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Schizotypy: the dynamic relationship between trait and state processes

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SCHIZOTYPY: THE DYNAMIC RELATIONSHIP BETWEEN TRAIT AND STATE PROCESSES

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ABSTRACT

Importantly, elevations in emotional reactivity to stress are often found in individuals vulnerable for psychosis. This study investigated several meaningful factors that appear to either increase vulnerability to stress (degree of schizotypy traits, trait negative affect, low perceived control, and impaired selective attention), or increase resiliency to stress (trait positive affect). A modified Posner spatial-cueing task utilizing affective cues was employed to assess selective attention within a neutral and an uncontrollable stressor condition. Between group differences (high, medium and low in schizotypy traits) and interactions between affective traits, state affect, and perceived control were evaluated in order to shed light on how specific dispositional vulnerabilities increase risk for future psychosis. Findings suggest that individuals high in schizotypy traits overall displayed greater attention vigilance than the other two groups. Importantly, this heightened attention vigilance appeared to be influenced by increased stress (presumably mediated by their increase in negative affect and low perceived control) and threatening negative affective cues. Thus, while the high trait schizotypy group displayed "better" attention performance than those medium and low in schizotypy traits, it is important to consider the consequences (e.g., attentional vigilance appears to come at the cost of narrowing attentional focus) and the underlying mechanisms (e.g., activation of the stress response systems) that may have contributed to this performance enhancement.

Keywords: schizotypy, selective attention, negative affect, positive affect, stress, perceived control, social evaluative threat

CHAPTER 1. INTRODUCTION

Research suggests that while certain perceptual aberrations (e.g., hallucinations and delusions) frequently occur within the general population, development of a psychotic disorder is not common (Loewy, Johnson & Cannon, 2007; for review see, van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). This leads to the question, if certain psychotic symptoms are continuous throughout the population, how can they be useful in prognosis (i.e., when do they become clinically relevant)? van Os and colleagues' meta-analysis (2009) on the persistence of psychosis indicates that psychosis proneness becomes clinically relevant, contingent on an individual's exposure to additional risk factors. In accord with this, vulnerability-stress models of schizophrenia posit that environmental stressors interact with underlying dispositional vulnerabilities to influence the onset and course of psychotic symptoms (e.g., Nuechterlein et al., 1992). Consistent with this notion, there is an abundant amount of research that suggests psychosocial stress contributes to both the manifestation and course of the disorder (i.e., symptom exacerbation; Nuechterlein et al., 1992; Ventura, Nuechterlein, Subotnik, Hardesty & Mintz, 2000; for review, see Walker, Mittal, & Tessner, 2008). Thus, by approaching the etiology of schizophrenia as an aggregation of factors (i.e., dispositional vulnerability factors that interact with environmental risk factors; Cannon & Keller, 2006; Cannon et al., 2008), it is possible to make better clinical prognosis (i.e., identify individuals at high risk for a psychotic disorder); which optimistically will enable the development of more effective interventions early on in order to ameliorate the devastating effects of the disorder. In this regard, examining what characteristics may increase or decrease individuals' vulnerability to stress remains an important direction for research. The primary goals of this project were to (1) shed light on potential underlying mechanisms (affective traits and selective attention) that might influence stress reactivity, (2) investigate the complex interplay between stress reactivity and individual differences that have been shown to moderate stress responses (affective traits, perceptions of control, and selective attention), and (3) examine whether these relationships differ between individuals higher in traits associated with a putative genetic liability for schizophrenia (i.e., psychometrically defined schizotypy) as compared to those medium or low in schizotypy traits. A modified Posner spatial cueing task was employed to assess selective attention within a neutral performance condition and an uncontrollable, social evaluative threat (SET) stress condition. Between group differences (high, medium and low in schizotypy traits) and interactions between affective traits, state affect, selective attention, perceived control were evaluated in order to shed light on how specific dispositional vulnerabilities might increase risk for future psychosis.

Given the complexity of the project's topics, a brief overview of the project's variables is presented. Next, context for the Stress-Illness Relationship is provided. This is followed by a discussion on individual trait differences that influence state-stress reactivity. Subsequently, emotion regulation processes in response to stress are elucidated. This requires the definition and explanation of systems involved in the emotional-appraisal process. A brief discussion of schizophrenia and schizotypy follows. These variables are then integrated and presented within the project's hypotheses. Last, an outline of the project's aims and their specific hypotheses are provided. To conclude, results and implications are discussed.

