional experience confounds differentially affected the generalized experiences of either group. These validity analyses enable more straightforward interpretations of the resultant self-reports of participants' in-the-moment emotional experiences.

Visual inspections of Figures 3, 4, 5, and 6 indicate that there are several intervals during which, as groups, individuals with schizophrenia and healthy controls reported nominally different emotional experiences. For example, a numerically greater proportion of individuals with schizophrenia reported experiencing positive emotion relative to the proportion of healthy controls reporting this emotion during an interval of the clip beginning at approximately 170 s and extending to approximately 240 s. In addition, beginning at approximately 25 s and continuing through until nearly 130 s of the film clip stimulus, a numerically greater proportion of individuals with schizophrenia reported experiencing ambivalence relative to the proportion of individuals reporting this emotion in the healthy control group. Although interesting, there is no precedent for parsing segmented emotional experience time course data *post hoc* and thus little guidance on how to properly balance the likelihoods of committing Type I and II errors when examining group differences at various intervals within the experimental film clip stimulus. In

addition, it is difficult to construe these numerical group differences as more than stimulus-specific effects which may not generalize to other laboratory stimuli or, more importantly, real-world stimuli and events (e.g., social partners and activities). Accordingly, the results presented in Figures 3 through 6 are interesting descriptive heuristics however the omnibus and planned pair-wise contrasts provide more substantive indications of participants' in-the-moment emotional experience.

The results of these analyses are as follows. First, as hypothesized, those with schizophrenia and healthy controls did not report experiencing notably different total amounts of positive emotion throughout the experimental stimulus nor did the groups report reliably different frequencies and average durations of discrete positive emotional episodes. Second, contrary to what was hypothesized, when generalized across the experimental stimulus, those with schizophrenia and healthy controls did not significantly differ along any measured dimension of univalent negative emotional experience (i.e., total amount of negativity, frequency and average duration of negative emotional episodes). Finally, also contrary to what was hypothesized based on the work of Cohen and Minor (2010) as well as Trémeau and colleagues (2009), the schizophrenia and healthy control participants did not demonstrate reliable differences in total amount of ambivalence reported during the *Life is Beautiful* film clip nor did the two experimental groups substantially differ in the number of ambivalent episodes reported or the average duration of those episodes.

4.2 Trait Anhedonia

The elevated trait negative emotion found in this study is a direct replication of prior work and thus reinforces the notion that basal elevations of negative emotional states characterize the reported everyday experiences of schizophrenia patients (Horan et al., 2005).

The finding that patients with schizophrenia did not exhibit attenuated trait positive emotion relative to individuals without mental illness diagnoses, on the other hand, flies in the face a large body of studies documenting trait anhedonia in schizophrenia (e.g., Berenbaum & Fujita, 1994; Blanchard et al., 1998; Horan et al., 2005). Collectively, these previous investigations employ a range of instruments including retrospective self-report questionnaires and interview-based measures (Horan et al., 2006), thereby detracting from the plausibility of a method artifact interpretation of this finding (e.g., that the Positive Affect subscale of the PANAS was insufficiently sensitive to document diminished positivity within schizophrenia). It does warrant mention, however, that, although state variants of the scale have been used previously with schizophrenia samples (e.g., Kring et al., 1993; Kring & Neale, 1996), this study's use of the PANAS as a measure of trait emotional experience is a novelty to the emotion within schizophrenia literature. It is therefore possible that another psychometric scale such as the Multidimensional Personality Questionnaire or other measure used more extensively with psychotic disorder populations may have indeed evidenced diminished trait positive emotion within the schizophrenia sample relative to the healthy control sample. Nevertheless, this is improbable given that (1) the extensive application and associated validation of the PANAS across numerous pathological and non-pathological samples (e.g., Crawford & Henry, 2004; Watson & Tellegen, 1985); and (2) the ability of the Negative Affect subscale to document elevated schizophrenic trait negative emotion in this study; taken with (3) the appreciable reliability of the measure observed in this study, gives little indication that the use of the PANAS was an inappropriate measure for this sample. Instead, as alluded to above, a potentially more plausible explanation for the null finding of trait anhedonia derives from a comparison of the present study to that of Gurrera et al. (2000) and Akdag et al. (2003) in which those with

schizophrenia in contrast to healthy controls also exhibited elevated trait negative emotion but not significantly different trait positive emotion. Explicitly, given the irregularity of the null findings reported in these three studies, an examination of their similarities may elucidate as to how best to reconcile this research with the larger trait anhedonia in schizophrenia literature.

There are two salient commonalities to these investigations: the use of chronic schizophrenia outpatient samples (e.g., mean ages of 40.78 and 41.60 years within this study and Akdag and colleagues', respectively) and the preponderance of males studied (e.g., 85% and 100% male within this study and Gurrera et al., respectively). These sampling characteristics are not uncommon to schizophrenia research however they indeed represent potential moderators to the trait anhedonia effect frequently ascribed to the disorder. As indicated by McGorry (2007), research in clinical staging suggests that different intervals of illness may correspond with different symptomatology and thus stages of illness should be routinely factored into studies examining features of schizophrenic psychopathology. Given that the sample employed within the present study, as with that of Gurrera et al. and Akdag et al., was comprised primarily of chronic, stable schizophrenia outpatients, it is possible that non-diminished trait positive emotion may represent the partial remission of more acute affective disturbance seen in earlier, more florid stages of illness (e.g., first-episode schizophrenia; cf. Marengo, Harrow, Herbener, & Sands, 2000). Regarding the potential influence of sex, as illustrated by Kring and Moran (2008), the vast majority of emotion in schizophrenia studies report results collapsed across sexes despite evidence for sex-differences in disease characteristics and trajectories (Goldstein & Link, 1988). Insofar as the sample of the present study was comprised mostly of men, it is possible that the inclusion of more female schizophrenia participants would be more likely to replicate the trait anhedonia effect. In support of this possibility, there is some evidence that female schizophrenia

patients exhibit more affective features including a host of depressive symptoms and dysphonia (Salem & Kring, 1998).

Overall, despite the potential moderating effects of chronicity and sex, a more recent review by Horan, Blanchard, Clark, and Green (2008) indicates that patterns of diminished trait positive and elevated trait negative emotion in schizophrenia are robust to differences in inpatient versus outpatient treatment, recent-onset versus chronic stages of illness, and other sampling characteristics. Thus, as it is not immediately clear what accounts for the discrepancy between the present study and others in self-reported trait anhedonia among those with schizophrenia, the topic requires further inquiry in order to square this finding with the larger literature.

4.3 Univalent Positive and Negative Emotional Experience

The general lack of group differences in univalent emotional experience reported in this study is consistent with over half of the emotional experience studies reviewed by Kring and Moran (2008). In particular, the non-abnormal positive emotional experience within individuals with schizophrenia is a replication of several works (e.g., Burbridge & Barch, 2007; Horan et al., 2006). However, given the importance of delineating positively- and negatively-valenced emotional components (Cacioppo & Berntson, 1994; Cacioppo et al., 1997), as well as the clear import of monitoring the valence of stimuli used to elicit emotional responses, the findings of this study are novel in that group differences in univalent emotional experience were not observed when such experiences were evoked by a laboratory stimulus with an admixture of positive and negative properties. More explicitly, prior studies eschewing bipolar emotion ratings in favor of unipolar ratings have tended to employ distinct positive, negative, and neutral stimuli to elicit emotional responses. It is the use of these controlled univalent stimuli that has provided indications of abnormal emotional responding within schizophrenia (e.g., inordinate negative

emotion in response to positive stimuli, elevated negative emotion in response to neutral stimuli; Cohen & Minor, 2010). This study extended this line of inquiry by employing a stimulus with more mixed, less discrete valences and the results indicate that those with and without schizophrenia process these more complex stimuli similarly and do not consequently experience notably different positive or negative emotions. Otherwise put, on the bases of these findings, there is clear indication that, over the course of an evolving narrative including dynamic positive and negative valence features, individuals with schizophrenia experience univalent emotions in the same way as do those without diagnoses of severe mental illness.

Apart from tonic or trait-like negativity (Horan et al., 2005), which was, incidentally, replicated in this study, there was sound *a priori* reason to expect elevated negative emotion in response to a mixed emotion film clip. For example, individuals with schizophrenia have been shown in three prior studies employing unipolar scales to endorse greater negative emotional experience across positive, negative, and neutral film clips (Earnst & Kring, 1999; Kring et al., 1993; Kring & Neale, 1996). As well, insofar as the presentation of a stimulus with mixed affective properties within a controlled setting likely demands greater effort and concentration in order for individuals with likely cognitive deficits to comprehend, increased negative emotion was expected on the basis of these efforts alone. Further, negative emotional experience represents an epiphenomenon of ambivalence in that increased ambivalence has been shown to produce emotional distress and upset (van Harreveld, van der Pligt, & de Liver, 2009). Therefore, to the extent that a stimulus with mixed affective qualities was predicted to produce greater ambivalence within those putatively liable to these emotional states (i.e., those with schizophrenia; although see below for discussion), it stood to reason that a preponderance of negative emotion would occur within the more ambivalent schizophrenia participants.