1.1 Overview

Research in both clinical and non-clinical populations suggests that specific dispositions serve as important moderators of the stress response given their influence on both subjective and biological responses to stress. In particular, trait negative affect (NA) and trait positive affect (PA) are important individual difference variables that appear to play key differential roles in moderating individuals' psychophysiological responses to stress (Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2004). Affective traits are predispositions that, both directly and indirectly, influence our responses to stress. Trait negative affect reflects the general tendency to experience negative emotional states, and is highly correlated with heightened perceptions of stress (Watson, Clark, & Tellegen, 1988), while trait positive affect reflects the general tendency to experience positive emotional states, and appears to increase the efficiency with which one approaches adverse events (Isen, 1993). Additionally, individual differences in how we perceive events greatly affects our psychological and physiological reactions to stress, such that stressors which are perceived as uncontrollable and/or have negative social evaluative component to them elicit large psychobiological responses to stress (for meta-analysis, see Dickerson & Kemeny, 2004). Furthermore, selective attention systems appear to play a role in an individual's ability to regulate emotional responses to stress (Ochsner & Gross, 2007; 2008). Importantly, schizophrenia spectrum disorders are often characterized by high trait negative affect and low trait positive affect (Horan, Blanchard, & Green, 2008) and low perceived control in reaction to stressful life events (Horan et al., 2005), as well as impaired selection attention (Gold & Luck, 2008). Furthermore, these vulnerability factors are also found in individuals identified as being at high-risk for schizophrenia (i.e., schizotypy; Gooding, Tallent & Matts, 2005). While research within schizophrenia spectrum disorders have examined most of these factors respectively, their relationship with stress is most likely to be an interaction and not a one-to-one relationship. Thus, this study employed a laboratory stressor in order to allow these relationships to be examined concurrently within individuals high, medium and low in schizotypy traits.

1.2 Understanding the Stress-Illness Relationship

To begin, what exactly is stress? From a biological standpoint, stress is the disruption of an organism's homeostasis. Stressors can be physiological (e.g., food deprivation) or psychological (e.g., fear provoking situations) in their nature. This thesis will focus on psychological stressors and, for simplicity, stress is defined as an environmental or physiological challenge that activates a series of biological events that provides the organism with the capacities for compensating with the challenging events. In this regard, stress is an adaptive process that serves to activate biological processes that allow individuals to handle challenges as they arise. General Adaptation Syndrome (GAS; Selye, 1950) suggests that adaptability to stress is a necessary component to an individual's overall well-being and survival. According to this theory, the initial response is an adaptive response that alerts one to the presence of the stressor (i.e., the alarm stage), which is subsequently followed by the activation of stress response systems in order to adapt and reestablish homeostasis (i.e., the resistance stage). However, should the stressor continue for long durations, the result is a depletion of system resources due to the constant metabolic demand (i.e., the exhaustion phase).

Many physiological systems are involved in our responses to stress, however the Hypothalamic-Pituitary-Adrenal Axis (HPA Axis) plays the largest role as it regulates a wide range of physiological systems in response to stress. These systems are important determinants in both our psychological and behavioral reactions to the experience of stress, in which the HPA Axis has been posited to be the underlying mechanism involved in the stress-symptom relationship (Walker et al., 2008). Consistent with GAS theory, when we experience stress a certain region of the brain serves as the alarm (i.e., the amygdala), when the amygdala activates in response to stress it alerts the paraventricular nucleus of the hypothalamus, the coordinator of the HPA Axis. Once the hypothalamus has been activated, it releases corticotrophin-releasing hormone (CRH) that sends signals to the pituitary cells to release adrenocorticotropic hormone (ACTH) onto the adrenal gland. ACTH then travels to the adrenal gland where it stimulates the release of stress hormones (cortisol and aldosterone) into the blood stream. The release of these stress hormones into the blood stream, particularly cortisol, prepares the body for action by initiating catabolic processes and engagement of the sympathetic nervous system. In the short-term, this biological cascade has adaptive effects that increase an individual's psychophysiological capacities in order to manage stressful events rather than disengaging due to limited physiological resources. However, consistent with Selye's exhaustion phase, chronic activation takes a toll in that it depletes physiological resources, and often results in the dysregulation of stress response systems (for review, see McEwen, 2007). In particular, periods of prolonged stress result in the failure of regulatory systems to provide negative feedback inhibition; as a consequence cortisol continues to be released into the bloodstream causing debilitating effects throughout the body and on cognitive systems (see Seeman, McEwen, Rowe, & Singer, 2001).

There is a large body of work that includes animal models, laboratory psychosocial stressors, and post-mortem research that suggests prolonged periods of stress impacts multiple regions of the brain (e.g., amygdala, hippocampus, and PFC) that are associated with functional deficits across an array of clinical disorders (for reviews, see LeDoux, 1996, 2000; McEwen, 2007; Sapolsky, 2004). Furthermore, dysregulation of the HPA Axis stress response system is associated with the development of several major mental disorders and symptom exacerbation (anxiety, depression and schizophrenia). Specifically, dysregulation in diurnal cortisol secretion patterns are related to increases in clinical symptom levels within schizophrenia disorders (Walker & Diforio, 1997; Walker, Mittal, & Tessner, 2008). Additionally, it has been found that schizophrenia patients fail to suppress corticotropic hormones as compared to controls in response to pharmacological challenge, thus indicating a malfunction in the negative feedback inhibition of the HPA axis (i.e., a failure to turn off the stress response; Walker et al., 2008). Similarly, elevated cortisol levels are found in individuals displaying subclinical psychosis prior to their conversion to an Axis I disorder (as defined by Diagnostic and Statistical Manual of Mental Disorders, 4th edition: DSM-IV; American Psychiatric Association, 1994). In a longitudinal study that examined individuals at high-risk for a psychotic disorder (i.e., those displaying subclinical levels of psychosis) cortisol levels were measured at three different time points, Walker and colleagues (2010) found an escalating cortisol secretion pattern over the 12-14 month period in the clinically at high-risk adolescents who converted to an Axis I psychotic disorder. Importantly, elevated cortisol responses are not consistently found in response to psychological distress, in which several groups have found that chronic schizophrenia patients compared to non-psychiatric controls fail to mount a proper response to psychosocial stress (as defined by lower cortisol levels; for review see, Bradley & Dinan, 2010). Lastly, in further support of HPA axis dysregulation within schizophrenia, there is abundant evidence that has shown that antipsychotic medications used to treat schizophrenia significantly dampen HPA activity (Walker et al., 2008). In summary, combined research provides ample evidence that HPA axis dysregulation is a feature of schizophrenia.

1.3 Individual Differences in Stress Reactivity

Despite the robust relationships found between psychosocial stress and psychological well-being, it is important to note that not everyone who experiences significant life stress goes onto develop a clinical disorder. Thus, individual differences in stress reactivity likely plays a determinant role in the stress-illness relationship; in which, several dispositional factors have been determined to affect both psychological and physiological responses to stress. Importantly, as I will discuss later, these dispositional factors are also linked to clinical outcomes within schizophrenia spectrum disorders.

From a psychological perspective, stress can be thought of as a consequence of the appraisal process (see Taylor, 2010). In this definition, the meaning of the event and whether it is perceived to be stressful is determined by the *primary appraisal* (Lazarus & Folkman, 1984). Taylor and others argue (e.g., Cohen, Kamarck, & Mermelstein, 1983) that because individuals vary so greatly in their subjective responses to the same situations, the best indicator of experienced stress depends upon the individual's perceptions of the event. For instance, imagine a scenario in which two individuals are guests attending the same wedding, and even though both individuals positively support the couple's pending nuptials and neither are acquainted with any other guests, one guest experiences significant distress regarding the event while the other guest experiences no distress. According to appraisals theories, we can conjecture that the first individual perceives the wedding as having negative consequences (e.g., I don't know anyone and I will embarrass myself) that are both uncontrollable and threatening to his/her social self, whereas the second individual envisions the wedding as a welcomed challenge (e.g., This is a great opportunity to make new friends). This example illustrates that it is not the situation per se that determines whether the event is perceived to be stressful. Which leads to the question, if the experience of stress is a consequence of an individual's perceptions of the event – what are the potential underlying mechanism involved in this process? To answer this question, this project (1) discusses individual differences that moderate stress reactivity, (2) both defines and explains the process of emotional regulation, and (3) synthesizes these research findings in order to propose a model that elucidates how individual differences found within high-risk individuals (i.e., those high in psychometrically defined schizotypy traits) may lead to future psychosis. In doing so, the interdependence of affective systems and attentional control are highlighted with a specific focus on perceptions of controllability and social threat in relation to stress.