Why, then, given these rationales, did individuals with schizophrenia and those without mental illness not statistically differ on any metric of negative emotional experience? One possibility noted by Kring and Moran (2008) pertains to the extensive variability in findings noted throughout schizophrenia emotion elicitation studies employing film clip stimuli. That is, it is feasible that many of the findings reported in this literature comprise stimulus-specific effects which are therefore not directly generalizable to other stimuli or situations. Giving credence to this assertion, it is noteworthy that each of the three studies by Kring and colleagues using unipolar scales to document greater negative emotional experience within schizophrenia all employed the same film stimuli. Another possibility is that the mixed valence stimulus selected for this study contained enough unambiguously negative segments that it lacked the power to discriminate between groups when indices of emotional experiences were tabulated across the duration of the stimulus. Explicitly, if a significant portion of the experimental stimulus produced negative emotional experience within all participants, then only negative experiences different from the healthy control baseline in the large effect size range are likely to register as statistically significant differences. In view of Cohen and Minor's (2010) finding that schizophrenia patients' inordinate negative responses resulting from negative stimuli is of a small magnitude (i.e., effect size = 0.24), it is perhaps unsurprising that the two groups in this study did not differ in any measure of negative emotional experience across the entirety of the *Life is Beautiful* film clip. To further this point, it is worth noting that, Larsen and McGraw (2011) contend that all ambivalent film clip stimuli invariably include univalent components as these features are what set the context for genuine ambivalent experience. In this study, as displayed in Figure 5, for approximately 160 s of the 390 s duration of the experimental stimulus, around or above half of the proportion of individuals in both groups reported experiencing

negative emotional experience. Although the omnibus ANOVA did not indicate a main effect for emotion, it remains the case that a significant minority of the total experimental stimulus was experienced by both groups as uniformly negative which thereby makes discerning any small difference in overall negative emotional experience difficult.

Overall, either of the above possibilities point to clear directions for future research such as the inclusion of multiple evocative stimuli and a more fine-grained parsing of the emotional experience data or the use of more time-predicated analyses. Still, these analyses notwithstanding, on the basis of the present results, the positive and negative in-the-moment emotional experiences of individuals with and without schizophrenia are largely indistinguishable from one another such that the univalent experiences of individuals with schizophrenia cannot be readily considered out and out pathological.

4.4 Ambivalent Emotional Experience

As with the results of univalent positive and negative emotions, the present results indicate that individuals with schizophrenia, in response to a mixed valence stimulus, do not experience notably different ambivalence relative to healthy controls. This stands in contrast to the only other experimental investigation of ambivalence within schizophrenia (Trémeau et al., 2009), wherein, consistent with the early theorizing of Bleuler (1911/1950), individuals with schizophrenia relative to individuals without severe mental illness were found to experience greater ambivalent emotional experiences. There are two distinct possibilities that may account for these conflicting findings.

First, as discussed by the evaluative space model (Cacioppo & Berntson, 1994; Cacioppo et al., 1997) as well as previous work employing the same experimental stimulus as the present study (Larsen & McGraw, 2011), ambivalence is a comparatively rare phenomenon.

Consequently, rather than ambivalence being a common experience of individuals with schizophrenia, it may be that ambivalence is generally rare and only less rare within those with this disorder. The low base rate of ambivalent emotional experience poses a difficult challenge for researchers trying to avoid floor effects in experimentally inducing ambivalence to extract group differences and it is likely that only the most statistically powerful of methods and research designs will be successful in observing these differences. To this end, the schizophrenia sample of Trémeau and colleagues (2009) was more than double the size of that of the present study and this former study also included, within pictorial, aural, and lexical stimulus sets, multiple evocative stimuli as opposed to a single experimental stimulus. It is, therefore, possible that differences between the findings of the only two experimental investigations of ambivalence within schizophrenia are attributable to differences in methods and corresponding statistical power. However, assuming these methodological issues are corrected in future investigations, it is still worth noting that further research is needed in order to ascertain to what extent 'less rare' ambivalence would meaningfully impact the psychosocial functioning of individuals with schizophrenia.

Regarding the second possible account of the discrepant findings between the present study and that of Trémeau et al. (2009), the most important distinction to draw between these two studies pertains to the stimuli used to elicit emotional experiences and the consequent operational definitions of ambivalence. Specifically, ambivalence within the Trémeau and colleagues investigation was defined as the amount of positive emotion felt in reaction to negative stimuli and the amount of negative emotion felt in reaction to positive stimuli. Within the present study, ambivalence was defined as the amount of co-occurring positive and negative emotion experienced in reaction to a stimulus with intermixed positive and negative features.

Accordingly, disparities in stimulus sets and elicitation tasks aside, the larger conceptual difference between these two investigations is that the present study required participants to recognize ambivalence *as* ambivalence whereas the study by Trémeau and collaborators did not require participants to consciously recognize and report ambivalence. For example, within the Trémeau et al. study, it was theoretically possible for a given individual to report separately elevated positive and negative emotional experience as a result of a positive stimulus yet report no conscious awareness of the paradoxical nature of this emotional state. If, after perceiving the positive stimulus, this individual were then asked whether they were ambivalent, the individual would necessarily require the semantic knowledge of what it means to be ambivalent in order for them to label their phenomenological state and affirm the question. If the individual lacked the semantic or declarative knowledge of what a state of ambivalence feels like, they may then deny the question. Importantly, this declination would not change the emotional state upon which they based their self-report.

This example illustrates a fine difference between the conceptions of ambivalence between the two studies and these differences correspond with divergent forms of the construct initially delineated by Bleuler (1911/1950). That is, Bleuler discerned three separate forms of ambivalence including affective, cognitive, and behavioral ambivalence (Sanislow & Carson, 2001). Affective ambivalence occurs when a particular physical or mental object elicits simultaneous positive and negative feelings. Cognitive or intellectual ambivalence is more in line with the concept of cognitive dissonance (Festinger, 1962) and involves the simultaneous holding of logically incompatible beliefs or ideas and the associated introspective confusion resulting from this recognized paradox. Finally, behavioral ambivalence (i.e., 'ambivalence of the will') occurs when an individual experiences simultaneous approach and avoidance or

otherwise contradictory motivations. It may be argued that the experimental design of Trémeau and colleagues (2009) examines affective ambivalence proper whereas, to the extent that individuals were required to operate semantic knowledge structures (i.e., label their subjective experiences as ambivalent) in order to report their in-the-moment emotions, the present study examined a more cognitive variant of ambivalence. Put plainly, then, the results of this study would suggest that individuals with schizophrenia do not experience inordinate cognitive ambivalence relative to individuals without severe mental illness however the matter of affective ambivalence is addressed more directly by Trémeau and colleagues. If true, this would suggest that the pathology in schizophrenia patients' emotional experience occurs during earlier stages of emotion processing (i.e., affective ambivalence) but that this defect disappears or is masked by other influences at later stages of processing involving higher-order cognitions and evaluations (Frijda, 1999, as cited in Trémeau et al., 2009). Evidently, this possibility remains only speculative as the stimulus and apparatus of the present study were used with the intention of modeling affective ambivalence. Nevertheless, given the discrepancy between this study and that of Trémeau et al., it is clear that delineating subtypes of ambivalent emotional experience may be an important consideration for future research examining the topic of ambivalence within schizophrenia.

4.5 Limitations

Along with notable strengths including, in particular, the use of continuous measure of emotional experience, there are several limitations of this study. First, the unequal distribution of sexes in the schizophrenia group (i.e., 23 males, four females) may have feasibility impacted, and limited the generalizability of, the present results. As noted above, male-dominated schizophrenia samples and results collapsed across sexes are unfortunate norms in schizophrenia

research (Kring & Moran, 2008) and, indeed, within the present analyses, sex was not found to statistically confound any of the dependent measures. Nevertheless, in view of the difficulties of truly identifying and factoring out extraneous covariance (Miller & Chapman, 2001), which is a salient concern for quasi-experimental designs, the underrepresentation of females with schizophrenia and accompanying concerns of generalizability must be acknowledged. Second, although defensible in light of the well-documented cognitive deficits of schizophrenia (Heinrichs, 2005), the reduction of the ESG to a 2 x 2 interface as opposed to using more continuous applications of the methodology (e.g., Larsen & McGraw, 2011) resulted in a similar loss of statistical power as that observed when categorizing any continuous variable. In effect, participants in the present study perforce reported categorical null, positive, negative, and ambivalent subjective emotional experience and were thus unable to directly report degrees of emotional experience (e.g., intensity of ambivalence). This limitation is particularly important given the fact that arousal – which, independent of valence, comprises the other prominent component of subjective emotion (Feldman-Barrett & Russell, 1999) – was largely omitted from the present study. It is unclear whether the inclusion of an intensity metric would indicate group differences in underlying emotional experience however the herein presented data are limited in that they only allow for speculation of this issue. Third, as noted in Footnote 7, didactic instruction during the training trials of the emotional experience task precluded meaningful analysis of any affective priming effects. The scripted experimenter instructions as well as the use of a uniform stimuli presentation order across participants decrease the likelihood of differential priming between groups. Moreover, the findings of Kring, Gard, and Gard (2011), suggest that any affective priming within the schizophrenia group is unlikely to be of prolonged duration. Nevertheless, it remains possible that, on an individual participant basis, emotion(s)