Stress reactivity is a dynamic process that engages several psychobiological processes in order to cope with sources of stress. Emotions in particular appear to promote physiological states that serve not only basic survival, but also overall states of well-being (Damasio, 2004). Specifically, it has been found that individuals who experience more positive affective states (e.g., joy and enthusiasm) have faster physiological recovery and generally lower cortisol output following stress; whereas, negative affective states (e.g., anger or shame) are associated with heightened physiological reactivity (as measured by cardiovascular responses) to stress and slower recovery following stress (Polk, Cohen, Doyle, Skoner & Kirschbaum, 2005; Steptoe, Gibson, Hamer, & Wardle, 2007; Tugade & Fredrickson, 2004).

Interestingly, cortisol reactivity to stress appears to have differential relationship with state affect as compared to trait affect, in which differences in cortisol rhythmicity display a stronger relationship with trait then state affect. For instance, Polk and colleagues (2005) collected cortisol assays in a non-clinical population over a three-week period and found that trait negative affect and not state negative affect predicted higher total cortisol concentrations. Additionally, males lower in trait positive affect displayed a relatively high-flat cortisol rhythm, whereas females higher in trait positive affect displayed lower basal and overall cortisol concentrations. State positive affect was only associated with lower basal cortisol concentrations in females. Additionally, Kemeny and Dickerson's meta-analysis (2004) suggested that subjective distress and state negative affect did not predict cortisol change in response to stress in healthy individuals. In this regard, cortisol reactivity appears to be a function of underlying traits that influence perceptions of the event. As previously discussed, one's perceptions about the event will determine if the event is stressful; however not all stressful events appear to elicit cortisol responses. According to Kemeny and Dickerson's meta-analysis (2004), it is specifically events that are determined to be uncontrollable and/or that have social evaluative threat that appear to elicit cortisol release (further detail provided below). Consequently, the extent to which an individual perceives an event as uncontrollable and/or as a social evaluative threat appears to play a critical role in HPA activation.

As mentioned earlier, perceptions of control and social evaluative threat are important determinants in stress reactivity. Perceived control and social evaluative threat appear to play an important role in an individual's ability to effectively cope with psychosocial stress, as it appears to be integrally related to activation of stress response systems that serve the goal of maintaining one's social status and group acceptance (i.e., Social-Self Preservation Theory; Dickerson, Gruenewald, & Kemeny, 2004; Gruenewald, Kemeny, Aziz, & Fahey, 2004). Perceived control refers to the conscious process by which an event is determined to be manageable, or more simply put, it can be thought of as the extent to which an individual/organism believes that they have the resources and capability to manage an event. Perceptions of controllability appear to be enhanced by positive emotions (for review, see Folkman & Moskowitz, 2000), whereas an increased expectancy of uncontrollable negative events is associated with increased negative emotions and decreased feelings of self-efficacy (see Bandura, 1997). Moreover, Diehl and Hay (2010) using ecological momentary assessment techniques found that individuals within a broad age range (18-89 years old) report higher negative affect on days in which they felt less in control with this effect being strongest in adolescents. Similarly, perceived social evaluative threat is associated with increased negative emotions and physiological reactivity to stress. In an experiment that elicited negative emotions through negative social-evaluation (shame condition) or hostile false feedback (anger condition) as compared to pride through positive social-evaluation, participants in the negative emotion conditions appraised the task as significantly more threatening and difficult, and displayed increased autonomic arousal (cardiovascular reactivity) to the task, whereas participants who had pride elicited perceived the same task as having a low situational threat and demand, and displayed significantly lower autonomic arousal in comparison (Herald & Tomaka, 2002). Regrettably, given the correlational nature of these studies directionality of the relationship between affect with perceptions of control and social threat cannot be determined. However, it is worth noting that basic research utilizing animal models of controllability appear to suggest that affective systems are involved in the motivational deficits that occur in response to chronic uncontrollable stress (for review, see Cabib & Puglisi-Allegra, 2012).

1.4 Emotion Regulation

Emotion regulation refers to the ability to monitor and control the expression of emotional states via evoked thoughts and behaviors (Richards & Gross, 2000). While there exists a variety of emotional regulatory processes, this thesis focuses on a modified version of Richard's and Gross' conceptualization of antecedent-focused emotion regulation (a.k.a., reappraisal). According to their model, reappraisal strategies theoretically occur early in the emotion-generative process, and entails reconstructing the meaning or diminishing the emotional relevance of the stressor. As explained below, the view of this project is that the relationship between emotions and appraisal processes are bidirectional in nature. Thus, this thesis abdicates the temporal relationship between the emotion-generative process and reappraisal in relation to emotion regulation strategies. This distinction is important in that emotions often precede cognitions, especially in response to events perceived as threatening and uncontrollable (LeDoux, 1996, 2000). From here forward, emotion-appraisal interactions will be referred to as emotion regulation strategies.

There is a considerable amount of evidence that perceptions of control and threat are associated with the experience of specific affective traits. However, as mentioned earlier, a causal link for this relationship remains unclear. Cognitive theorists often deem that appraisals are responsible for emotional responses, yet there is substantial evidence that indicates the relationship between emotions and cognitions is bidirectional. For instance, fear activation occurs independent of, and often precedes, conscious cognition (see Ohman & Wiens, 2000). Furthermore, the neural systems involved in emotional appraisals are disparate from the systems involved in cognitive appraisals, in that brain damage to areas responsible for cognitive appraisals does not impact emotional reactions (LeDoux, 2000). Thus, overall, emotional organization appears to be an interaction of appraisal and affective systems. Given the complexity of the underlying systems involved in cognitive appraisals and emotions, and the long-standing debate regarding the causality (e.g., Zajonc, 1980, 1984 vs. Lazarus, 1984) it is outside the scope of this project to further weigh in on this controversy. However, as suggested above, this thesis posits that emotion regulation is an interaction between appraisal processes and affective systems. Evidence for this is position is provided in array of interdisciplinary studies that have examined these processes (e.g., Manstead, Frijda, & Fischer, 2004).

1.5 Biological Correlates of Emotion Regulation

As previously discussed, dysregulation of stress response systems (particularly the HPA axis) is associated with the development of several clinical disorders. Importantly, individual differences in the ability to down-regulate negative affect is associated with more adaptive diurnal cortisol rhythms in seniors (Urry et al., 2006) as well as adults (Polk et al., 2005). Previous research indicates that PFC projections to the amygdala exert a top-down, inhibitory influence over negative affective states (Ochsner & Gross, 2005; Phan et al., 2005; Urry et al., 2006). However, being that there are no direct connections between the PFC and the amygdala, the PFC's influence over the amygdala, and thus stress reactivity, is indirect and appears to be mediated by other regions (LeDoux, 1996, 2000). Specifically, the top-down-regulation of negative affect and dampening of HPA axis stress responses via cognitive reappraisals appears to be a function of PFC sent signals (presumably via the medial PFC) to the amygdala (Urry et al., 2006). In response to these signals, amygdala activity is attenuated and its projections to the hypothalamus are inhibited, thereby reducing/halting further cortisol secretion from the HPA axis. Conversely, increasing negative affect via negative cognitive appraisals (i.e., up-regulation of negative affect) is associated with increased amygdala activation, which supports further cortisol release (Urry et al., 2006). In summary, it appears that intentional regulation of negative affect is dependent on regions of the prefrontal cortex (PFC) and the amygdala; and that these structures directly and indirectly communicate with the HPA-axis. These findings suggest that individual differences in the ability to regulate negative affect are important determinants in adaptive HPA axis function.

1.6 Selective Attention and Emotion Regulation

Information processing models suggest that affective stimuli receive preferential processing via a complex interplay between affective systems and selective attention (Raymond, 2009). Attention, in humans, can be defined as the process by which information is extracted from the environment or internal structures such as memory (Smith & Kosslyn, 2010). Through this process, we are able to focus on specific information usually at the expense of other information. Importantly, while there exists a variety of opposing theories regarding what makes up the construct of attention, it is generally in agreement that attention is not a unitary construct. Posner and Petersen (1990) posited that there are 3 major components to attention: alerting (vigilance maintenance), orienting (selective attention), and executive control (conflict resolution of competing information). As this section will discuss, the orienting response plays a particularly important role in our ability to regulate emotional distress. For this reason, this study will primarily focus on the orienting response.

As noted, the processing of information comes at a cost to other information, in which the orienting response is believed to be the mechanism by which information selection occurs. Posner (1980) defined the orienting response as the alignment of attention with sources of sensory information and/or internal semantic structures that are stored in memory. Posner further specified that orienting responses occur to both internal and external information, and involves covert and/or overt eye movement. According to Posner (1980), three processes are involved in the orienting of attention; in order to engage attention to process new information: (1) an individual needs to disengage from what they are currently attending to, (2) redirect/shift their focus to the new information, (3) engage attention to the new information. In this paradigm, selective attention is directed towards locations in space. Thus, the efficiency of orienting responses may be tested by measuring the ability to detect information at various spatial locations via respective examination of reaction times to valid and invalid cue trials. Posner reasoned that presenting a cue that signals the location of information to be processed (i.e., the target) should enhance reaction times in response to the target. Conversely, in invalid-cued trials the cue does not direct attention towards the target's location rather the cue directs attention away from the target's spatial location (i.e., invalid), thus attention needs to be disengaged from the invalid cue location and shifted to the target location. This process of disengage-shift-engage comes at a response cost, in which invalid cue trials have significantly longer reaction times (Posner, 1980). These longer reaction times to invalid trials are an indication that attention is being engaged at the invalid cue location at the cost of processing new relevant information (i.e., the target). In this way, the Posner paradigm (i.e., spatial cueing task) provides an empirically validated method of investigating selective attention through the examination of orienting responses following an invalid as compared to a valid cue.