generated during the training phase of the emotional experience task carried over to contaminate or otherwise alter subjective experiences during the presentation of the experimental stimulus. Fourth, apart from concerns regarding the ecological validity of laboratory emotion elicitation stimuli generally (Droit-Volet et al., 2011), the fact that the *Life is Beautiful* film clip served as the sole experimental stimulus in the present investigation places a limit on the external validity of the resultant findings. Future research should utilize multiple elicitation stimuli in order to generalize findings across the idiosyncratic features of singular film clips and other objects used to elicit emotional experience. A fifth limitation of this study regards the recognized importance of context to subjective emotional experience (Gard & Kring, 2009). That is, although a narrative was provided to all participants immediately prior to the presentation of the test stimulus (see Appendix B) in an effort to instill a frame of reference for the ensuing emotional experiences, the success of this intention was never explicitly examined. It is therefore possible that this procedural aspect failed, in whole or in part, to contextualize the affecting features of the experimental stimulus for participants which thereby may have obscured their self-reported emotional experiences. A sixth limitation regards the nuances of employing emotional elicitation affective stimuli. That is, as noted by Kring and Moran (2008), it is imperative in emotion research to discern whether participants' responses reflect reports of the affective properties of stimuli or, instead, features of their phenomenological feeling states. Given the content of the didactic instructions provided to all participants wherein the reporting of subjective experience was expressly requested, it is likely that participants reported on the affective quality of their experiences when navigating the ESG. However, as it is possible that at least some participants reported on the stimuli rather than on their emotional reactions to said stimuli, a more explicit inspection (e.g., asking participants to verbally report the chronology of their emotional

experiences *post hoc*) would have enabled greater certainty in this assumption. Finally, seventh, by collapsing across the duration of the stimulus to analyze total amounts, frequencies, and durations of emotional experience, potentially invaluable emotional time course data may have been omitted. These data may be particularly helpful in adjudicating such questions as whether what induces univalent or ambivalent emotional experience within those with schizophrenia are the same aspects of the stimulus that induce these subjective emotional experiences within non-psychiatric individuals. Accordingly, future work should employ different data analytic strategies that are more sensitive to the temporal unfolding of elicited emotional experience.

4.6 Future Directions

In light of the frequency of null findings reported in this study, there are several further directions for future research in addition to those already listed. Of note, the extensive heterogeneity of schizophrenic symptomatology (Tandon et al., 2009) was unaddressed in the preceding analyses. To the extent that any ambivalent emotional experience may co-vary with specific symptoms or syndromes, future research should look to evaluate more symptomatically homogenous subsets of individuals with schizophrenia in order to clarify whether ambivalence is prominent within particular groups of patients and not in others. Research in line with Research Domain Criteria initiatives (Sanislow et al., 2010) would obviate the strictures imposed by the artificialities of current psychiatric categories and is therefore more likely to provide illuminating insights into underlying neurobiology of emotional responding generally and ambivalence specifically. However, in the interim, symptom-based research would likely provide more immediate clinical value regarding which individuals experience significant ambivalence and therefore which individuals may be most responsive to certain psychosocial interventions (e.g., Motivational Enhancement Therapy; see Miller, 1996). Finally, an additional direction for future

research includes the use of eye-tracking technology and other indices of emotional experience that are amenable to time course analyses. Explicitly, these methods may enable greater insights into the etiologies of individuals' emotional experiences by, for example, identifying those specific environmental objects individuals visually fixate to onset a particular emotional episode.

4.7 Conclusions

Eugen Bleuler (1911/1950) both coined the term and posited the construct of ambivalence as a central feature of schizophrenia patients' subjective emotional experiences of the world. Contrary to this contention and more recent work on the topic (Cohen & Minor, 2010; Trémeau et al., 2009), however, the present results suggest that schizophrenia patients' in-the-moment positive, negative, and ambivalent emotional experiences are not remarkably different from those of individuals without diagnoses of mental illness and therefore cannot rightly be considered abnormal. Possibilities lay in future investigations examining different subtypes of ambivalence and further work is needed to pin down reliable defects in schizophrenia patients' state as well as trait emotional experiences. In turn, it is likely that these investigations are necessary in order to reconcile the observations of this study with that of Bleuler's original clinical description of schizophrenic ambivalence.

REFERENCES

Addington, D., Addington, J., & Maticka-Tyndale, E. (1993). Assessing depression in schizophrenia: The Calgary Depression Scale. *The British Journal of Psychiatry*, *163*, 39-44.

Affect Matrix Experiment Software [Computer software]. Unpublished instrument, Texas Tech University, Lubbock, TX.

Aghevli, M. A., Blanchard, J. J., & Horan, W. P. (2003). The expression and experience of emotion in schizophrenia: A study of social interactions. *Psychiatry Research*, *119*, 261-270.

Akdag, S. J., Nestor, P. G., O'Donnell, B. F., Niznikiewicz, M. A., Shenton, M. E., McCarley, R. W. (2003). The startle reflex in schizophrenia: Habituation and personality correlates. *Schizophrenia Research*, *64*, 165-173.

Aleman, A., & Kahn, R. S. (2005). Strange feelings: Do amygdala abnormalities dysregulate the emotional brain in schizophrenia?. *Progress in Neurobiology*, *77*, 283-298.

Alpert, M., & Rosen, A. (1990). A semantic analysis of the various ways that the terms "affect," "emotion," and "mood" are used. *Journal of Communication Disorders*, *23(4-5)*, 237-246.

Amador, X. F., & Gorman, J. M. (1998). Psychopathologic domains and insight in schizophrenia. *Psychiatric Clinics of North America*, *21(1)*, 27-42.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: American Psychiatric Association.

Andrade, E. B., & Cohen, J. B. (2007). On the consumption of negative feelings. *Journal of Consumer Research*, *34*, 283-300.

Andreasen, N. C. (1979). Affective flattening and the criteria for schizophrenia. *The American Journal of Psychiatry*, *136(7)*, 944-947.

Andreasen, N. C., & Olsen, S. (1982). Negative v. positive schizophrenia: Definition and validation. *Archives of General Psychiatry, 39,* 789-794.

Andreasen, N. C. (1989). Scale for the assessment of negative symptoms (SANS). *British Journal of Psychiatry*, *155(7)*, 53-58.

Angermeyer, M. C., & Kuhnz, L. (1988). Gender differences in age at onset of schizophrenia: An overview. *European Archives of Psychiatry and Clinical Neuroscience*, *237(6)*, 351-364.

Arndt, S., Alliger, R. J., & Andreasen, N. C. (1991). The distinction of positive and negative symptoms: The failure of a two-dimensional model. *British Journal of Psychiatry*, *158*(3), 317-322.

Basco, M. R., Bostic, J. Q., Davies, D., Rush, A. J., Witte, B., Hendrickse, W., & Barnett, V. (2000). Methods to improve diagnostic accuracy in a community mental health setting. *American Journal of Psychiatry, 157,* 1599-1605.

Berenbaum, H., & Fujita, F. (1994). Schizophrenia and personality: Exploring the boundaries and connections between vulnerability and outcome. *Journal of Abnormal Psychology*, *103*, 148-158.

Berenbaum, H., & Oltmanns, T. F. (1992). Emotional experience and expression in schizophrenia and depression. *Journal of Abnormal Psychology*, *101(1)*, 37-44.

Berridge, K. C. (2000). Measuring hedonic impact in animals and infants: microstructure of affective taste reactivity patterns. *Neuroscience and Biobehavioral Reviews*, *24(2)*, 173-198.

Blanchard, J. J., Mueser, K. T., & Bellack, A. S. (1998). Anhedonia, positive and negative affect, and social functioning in schizophrenia. *Schizophrenia Bulletin*, *24(3)*, 413-424.

Bleuler, E. (1950). *Dementia Praecox or the Group of Schizophrenias*. New York, NY: International University Press (Original work published 1911).

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, *54*, 579-616.

Breedlove, S. M., Watson, N. V., & Rosenzweig, M. R. (2010). *Biological psychology (sixth edition)*. Sunderland, MA: Sinauer Associates, Inc.

Buchanan, R. W., & Carpenter, W. T. (1994). Domains of psychopathology: an approach to the reduction of heterogeneity in schizophrenia. *The Journal of Nervous and Mental Disease*, *182*, 193-204.

Burbridge, J. A., & Barch, D. M. (2007). Anhedonia and the experience of emotion in individuals with schizophrenia. *Journal of Abnormal Psychology*, *116(1)*, 30-42.

Butzlaff, R. L., & Hooley, J. M. (1998). Expressed emotion and psychiatric relapse. *Archives of General Psychiatry*, *55(6)*, 547-552.

Cacioppo, J. T., & Berntson, G. G. (1994). Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates. *Psychological Bulletin*, *115*, 401-423.

Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1997). Beyond bipolar conceptualizations and measures: The case of attitudes and evaluative space. *Personality and Social Psychology Review*, *1*, 3-25.