Attention and emotion are both important mechanisms that contribute to the selection of information that will receive prioritization in processing (Raymond, 2009). Affective systems play a significant role in directing attention to relevant environmental cues prior to conscious awareness and other high-order processes (Crawford & Cacioppo, 2002). Research suggests that distinct affective systems guide attention in response to stressful situations. Both positive affect and negative affect have been shown to differentially influence attentional processes. Negative affective stimuli appears to be particularly effective at capturing attention outside of conscious awareness, in which it has been argued that preferential processing for negative stimuli would have evolved due to its important adaptive features (Zajonc, 1984). Bradley (2009) argued that orienting responses are not disparate from emotions, in that orienting engages the same motivational systems and also appears to be mediated by activation of these systems that have evolved to support survival. Consistent with these theories, affective systems are able to recruit attentional processes. This relationship appears to be bidirectional, in that trait negative affect is associated with an impaired ability to shift attention, which in turn appears to maintain states of negative affect (Fox, Russo, Bowles & Dutton, 2001). Conversely, positive affect is associated with enhanced attention performance on a global-local visual processing task (Fredrickson & Branigan, 2005).

The ability to efficiently orient responses is an important component to emotion regulation processes. Inability to efficiently orient responses has been associated with increased emotional reactivity (Compton, 2000), as well as several clinical disorders (e.g., Gooding, Braun, & Studer, 2006; Jongen, Smulders, Ranson, Arts & Krabendam, 2007; Koster, Leyman, Raedt, & Crombez, 2006). Negative attentional biases have long been proposed as a feature of depression, in which several studies have found that depressed patients allocate more attention to negative faces than happy faces, interpret faces as being more negative than non-depressed controls, and have greater memory for negative events (for review, see Fossati, 2008). Several studies that have utilized Posner's spatial cueing task to test orienting responses have found significant between group differences that appear to be moderated by affect. Compton (2000) found that an impaired ability to disengage attention during a spatial cueing task predicted individuals that reported greater amounts of negative affect following an experimental mood induction designed to elicit emotional distress (i.e., a film clip of holocaust survivors' recount of atrocities that occurred during Nazi occupation). Conversely, Ellenbogen, Schwartzman, Stewart, and Walker (2002) investigated orienting responses within three distinct conditions (uncontrollable stressor, reward stressor and neutral task conditions). They found that participants in the uncontrollable stressor condition displayed rapid disengagement (i.e., faster to shift away from invalid cues) to negative affective word cues as compared to neutral or positive affective cues; and this rapid disengagement from negative words associated with stress-induced changes in mood (i.e., increased negative affect). Of further interest, individual differences appeared to influence the relationship between condition and attention disengagement, such that psychometrically defined high dysphoric individuals displayed impaired attentional disengagement following the uncontrollable stressor, but not the neutral or reward condition. Given these findings, this study investigated the complex interplay between performance condition (neutral vs. uncontrollable stressor) and the cue's affective valence and validity across conditions (using a repeated measure design).

1.7 Vulnerability Stress Models and Schizotypy

The last dispositional factor to be discussed is that of schizotypy. It has been proposed that the underlying genetic vulnerabilities that contribute to the development of schizophrenia are also present in individuals with schizotypal personality disorder (SPD; for review, see Walker, Kestler, Bollini, & Hochman, 2004). DSM-IV (APA, 1994) defined SPD shares many of the features of schizophrenia, such as cognitive and affective disturbances (e.g., delusional beliefs and inappropriate affect). Consistent with vulnerability stress models of schizophrenia that posit functional deteriorations in cognitive and behavioral functioning are observed prior to disorder onset, adolescents with SPD display similar but less severe neurocognitive deficits, as well as subclinical symptoms (Walker, Kestler, Bollini, & Hochman, 2004). Furthermore, research indicates that SPD individuals also display increased sensitivity to stress as suggested by higher cortisol levels when compared to other personality disorders and individuals without a DSM diagnosis (Mittal, Dhruv, Tessner, Walder & Walker, 2007; Weinstein, Diforio, Schiffman, Walker, & Bonsall, 1999). Remarkably, certain studies have found that a large proportion (20-40%) of adolescents displaying schizotypal symptoms go onto to develop an Axis I schizophrenia spectrum disorder (for review, see Walker et al., 2004); however, this large effect is not always consistently found (e.g., Gooding, Tallent, & Matts, 2005). Nevertheless, the use of schizotypy samples provides functional information that can serve to enhance our understanding of certain individual differences that have been associated with increased stress reactivity and symptomatology within the schizophrenia spectrum disorders. Also, importantly, it allows us to examine these features prior to conversion and confounding factors such as medication effects (Gooding et al., 2005).

An economically and empirically supported way of identifying schizotypy samples is through the use of psychometric scales. Similar to individuals with schizophrenia and SPD, psychometrically defined schizotypal individuals report higher levels of negative affect, lower levels of positive affect, and greater usage of avoidant coping strategies (Horan, Blanchard, Clark, & Green, 2008; MacAulay & Cohen, 2013). Additionally, schizotypal traits have been associated with abnormalities in HPA axis functioning, in which high positive symptoms scores on the Schizotypy Personality questionnaire (SPQ; Raine, 1991) are associated with abnormal cortisol reactivity (i.e., enhanced cortisol suppression) in response to pharmacological challenge (Hori et al., 2011). Furthermore, individuals who score high on self-report measures of schizotypal traits display similar but less severe deficits in attention on continuous performance tasks (CPT; as measured by d' and reaction time; Chen, Hsiao, & Lin, 1997; Lenzenweger, Cornblatt, & Putnick, 1991) and poor executive control on the Wisconsin Card Sorting Task (Chang et al., 2011). Our group has also found that SPQ identified schizotypal individuals perform significantly worse on a measure of attention span (i.e., digit span tasks) but do not significantly differ from controls on other measures of cognitive functioning (MacAulay & Cohen, 2013). Collectively, these studies suggest that psychometrically defined schizotypy samples provide a suitable way of examining underlying characteristics that may lead to aberrant stress responses within schizophrenia spectrum disorders.

As discussed, individual differences in stress reactivity appear to play a determinant role in the stress-illness relationship. It has been well established that perceived control and the systems involved in emotion regulation affect both psychological and physiological responses to stress. Importantly, these same dispositional factors appear to be stable characteristics of individuals along the schizophrenia spectrum. For example, there exists a robust relationship between high levels of trait negative affect and lower trait positive affect in relation to symptom manifestation and exacerbation within the schizophrenia literature (Horan et al., 2008). Furthermore, elevations in negative emotional reactivity to stress are often found in individuals vulnerable for psychosis (Myin-Germeys & van Os, 2007). Additionally, recent-onset schizophrenia patients appraise minor life-events as significantly less controllable than non-psychiatric controls (Horan et al., 2005). Notably, experience-sampling methods suggest that schizophrenia patients experience less control over their thoughts and increased physiological arousal in conjunction with reported elevations in negative mood (Kimhy et al., 2010). Bak and colleagues (2007) proposed that perceptions of control are entirely emotionally regulated rather than guided by top-down executive function in schizophrenia patients. Remarkably, adolescents' perceptions of control (as measured by locus of control) was the best predictor of schizophrenia onset found in the National Institute of Mental Health's (NIMH) longitudinal Israeli High-Risk Study (Frenkel, Kugelmass, Nathan, & Ingraham, 1995). Taken together, given the relationship between perceived control and stress, perceptions regarding the experience of control appear to be an important vulnerability marker for schizophrenia. However, to our knowledge, no study has examined the complex interplay between perceived control and affective traits within a high-risk group in response to an uncontrollable stressor task. Thus, the proposed study will assess individual differences in affective state reactivity in relation to affective traits, perceived control, and schizotypy traits (high, medium vs. low) following an uncontrollable, social evaluative threat stress condition.