Carpenter, W. T., Heinrichs, D. W., & Alphs, L. D. (1988). Deficit and nondeficit forms of schizophrenia: The concept. *American Journal of Psychiatry, 145,* 578-583.

Carroll, A., Fattah, S., Clyde, Z., Coffey, I., Owens, D. G. C., & Johnstone, E. C. (1999). Correlates of insight and insight change in schizophrenia. *Schizophrenia Research*, *35(3)*, 247-253.

Cohen, A. S., & Docherty, N. M. (2005). Symptom-oriented versus syndrome approaches to resolving heterogeneity of neuropsychological functioning in schizophrenia. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *17(3)*, 384-390.

Cohen, A. S., Iglesias, B., & Minor, K. S., (2009). The neurocognitive underpinnings of diminished expressivity in schizotypy: What the voice reveals. *Schizophrenia Research*, *109(1-3)*, 38-45.

Cohen, A. S., & Minor, K. S. (2010). Emotional experience in patients with schizophrenia revisited: Meta-analysis of laboratory studies. *Schizophrenia Bulletin*, *36(1)*, 143-150.

Cohen, A. S., Minor, K. S., & Najolia, G. M. (2010). A framework for understanding experiential deficits in schizophrenia. *Psychiatry Research*, *178(1)*, 10-16.

Cohen, A. S., Najolia, G. M., Brown, L. A., & Minor, K. S. (2011). The state-trait disjunction of anhedonia in schizophrenia: Potential affective, cognitive and social-based mechanisms. *Clinical Psychology Review*, *31(3)*, 440-448.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112(1),* 155-159.

Conover, W. J. (1999). *Practical nonparametric statistics* (Third Edition). New York, NY: John Wiley & Sons.

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, *53*, 594-628.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, *107(2)*, 261-288.

Corcoran, C., Walker, E., Huot, R., Mittal, V., Tessner, K., Kestler, L., & Malaspina, D. (2003). The stress cascade and schizophrenia: Etiology and onset. *Schizophrenia Bulletin*, *29(4)*, 671-692.

Costello, C. G. (1992). Research on symptom versus research on syndromes: Arguments in favour of allocating more research time to the study of symptoms. *The British Journal of Psychiatry*, *160(3)*, 304-308.

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology, 43,* 245-265.

Csikszentmihalyi, M., & Larson, R. (1992). Validity and reliability of the Experience Sampling Method. In M. DeVries (Ed.), *The Experience of Psychopathology: Investigating Mental Disorders in their Natural Settings* (pp. 43-57). Cambridge, UK: Cambridge University Press.

Damasio, A. R., Grabowski, T. J., Bechara, A., Damasio, H., Ponto, L. L. B., Parvizi, J., & Hichwa, R. D. (2000). Subcortical and cortical brain activity during the feeling of self-generated emotions. *Nature Neuroscience*, *3*, 1049-1056.

Davidson, R. J. (1998). Affective style and affective disorders: Perspectives from affective neuroscience. *Cognition and Emotion*, *12(3)*, 307-330.

DeVries, M. W., & Delespaul, P. A. E. G. (1989). Time, context, and subjective experiences in schizophrenia. *Schizophrenia Bulletin*, *15(2)*, 233-244.

Dickinson, D., Ragland, J. D., Gold, J. M., & Gur, R. C. (2008). General and specific cognitive deficits in schizophrenia: Goliath defeats David. *Biological Psychiatry*, *64(9)*, 823-827.

Docherty, N. M., & Gordinier, S. W. (1999). Immediate memory, attention and communication disturbances in schizophrenia patients and their relatives. *Psychological Medicine: A Journal of Research in Psychiatry and the Allied Sciences*, *29(1)*, 189-197.

Droit-Volet, S., Fayolle, S. L., Gil, S. (2011). Emotion and time perception: Effects of film-induced mood. *Frontiers in Integrative Neuroscience*, *5*, 1-9.

Dworkin, R. H. (1992). Affective deficits and social deficits in schizophrenia: What's what?. *Schizophrenia Bulletin*, *18(1)*, 59-64.

Eack, S. M., & Newhill, C. E. (2007). Psychiatric symptoms and quality of life in schizophrenia: A meta-analysis. *Schizophrenia Bulletin*, *33(5)*, 1225-1237.

Earnst, K. S., Kring, A. M., Kadar, M. A., Salem, J. E., & Shepard, D. A. (1996). Facial expression in schizophrenia. *Biological Psychiatry*, *40(6)*, 556-558.

Earnst, K. S., & Kring, A. M. (1999). Emotional responding in deficit and non-deficit schizophrenia. *Psychiatry Research*, *88*, 191-207.

Edwards, J., Jackson, H. J., & Pattison, P. E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia: A methodological review. *Clinical Psychology Review*, *22(6)*, 789-832.

Ersner-Hershfield, H., Mikels, J. A., Sullivan, S. J., & Carstensen, L. L. (2008). Poignancy: Mixed emotional experience in the face of meaningful endings. *Journal of Personality and Social Psychology*, *94*, 158-167.

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2009). G*Power (Version 3.1.2) [Computer software]. Düsseldorf, DE: Heinrich Heine University.

Feldman-Barrett, L., & Russell, J. A. (1999). The structure of current affect: Controversies and emerging consensus. *Current Directions in Psychological Science*, *8*(*1*), 10-14.

Fennig, S., Craig, T., Lavelle, J., Kovasznay, B., & Bromet, E. J. (1994). Best-estimate versus structured interview-based diagnosis in first-admission psychosis. *Comprehensive Psychiatry, 35(5),* 341-348.

Fenton, W. S., & McGlashan, T. H. (1991). Natural history of schizophrenia subtypes: 1. Longitudinal study of paranoid, hebephrenic, and undifferentiated schizophrenia. *Archives of General Psychiatry*, *48(11)*, 969-977.

Festinger, L. (1962). Cognitive dissonance. *Scientific American*, *207*(*4*), 93-107.

Field, A. (2009). *Discovering statistics using SPSS (3rd Edition)*. London, UK: Sage.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B.W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition (SCID-I/P)*. New York: Biometrics Research, New York State Psychiatric Institute.

Folsom, D. P., Hawthorne, W., Lindamer, L., Gilmer, T., Bailey, A., Golshan, S.,… Jeste, D. V. (2005). Prevalence and risk factors for homelessness and utilization of mental health services among 10,340 patients with serious mental illness in a large public mental health system. *The American Journal of Psychiatry*, *162*, 370-376.

Freeman, D., Garety, P. A., Kuipers, E. (2001). Persecutory delusions: Developing the understanding of belief maintenance and emotional distress. *Psychological Medicine: A Journal of Research in Psychiatry and the Allied Sciences*, *31(7)*, 1293-1306.

Frijda, N. H. (1986). *The Emotions*. Cambridge, UK: Cambridge University Press.

Furnham, A. (1986). Response bias, social desirability and dissimulation. *Personality and Individual Differences*, *7(3)*, 385-400.

Gard, D. E., Kring, A. M., Gard, M. G., Horan, W. P., & Green, M. F. (2007). Anhedonia in schizophrenia: Distinctions between anticipatory and consummatory pleasure. *Schizophrenia Research*, *93(1-3)*, 253-250.

Germans, M. K., & Kring, A. M. (2000). Hedonic deficit in anhedonia: Support for the role of approach motivation. *Personality and Individual Differences*, *28(4)*, 659-672.

Goldstein, J. M., & Link, B. G. (1988). Gender and the expression of schizophrenia. *Journal of Psychiatry Research*, *22*, 141-155.

Grant, P. M., & Beck, A. T. (2009). Defeatist beliefs as a mediator of cognitive impairment, negative symptoms, and functioning in schizophrenia. *Schizophrenia Bulletin*, *35*(*4*), 798-806.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, *9(1)*, 87-108.

Grube, B. S., Bilder, R. M., & Goldman, R. S. (1998). Meta-analysis of symptom factors in schizophrenia. *Schizophrenia Research*, *31(2)*, 113-120.

Gurrera, R. J., Nestor, P. G., & O'Donnell, B. F. (2000). Personality traits in schizophrenia: Comparison with a community sample. *Journal of Nervous and Mental Disease*, *188*, 31-35.

Hafner, H., an der Heiden, W., Behrens, S., et al. (1998). Causes and consequences of the gender differences in age at onset of schizophrenia. *Schizophrenia Bulletin*, *24(1)*, 99-113.

Harrison, G., Hopper, K., Craig, T., Laska, E., Siegel, C., Wanderling, J.,… Wiersma, D. (2001). Recovery from psychotic illness: a 15- and 25-year international follow-up study. *The British Journal of Psychiatry*, *178*, 506-517.

Harrison, P. J., & Weinberger, D. R. (2005). Schizophrenia genes, gene expression, and neuropathology: On the matter of their convergence. *Molecular Psychiatry*, *10*, 40-68.

Hegarty, J. D., Baldessarini, R. J., Tohen, M., Waternaux, C., & Oepen, G. (1994). One hundred years of schizophrenia: A meta-analysis of the outcome literature. *The American Journal of Psychiatry*, *151*, 1409-1416.

Heinrichs, R. W. (2005). The primacy of cognition in schizophrenia. *American Psychologist*, *60(3)*, 229-242.

Hemple, R. J., Tulen, J. H., van Beveren, N. J., Mulder, P. G., & Hengeveld, M. W. (2007). Subjective and physiological responses to emotion-eliciting pictures in male schizophrenic patients. *International Journal of Psychophysiology*, *64(2)*, 174-183.

Hemple, R. J., Tulen, J. H., van Beveren, N. J., van Steenis, H. G., Mulder, P. G., & Hengeveld, M. W. (2005). Physiological responsivity to emotional pictures in schizophrenia. *Journal of Psychiatric Research*, *39(5)*, 509-518.

Hoekert, M., Kahn, R. S., Pijnenborg, M., & Aleman, A. (2007). Impaired recognition and expression of emotional prosody in schizophrenia: Review and meta-analyses. *Schizophrenia Research*, *96(1-3)*, 135-145.

Hoenig, J. M., & Heisey, D. M. (2001). The abuse of power: The pervasive fallacy of power calculations for data analysis. *The American Statistician, 55*, 19-24.

Horan, W. P., & Blanchard, J. J. (2003). Neurocognitive, social, and emotional dysfunction in deficit syndrome schizophrenia. *Schizophrenia Research*, *65(2-3)*, 125-137.

Horan, W. P., Blanchard, J. J., Clark, L. A., & Green, M. F. (2008). Affective traits in schizophrenia and schizotypy. *Schizophrenia Bulletin*, *34*(*5*), 856-874.

Horan, W. P., Green, M. F., Kring, A. M., & Nuechterlein, K. H. (2006). Does anhedonia in schizophrenia reflect faulty memory for subjectively experienced emotions? *Journal of Abnormal Psychology*, *115(3)*, 496-508.

Horan, W. P., Kring, A. M., & Blanchard, J. J. (2006). Anhedonia in schizophrenia: A review of assessment strategies. *Schizophrenia Bulletin*, *32(2)*, 259-272.

Horan, W. P., Subotnik, K. L., Reise, S. P., Ventura, J., & Nuechterlein, K. H. (2005). Stability and clinical correlates of personality characteristics in recent-onset schizophrenia. *Psychological Medicine, 35(7)*, 995-1005.

Hunter, P. G., Schellenberg, E. G., & Schimmack, U. (2008). Mixed affective responses to music with conflicting cues. *Cognition and Emotion*, *22*, 327-352.

Hyman, I. E., & Loftus, E. F. (1998). Errors in autobiographical memory. *Clinical Psychology Review*, *18(8)*, 933-947.

IBM SPSS Statistics for Mac (Version 20) [Computer software]. Armonk, NY: IBM Corp.

Izard, C. E. (2010). The many meanings/aspects of emotion: Definitions, functions, activation, and regulation. *Emotion Review*, *2(4)*, 363-370.

Jaeger, J., Bitter, I., Czobor, P., & Volavka, J. (1990). The measurement of subjective experience in schizophrenia: The Subjective Deficit Syndrome Scale. *Comprehensive Psychiatry*, *31*, 216-226.

Jobe, T. H., & Harrow, M. (2005). Long-term outcome of patients with schizophrenia: A review. *Canadian Journal of Psychiatry*, *50(14)*, 892-900.

Kay, S. R., Opler, L. A., & Lindenmayer, J. (1988). Reliability and validity of the positive and negative syndrome scale for schizophrenics. *Psychiatry Research*, *23(1)*, 99-110.

Keefe, R. S., Mohs, R. C., Davidson, M., Losonczy, M. F., Silverman, J. M., Lesser, J. C., … Davis, K. L. (1988). Kraepelinian schizophrenia: A subgroup of schizophrenia?. *Psychopharmacology Bulletin*, *24(1)*, 56-61.

Keshavan, M. S., Tandon, R., Boutros, N. N., & Nasrallah, H. A. (2008). Schizophrenia, "just the facts": What we know in 2008: Part 3: Neurobiology. *Schizophrenia Research*, *106(2-3)*, 89-107.

Kessler, R. C., Wittchen, H., Abelson, J., & Zhao, S. (2000). Methodological issues in assessing psychiatric disorders with self-reports. In A. A. Stone, J. S. Turkkan, C. A. Bachrach, J. B. Jobe, H. S. Kurtzman, & V. S. Cain (Eds.), *The science of self-report: Implications for research and practice* (pp. 229-257). Mahwah, NJ: Lawrence Erlbaum Associates.

Kirkpatrick, D., & Buchanan, R. W. (1990). Anhedonia and the deficit syndrome of schizophrenia. *Psychiatry Research*, *31(1)*, 25-30.

Kirkpatrick, B., Amador, X. F., Yale, S. A., Bustillo, J. R., Buchanan, R. W., & Tohen, M. (1996). The deficit syndrome in the DSM-IV field trial: Part II: Depressive episodes and persecutory beliefs. *Schizophrenia Research*, *20(1-2)*, 79-90.

Kitamura, T., & Suga, R. (1991). Depressive and negative symptoms in major psychiatric disorders. *Comprehensive Psychiatry*, *32*, 88-94.

Knapp, M., Mangalore, R., & Simon, J. (2004). The global costs of schizophrenia. *Schizophrenia Bulletin*, *30(2)*, 279-293.

Kohler, C. G., & Martin, E. A. (2006). Emotional processing in schizophrenia. *Cognitive Neuropsychiatry*, *11(3)*, 250-271.

Kraepelin, E. (1971). *Dementia Praecox and Paraphrenia*. Chicago, IL: Chicago Medical Book Co. (Original work published 1919).

Kring, A. M. (1999). Emotion in schizophrenia: Old mystery, new understanding. *Current Directions in Psychological Science*, *8(5)*, 160-163.

Kring, A. M., Barrett, L. F., & Gard, D. E. (2003). On the broad applicability of the affective circumplex: Representations of affective knowledge among schizophrenia patients. *Psychological Science*, *14(3)*, 207-214.

Kring, A. M., & Caponigro, J. M. (2010). Emotion in schizophrenia: Where feeling meets thinking. *Current Directions in Psychological Science*, *19(4)*, 255-259.

Kring, A. M., & Earnst, K .S. (1999). Stability of emotional responding in schizophrenia. *Behavior Therapy*, *30(3)*, 373-388.

Kring, A. M., Gard, M. G., & Gard, D. E. (2011). Emotion deficits in schizophrenia: Timing matters. *Journal of Abnormal Psychology*, *120(1)*, 79-87.

Kring, A. M., Kerr, S. L., Earnst, K. S. (1999). Schizophrenic patients show facial reactions to emotional facial expressions. *Psychophysiology*, *36(2)*, 186-192.

Kring, A. M., Kerr, S. L., Smith, D. A., & Neale, J. M. (1993). Flat affect in schizophrenia does not reflect diminished subjective experience of emotion. *Journal of Abnormal Psychology*, *102(4)*, 507-517.

Kring, A. M., & Moran, E. K. (2008). Emotional response deficits in schizophrenia: Insights from affective science. *Schizophrenia Bulletin*, *34(5)*, 819-834.

Kring, A. M., & Neale, J. M. (1996). Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion?. *Journal of Abnormal Psychology*, *105(2)*, 249-257.

Kring, A. M., & Sloan, D. M. (2007). The Facial Expression Coding System (FACES): Development, validation, and utility. *Psychological Assessment*, *19(2)*, 210-224.

Larsen, J. T., & McGraw, A. P. (2011). Further evidence for mixed emotions. *Personality Processes and Individual Differences*, *100(6)*, 1095-1110.

Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time?. *Journal of Personality and Social Psychology*, *81(4)*, 684-696.

Larsen, J. T., Norris, C. J., McGraw, A. P., Hawkley, L. C., & Cacioppo, J. T. (2009). The evaluative space grid: A single-item measure of positivity and negativity. *Cognition and Emotion*, *23*, 453-480.

LeDoux, J. E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience*, *23*, 155-184.

Lenzenweger, M. F. (2006). Schizotaxia, schizotypy, and schizophrenia: Paul E. Meehl's blueprint for the experimental psychopathology and genetics of schizophrenia. *Journal of Abnormal Psychology*, *115(2)*, 195-200.

Leventhal, A. M., Chasson, G. S., Tapia, E., Miller, E. K., & Pettit, J. W. (2006). Measuring hedonic capacity in depression: A psychometric analysis of three anhedonia scales. *Journal of Clinical Psychology*, *62(12)*, 1545-1558.

Lobbestael, J., Leurgans, M., & Arntz, A. (2011). Inter-rater reliability of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID I) and Axis II Disorders (SCID II). *Clinical Psychology & Psychotherapy, 18(1),* 75-79.

Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for the Expanded Brief Psychiatric Rating Scale. *Schizophrenia Bulletin*, 12, 594-602.

Maki, P., Veijola, J., Jones, P. B., Murray, G. K., Koponen, H., Tienari, P.,… Isohanni, M. (2005). Predictors of schizophrenia – a review. *British Medical Bulletin*, *73-74(1)*, 1-15.

Marengo, J., Harrow, M., Herbener, E. S., & Sands, J. (2000). A prospective longitudinal 10-year study of schizophrenia's three major factors and depression. *Psychiatry Research*, *97*(*1*), 61-77.

Mattes, R. M., Schneider, F., Heimann, H., & Birbaumer, N. (1995). Reduced emotional response of schizophrenic patients in remission during social interaction. *Schizophrenia Research*, *17(3)*, 249-255.

McGorry, P. D. (2007). Issues for DSM-V: Clinical staging: A heuristic pathway to valid nosology and safer, more effective treatment in psychiatry. *American Journal of Psychiatry*, *164,* 859-860.

Meehl, P. E. (1962). Schizotaxia, schizotypy, schizophrenia. *American Psychologist*, *17(12)*, 827-838.

Meehl, P. E. (1990). Toward and integrated theory of schizotaxia, schizotypy, and schizophrenia. *Journal of Personality Disorders*, *4*, 1-99.

Miller, G. A., & Chapman, J. P. (2001). Misunderstanding analysis of covariance. *Journal of Abnormal Psychology*, *110*(*1*), 40-48.

Miller, W. R. (1996). Motivational interviewing: Research, practice, and puzzles. *Addictive Behaviors*, *21*(*6*), 835-842.

Mintz, A. R., Dobson, K. S., & Romney, D. M. (2003). Insight in schizophrenia: A meta-analysis. *Schizophrenia Research*, *61(1)*, 75-88.

Mueser, K. T., Curran, P. J., & McHugo, G. J. (1997). Factor structure of the Brief Psychiatric Rating Scale in schizophrenia. *Psychological Assessment*, *9(3)*, 196-204.

Murphy, D., & Cutting, J. (1990). Prosodic comprehension and expression in schizophrenia. *Journal of Neurology, Neurosurgery & Psychiatry with Practical Neurology*, *53(9)*, 727-730.

Myin-Germeys, I., Delespaul, P. A. E. G., & Devries, M. W. (2000). Schizophrenia patients are more emotionally active than is assumed based on their behavior. *Schizophrenia Bulletin*, *26(4)*, 847-854.

Myin-Germeys, I., Peeters, F., Havermans, R., Nicolson, N. A., DeVries, M. W., Delespaul, P., & van Os, J. (2003). Emotional reactivity to daily life stress in psychosis and affective disorder: An experience sampling study. *Acta Psychiatrica Scandinavica*, *107(2)*, 124-131.

Nayani, T. H., & David, A. S. (1996). The auditory hallucination: A phenomenological survey. *Psychological Medicine: A Journal of Research in Psychiatry and the Allied Sciences*, *26(1)*, 177-189.

Norman, R. M., & Malla, A. K. (1993). Stressful life events and schizophrenia: 1: A review of the research. *The British Journal of Psychiatry*, *162*, 161-166.

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *TRENDS in Cognitive Sciences*, *9(5)*, 242-249.

Overall, J. E., & Gorham, D. R. (1962). The Brief Psychiatric Rating Scale. *Psychological Reports, 10*, 799-812.

Perala, J., Suvisaari, J., Saarni, S. I., Kuoppasalmi, K., Isometsa, E., Pirkola, S.,… Lonnqvist, J. (2007). Lifetime prevalence of psychotic and bipolar I disorders in a general population. *Archives of General Psychiatry, 64*(1), 19-28.

Petronis, A. (2004). The origins of schizophrenia: Genetic thesis, epigenetic antithesis, and resolving synthesis. *Biological Psychiatry*, *55(10)*, 965-970.

Phan, K. L., Wager, T., Taylor, S. F., & Liberzon, I. (2002). Functional neuroanatomy of emotion: A meta-analysis of emotion activation studies in PET and fMRI. *NeuroImage*, *16*, 331-348.

Phillips, L. J., McGorry, P. D., Garner, B., Thompson, K. N., Pantelis, C., Wood, S. J., & Berger, G. (2006). Stress, the hippocampus and the hypothalamic-pituitary-adrenal axis: Implications for the development of psychiatric disorders. *Australian and New Zealand Journal of Psychiatry*, *40(9)*, 725-741.

Potvin, S., Sepehry, A. A., & Stip, E., (2007). Meta-analysis of depressive symptoms in dual-diagnosis schizophrenia. *Australian and New Zealand Journal of Psychiatry*, *41(10)*, 792-799.

Rado, S. (1953). Dynamics and classification of disordered behavior. *The American Journal of Psychiatry*, *110*, 406-426.

Raulin, M. L. (1984). Development of a scale to measure intense ambivalence. *Journal of Consulting and Clinical Psychology*, *52(1)*, 63-72.

Raulin, M. L., & Brenner, V. (1993). Ambivalence. In C. G. Costello (Ed.), *Symptoms of Schizophrenia* (pp. 201-226). New York, NY: John Wiley & Sons.

Regier, D. A. (2007). Time for a fresh start? Rethinking psychosis in DSM-V. *Schizophrenia Bulletin*, *33(4)*, 843-845.

Ross, E. D., Orbelo, D. M., Cartwright, J., Hansel, S., Burgard, M., Testa, J. A., & Buck, R. (2001). Affective-prosodic deficits in schizophrenia: Profiles of patients with brain damage and comparison with relation to schizophrenic symptoms. *Journal of Neurology, Neurosurgery & Psychiatry with Practical Neurology*, *70*, 597-604.

Rottenberg, J., Ray, R. D., & Gross, J. J. (2007). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *Handbook of emotion elicitation and assessment, series in affective science* (pp. 9-28). New York, NY: Oxford University Press.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*, 145-172.

Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, *125*, 3-30.

Russell, J. A., Weiss, A., & Mendelsohn, G. A. (1989). Affect grid: A single-item of pleasure and arousal. *Journal of Personality and Social Psychology*, *57*, 493-502.

Salem, J. E., & Kring, A. M. (1998). The role of gender differences in the reduction of etiologic heterogeneity in schizophrenia. *Clinical Psychology Review*, *18*(*7*), 795-819.

Sanislow, C. A., & Carson, R. C. (2001). Schizophrenia: A critical examination. In H. E. Adams & P. B. Sutker (Eds.), *Comprehensive handbook of psychopathology*, *third edition* (pp. 403-441). New York, NY: Kluwer Academic/Plenum Publishers.

Sanislow, C. A., Pine, D. S., Quinn, K. J., Kozak, M. J., Garvey, M. A., Heinssen, R. K.,… Cuthbert, B. N. (2010). Developing constructs for psychopathology research: Research Domain Criteria. *Journal of Abnormal Psychology*, *119*(*4*), 631-639.

Sass, L. (2007). Contradictions of emotion in schizophrenia. *Cognition & Emotion*, *21(2)*, 351-390.

Scherer, K. R. (1984). Emotion as a multicomponent process: A model and some cross-cultural data. *Review of Personality & Social Psychology*, *5*, 37-63.

Schimmack, U. (2005). Response latencies of pleasure and displeasure ratings: Further evidence for mixed feelings. *Cognition and Emotion*, *19*, 671-691.

Schimmack, U. & Colcombe, S. (1999). *Mixed feelings: Towards a theory of pleasure and displeasure.* Unpublished manuscript, Department of Psychology, University of Toronto, Mississauga. Retrieved September 23, 2011, from http://www.erin.utoronto.ca/~w3psyuli/msMixedFeelings.pdf.

Schlenker, R., Cohen, R., & Hopmann, G. (1995). Affective modulation of the startle reflex in schizophrenia patients. *European Archives of Psychiatry and Clinical Neuroscience*, *245(6)*, 309-318.

Schmidtke, V., & Heuer, H. (1997). Task integration as a factor in secondary-task effects on sequence learning. *Psychological Research*, *60*, 53-71.

Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness Studies*, *4*, 5-34.

Sincoff, J. B. (1990). The psychological characteristics of ambivalent people. *Clinical Psychology Review*, *10(1)*, 43-68.

Spelke, E., Hirst, W., & Neisser, U. (1976). Skills of divided attention. *Cognition*, *4*, 215-230.

Strauss, J. S. (1994). The person with schizophrenia as a person: II: Approaches to the subjective and complex. *British Journal of Psychiatry*, *164(23)*, 103-107.

Sullivan, H. S. (1927). Affective experience in early schizophrenia. *The American Journal of Psychiatry*, *6*, 467-483.

Sullivan, H. S. (1962). *Schizophrenia as a human process*. New York, NY: W. W. Norton & Company.

Suvisaari, J., Perala, J., Saarni, S. I., Juvonen, H., Tuulio-Henriksson, A., & Lonnqvist, J. (2009). The epidemiology and descriptive and predictive validity of DSM-IV delusional disorder and subtypes of schizophrenia. *Clinical Schizophrenia & Related Psychoses*, *2(4)*, 289-297.

Tandon, R., Keshavan, M. S., & Nasrallah, H. A. (2008). Schizophrenia, "just the facts" what we know in 2008: 2. Epidemiology and etiology. *Schizophrenia Research*, *102(1)*, 1-18.

Tandon, R., Nasrallah, H. A., & Keshavan, M. S. (2009). Schizophrenia, "just the facts": 4. Clinical features and conceptualization. *Schizophrenia Research*, *110(1)*, 1-23.

Toomey, R., Faraone, S. V., Simpson, J. C., & Tsuang, M. T. (1998). Negative, positive, and disorganized symptom dimensions in schizophrenia, major depression, and bipolar disorder. *Journal of Nervous & Mental Disease*, *186(8)*, 470-476.

Trémeau, F. (2006). A review of emotion deficits in schizophrenia. *Dialogues in Clinical Neuroscience*, *8(1)*, 59-70.

Trémeau, F., Antonius, D., Cacioppo, J. T., Ziwich, R., Jalbrzikowski, M., Saccente, E.,… & Javitt, D. (2009). In support of Bleuler: Objective evidence for increased affective ambivalence in schizophrenia based upon evocative testing. *Schizophrenia Research*, *107(2-3)*, 223-231.

van Harreveld, F., van der Pligt, J., & de Liver, Y. N. (2009). The agony of ambivalence and ways to resolve it: Introducing the MAID Model. *Personality and Social Psychology Review*, *13*, 45-61.

Volz, M., Hamm, A. O., Kirsch, P., & Rey, E. (2003). Temporal course of emotional startle modulation in schizophrenia patients. *International Journal of Psychophysiology*, *49(2)*, 123-137.

Wager, T. D., Phan, K. L., Liberzon, I., & Taylor, S. F. (2003). Valence, gender, and lateralization of functional brain anatomy in emotion: A meta-analysis of findings from neuroimaging. *NeuroImage*, *19(3)*, 513-531.

Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology, 97(3),* 346-353.

Watson, D., & Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54(6),* 1063-1070.

Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin, 98,* 219-235.

Widen, S. C., & Russell, J. A. (2010). Descriptive and prescriptive definitions of emotion. *Emotion Review*, *2(4)*, 377-378.

Wolf, K., Mass, R., Kiefer, F., Eckert, K., Weinhold, N., Wiedemann, K., & Naber, D. (2004). The influence of olanzapine on facial expression of emotions in schizophrenia – an improved facial EMG study. *German Journal of Psychiatry*, 7*,* 14-19.

Wolf, K., Mass, R., Kiefer, E., Wiedemann, K., & Naber, D. (2006). Characterization of the facial expression of emotions in schizophrenia patients: Preliminary findings with a new electromyography method. *The Canadian Journal of Psychiatry*, *51(6)*, 335-341.

Zanarini, M. C., Skodol, A. E., Bender, D., Dolan, R., Sanislow, C., Schaefer, E.,… Gunderson, J. G. (2000). The Collaborative Longitudinal Personality Disorders Study: Reliability of Axis I and II diagnoses. *Journal of Personality Disorders, 14(4),* 291-299.

Zumbo, B. D., & Hubley, A. M. (1998). A note on misconceptions concerning prospective and retrospective power. *The Statistician, 47*, 385-388.

APPENDIX A: IRB APPROVAL

Project Report and Continuation Application

(Complete and return to IRB, 203-B1 David Boyd Hall.
Direct questions to IRB Chairman Robert Mathews 578-8692.)

Institutional Review Board
Dr. Robert Mathews, Chair
203 B-1 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb

IRB#: 2679 **Your Current Approval Expires On:** 6/21/2011

Review type: Full **Risk Factor:** Minimal **Date Sent: April 29, 2011**

PI: Alex Cohen **Dept:** Psychology **Phone:** (225) 578-7017

Student/Co-Investigator:

Project Title: Understanding Negative Symptoms in Schizophrenia Using Novel Technologies

Number of Subjects Authorized: 200

Please read the entire application. Missing information will delay approval!

I. PROJECT FUNDED BY: LA Board of Regents-RCS **LSU proposal #:** 31075

II. PROJECT STATUS: Check the appropriate blank(s); and complete the following:

- X 1. **Active**, subject **enrollment continuing**; # subjects enrolled: 35
- ___ 2. **Active**, subject **enrollment complete**; # subjects enrolled: ____
- ___ 3. **Active**, subject **enrollment complete**; work with subjects continues.
- ___ 4. **Active, work with subjects complete**; data analysis in progress.
- ___ 5. Project **start postponed**
- ___ 6. **Project complete;** end date __/__/__
- ___ 7. **Project cancelled**: no human subjects used.

III. PROTOCOL: (Check one).

- X Protocol continues as previously approved
- ___ Changes are requested*
  - *List (on separate sheet) any changes to approved protocol.*

IV. UNEXPECTED PROBLEMS: (did anything occur that increased risks to participants):

- State number of events since study inception: 0 since last report: 0
- If such events occurred, describe them and how they affect risks in your study, in an attached report.
- Have there been any **previously unreported** events? Y/N N ?
  (if YES, attach report describing event and any corrective action).

V. CONSENT FORM AND RISK/BENEFIT RATIO:

Does new knowledge or adverse events change the risk/benefit ratio? Y/N___; N/A
Is a corresponding change in the consent form needed? Y/N___

VI. ATTACH A BRIEF, FACTUAL SUMMARY of project progress/results to show continued participation of subjects is justified; or to provide a final report on project findings.

VII. ATTACH CURRENT CONSENT FORM (only if subject enrollment is continuing); and check the appropriate blank:

- X 1. Form is unchanged since last approved
- ___ 2. Approval of revision requested herewith: (identify changes)

Signature of Principal Investigator: _____ **Date:** May 6th 2011

IRB Action:
- J Continuation approved; **Approval Expires:** 5/9/12
- ___ Disapproved
- ___ File closed

Signed _____ Date 5/10/11

Form date: April 16, 2008

CONSENT FORM

Project Title: Computerized Measure of Negative Symptoms.

Performance Site:

1. Tyler Community Mental Health Clinic, Lafayette, LA
2. Peaceful Village group home: 811 Martin Luther Kind Drive. Lafayette LA 70501
3. River Oaks group home: 1507 Surrey Street. Lafayette LA 70501
4. Capitol Area Community Mental Health Clinic, Baton Rouge, LA
5. Audubon Hall, LSU Campus, Baton Rouge, LA

Investigator: The following investigator is available for questions Monday-Friday, 8:00 a.m.-4:30 p.m.

Alex S. Cohen, Ph.D.
Psychology Department, LSU
(225) 578-7017

Purpose of the Study: The purpose of this research project is to develop a measure of mental illness symptoms using computerized analysis of speech. We are also interested in how this measure might be related to attention and memory and personality and social support variables.

Inclusion Criteria: You are being asked to participate in this study because you are between the ages of 18 and 55, and are either:

1. A patient with a diagnosis of schizophrenia, schizoaffective disorder or depression
2. An individual who is free from mental illness.

Exclusion Criteria: Participation is excluded for individuals who are not judged to be clinically stable, have evidence of mental retardation or have history of significant head trauma or alcohol or drug dependence.

Maximum Number of Subjects: The maximum number of subjects will be 200.

Study Procedures/Description of the Study: I am aware that this study will take place over two sessions.

During the first session, I will be asked questions about my history and about my mental illness and substance use. I will also be asked to complete several questionnaires and paper and pencil tests that measure my quality of life and attention. One of these questionnaires will measure my living skills – for example, how well I can pay bills, handle money and read a bus schedule. I will be recorded during parts of this study using a microphone. This session will last approximately two hours. For participating in this session, I will be compensated $20 cash.

The second session will occur on a separate day. During this session, I will be asked to complete questionnaires and paper and pencil tests that measure personality, attention, memory and functioning. I will also watch a 15 minute-movie while reporting my mood. I will also complete a 30 minute test of attention and memory. This session will last approximately two hours. For participating in this session, I will be compensated $20 cash

I give permission for the researchers to access my medical records so that they can determine whether I am appropriate for this study. I also recognize that certain portions of this study will be

audio and video taped. This is being done to ensure we are doing things correctly, and for measuring certain symptoms of mental illness.

Benefits: I understand that I will not directly benefit from participating in this study. My participation will help researchers find out more information about schizophrenia, depression and related illnesses.

Risks/Discomforts: I understand that I will be expected to participate in two sessions. This may be inconvenient in that it will take a total of four hours of my time. I also recognize that I will be asked to talk about my mental health history.

Right to Refuse: Participation in this study is voluntary. I may refuse to answer any questions or discontinue any test I am taking. Further, I can change my mind and withdraw from this study at any time without risking my relationship with either Louisiana State University or any treatment clinic or group home. I also recognize that I can contact the researchers at any point after the study is complete to have my audio and video taped records destroyed.

Privacy: All information obtained in this study will be kept confidential unless release is legally compelled. Limits to confidentiality include situations where an individual is at risk of hurting themselves (e.g., suicide) or hurting someone else (e.g., homicide, child abuse). I understand that the investigators are required by law to report any reasonable suspicions.

All records will be kept in a locked laboratory in a secure facility. Electronic data will be entered without identifying information and will be password protected. To ensure confidentiality, I will be assigned a number. All information collected during this study will be linked to this number and kept separate from any identifying information such as my name. Results of the study may be published, but no names or identifying information will be included for publication.

Financial Information: I will receive $20 cash upon the completion of each session. I will receive a prorated amount if I am unable to complete the entire session. The total monetary compensation for this project will not exceed $40.

Withdrawal: Participation in this study is voluntary. I may withdraw from this study at any time without penalty or loss of any benefit to which I would otherwise be entitled to.

Signatures:

The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Chairman, LSU Institutional Review Board, (225)578-8692. I agree to participate in the study described above and acknowledge the researchers' obligation to provide me with a copy of this consent form if signed by me.

_____ _____

Participant Signature Date

**Research Assistant: please complete the statement below to indicate whether the consent form was read to the participant.*

(Check One)

_____ I certify that I have read this consent form to the participant and explained that by completing the signature line above, he/she has agreed to participate (*NOTE – Consent form should be read to all patient participants).*

_____ The participant will be enrolled as a control and is English-literate. The participant refused my offering to read this consent form to them.

_____ _____

Signature of Research Assistant Date

_____ _____

Signature of Principal Investigator Date

Study Approved By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Approval Expires: 5-9-2012

APPENDIX B: EVALUATIVE SPACE GRID TRAINING SCRIPT

There are many words that can be used to describe our feelings. To get a sense of this, can you give me a couple of words that you might use to describe feeling positive? [Allow participant to generate a few examples of positive emotions – e.g., *happy*, *glad*, *joyful*]

Good, now, can you give me a couple of words that you might use to describe feeling negative? [Allow participant to generate a few examples of negative emotions – e.g., *sad*, *sorry*, *depressed*]

As you can see, there are a lot of words to describe how you feel. This can be useful because there are many things that can make us feel positive as well as negative. For instance, movies often make us feel a certain way. In a few moments, you are going to watch a clip from a movie for about 10 minutes. While you are watching this clip, I want you to report how it makes you feel. One way to report your feelings about this clip is in terms of how positive and negative it makes you feel. You can do this using these four squares [Open grid by clicking on "Start Experiment" button].

Notice that this square [use the track pad as well as an ostensive point to direct the participant's attention to the square comprising the bottom-left quadrant] is labeled 'NONE'. While you are watching the movie, I want you to select this square anytime the clip does not make you feel either positive or negative emotions. For example, you would select this square if the movie does not make you feel either happy or sad. You select this square by sliding and holding your finger so that this square turns blue [demonstrate for participant by using the track pad].

Now look at this square [use the track pad as well as an ostensive point to direct the participant's attention to the square comprising the bottom-right quadrant]. Notice that this square is labeled 'HAPPY'. I want you to select this square anytime the movie makes you feel positive emotions. For example, if you were watching the movie and began to feel happy or glad then you would select this square. You select this square by sliding and holding your finger so that this square turns blue [demonstrate for participant by using the track pad].

Now look at this square [use the track pad as well as an ostensive point to direct the participant's attention to the square comprising the top-left quadrant]. Notice that this square is labeled 'SAD'. I want you to select this square anytime the movie makes you feel negative emotions. For example, if you were watching the movie and began to feel sad or distressed then you would select this square. You select this square by sliding and holding your finger so that this square turns blue [demonstrate for participant by using the track pad].

Lastly, look at this square [use the track pad as well as an ostensive point to direct the participant's attention to the square comprising the top-right quadrant]. Notice that this square does not have a label. We are going to call this square the 'BOTH' square. Remember, this is very important, even though this square is not labeled, it is the 'BOTH' square. I want you to select this square anytime the movie makes you feel both positive and negative emotions at the

same time. For example, if you were watching the movie and began to feel happy but also sad then you would select this square. You select this 'BOTH' square by sliding and holding your finger so that this square turns blue [demonstrate for participant by using the track pad].

Before we start, let's get some practice. We are going to watch some sample movie clips and I want you to select the square that best represents how the clip makes you feel. Remember, to select a square you slide and hold your finger so that the correct square turns blue.

[*Ensure "Subject ID Number", and "Save Data to" fields are correct.* Load H.wmv and start program. Adjust sound if necessary and allow participant to respond to clip]

1. How did this clip make you feel? [Allow participant to answer]. This clip was pretty happy. Which square did you select to indicate that the movie made you feel happy or positive [or use participant's words]? [Allow participant to select 'HAPPY' square on paper grid]

- [If participant selects the correct square, provide oral feedback and proceed to the next comprehension probe] Good work!
- [If participant selects the incorrect square, assert correction with ostensive point to correct square and provide oral redress] Remember, if watching a part of the movie clip makes you feel happy or glad, then you should select the 'HAPPY' square. [Allow participant to make correction then provide oral feedback and proceed to the next comprehension probe]

Let's try another practice. [*Ensure "Subject ID Number", and "Save Data to" fields are correct.* Load S.wmv and start program. Adjust sound if necessary and allow participant to respond to clip]

2. How did this clip make you feel? [Allow participant to answer]. This clip was pretty sad. Which square did you select to indicate that the movie made you feel sad or negative [or use participant's words]? [Allow participant to select 'SAD' square on paper grid]

- [If participant selects the correct square, provide oral feedback and proceed to the next comprehension probe] Good work!
- [If participant selects the incorrect square, assert correction with ostensive point to correct square and provide oral redress] Remember, if watching a part of the movie clip makes you feel sad or negative, then you should select the 'SAD' square. [Allow participant to make correction then provide oral feedback and proceed to the next comprehension probe]

Let's try another practice. [*Ensure "Subject ID Number", and "Save Data to" fields are correct.* Load N.wmv and start program. Adjust sound if necessary and allow participant to respond to clip]

3. How did this clip make you feel? [Allow participant to answer]. This clip was neutral. Which square did you select to indicate that the movie did not make you feel any emotions [or use participant's words]? [Allow participant to select 'NONE' square on paper grid]

- [If participant selects the correct square, provide oral feedback and proceed to the next comprehension probe] Good work!
- [If participant selects the incorrect square, assert correction with ostensive point to correct square and provide oral redress] Remember, if watching a part of the movie clip does not make you feel any emotions, then you should select the 'NONE' square. [Allow participant to make correction then provide oral feedback and proceed to the next comprehension probe]

Let's try one last practice. [*Ensure "Subject ID Number", and "Save Data to" fields are correct.* Load A.wmv and start program. Adjust sound if necessary and allow participant to respond to clip]

4. How did this clip make you feel? [Allow participant to answer]. This clip might have made you feel both happy and sad at the same time. Which square did you select to indicate that the movie made you feel both positive and negative emotions [or use participant's words] at the same time? [Allow participant to select 'BOTH' square on paper grid]

- [If participant selects the correct square, provide oral feedback and proceed to the final instructions] Good work!
- [If participant selects the incorrect square, assert correction with ostensive point to correct square and provide oral redress] Remember, this is the 'BOTH' square and if watching a part of the movie clip makes you feel both positive and negative emotions at the same time, then you should select the 'BOTH' square. [Allow participant to make correction then provide oral feedback and proceed to the final instructions]

We are about to start, but before we do I want to set the scene for the clip you are about to watch. This movie is set in Nazi Germany during World War II. Of the many horrible things that took place during this time, one of the worst was that many families were broken apart. People were taken from their loved ones and imprisoned in concentration camps where they faced slavery and the constant threat of death. Despite this horrific reality facing many of those who experienced these camps, some people persevered and lived remarkable lives.

Okay, before we start do you have any questions? [Answer any questions the participant may have].

Please keep in mind that it is important to maintain your focus on the movie clip as well as how it makes you feel for the full time that the movie is being shown. How you feel as you watch the film may change throughout the clip and so it is important that you continue to update how you feel by selecting the appropriate square. Remember, focus on the movie clip and how it makes

you feel and select the square that most accurately characterizes your feelings at that time. Ready?

[*Ensure "Subject ID Number", and "Save Data to" fields are correct.* Load TEST.wmv and start program. Adjust sound if necessary and allow participant to respond to clip]

[If you notice that the participant is being inattentive, provide the following directive] Remember, focus on the movie clip and how it makes you feel and select the square that most accurately characterizes your feelings.

[If you notice that the participant is perseverating in one square, provide the following directive] Remember, how you feel may change throughout the clip and so it's important that you update how you feel by selecting the appropriate square.

VITA

Dallas Andrew Callaway was born in Grande Prairie, Alberta, Canada, to parents Timothy and Joyce Callaway. At two years of age, Dallas moved with his family to Calgary, Alberta, Canada where he spent the remainder of his childhood and adolescence engaging in passions for athletics, family, fictional literature and film, and the social sciences including history and philosophy.

Dallas attended the University of Calgary in 2005 as a Bachelor of Science in Kinesiology major; however, after two years of study in this discipline, changed the direction of his theretofore post-secondary career in pursuit of a Bachelor of Arts in Psychology. During his final year of study at the University of Calgary, Dallas completed his Honours Thesis in Psychology under the mentorship of Susan A. Graham, whom he credits with influencing his perspectives on scientific practices generally and shaping his interests in the scholarly activity of clinical psychology specifically. In 2010, Dallas graduated First Class Honours from the University of Calgary. He then went on to enroll in the doctoral program in clinical psychology at the Louisiana State University where he currently studies schizophrenia and psychotic disorders under the mentorship of Alex S. Cohen.