While attention functioning in general appears to be impaired within schizophrenia (Luck & Gold, 2008), it is selective attention (as previously defined by Posner 1980) and its respective components that have garnered support as a potential biomarker for the disorder (for review, see Luck, Ford, Sarter, & Lustig, 2011). A plethora of studies have detected specific deficits in visual spatial orienting, as well as top-down (executive control) attentional processes within schizophrenia spectrum disorders (e.g., Gooding et al., 2006; Wang et al., 2005; Neuhaus et al., 2011). Furthermore, both schizophrenia and schizotypy have been associated with abnormalities in the ability to habituate orienting responses to auditory stimuli (as measured by skin conductance; Nuechterlein & Dawson, 1984; Raine, Benishay, Lencz, & Scarpa, 1997). Importantly, underlying deficits in orienting responses have been proposed as a biomarker for the disorder and also appear to be strongly related to attentional asymmetries (right vs. left hemisphere dysfunction; Maruff, Hay, Malone, & Currie, 1995). Never-medicated First Episode schizophrenia patients show an abnormality in the shifting of visual attention towards the right but not the left visual field (Posner, Early, Reiman, Pardo, & Dhawan, 1988). SPD individuals as compared to a control group have been shown to also have longer reaction times to invalid cues that require disenagement from the left visual field but not the right visual field (Moran, Thaker, Laporte, Cassady & Ross, 1996). Similar but less severe deficits in attention processes have also been observed in patients' first-degree relatives (Chirio et al., 2010). Interestingly, findings in attentional asymmetries in shifting responses have been extended to non-clinical populations, such that disengagement from the left hemifield to negative words as compared to neutral words appears to be enhanced following a stressor (Ellenbogen et al., 2002). Finally, to our knowledge, no study has examined the orienting responses within psychometrically defined schizotypy. However, it is plausible that selective attention deficits are evident in psychometrically defined schizotypal individuals. As previously mentioned, studies that have examined selective attention within psychometrically defined schizotypy have primarily measured d' (i.e., assessment of the difference between correctly identified targets and distractors), in which, impairments in d' could also reflect impaired selective attention. A goal of this study will be to investigate whether psychometrically defined schizotypal individuals differ in their orienting response when compared to demographically matched individuals who are lower in schizotypy traits.

1.8 Purpose

Stress reactivity serves an adaptive purpose in the short-term; however chronic activation of stress response systems appears to play a causal role in the development of schizophrenia spectrum disorders, in which a plethora of research suggests that psychosocial stress increases the risk for psychosis (Walker et al., 2008). However, as discussed not everyone who is exposed to stress develops a clinical disorder and not all schizophrenia patients who are exposed to stress experience symptom exacerbation. This study has introduced several meaningful factors that appear to (1) increase vulnerability to stress, or (2) decrease vulnerability to stress. While research within schizophrenia spectrum disorders have examined most of these factors respectively, their relationship with stress is most likely to be an interaction and not a one-to-one relationship. Thus, this study employed a laboratory stressor that allowed these relationships to be examined concurrently within individuals psychometrically defined as high, medium or low in schizotypy traits. In the proposed study, two sets of hypotheses were examined.

As previously stated, selective attention (defined by Posner's orienting response) involves three processes: disengage-shift-engage. Faster reaction time to targets in valid cue trials reflects enhanced attentional processing (engagement), while reaction time to targets in invalid cue trials serves as a proxy for the disengagement process. The following were manipulation checks for the study's spatial cueing task design. Based on previous research, it was posited that in the spatial cueing task that (1) accuracy for the target would be good (i.e., there would be a low error rate in correctly identifying which hemifield the target was presented in), and (2) selective attention performance would be impaired (as evidenced by slower mean reaction times) within invalid as compared to valid cue trials.

1.9 Study Aims and Hypotheses

Table 1

Spatial Cueing Task's Repeated Measures Variables with Levels and Between Group Factor

Condition	Cue Type	Cue Valence	Hemisphere	SPQ Group
Neutral	Valid	Positive	left	low
Stressor	Invalid	Negative	right	med
				high

Aim One: What factors influence selective attention (the orienting response)?

The ability to efficiently orient responses is an important component to emotion regulation processes. Inability to efficiently orient responses has been associated with both increased psychological and physiological distress. There is substantial evidence that affective systems recruit attentional processes, in which negative affective stimuli appears to hold attention and impair the disengagement process, whereas positive affective states have been associated with the improved ability to shift attention. Given affective systems influence over attentional processes, it is plausible that affective stimuli moderate sensitivity to stressful events through the orienting of attentional processes. An aim of this study was to examine the interplay between selective attention and uncontrollable stress. This study investigated whether (1) selective attention was differentially influenced by neutral as compared to stressful performance conditions, (2) affective stimuli (positive vs. negative) differentially moderated the orienting response (engagement and disengagement), and (3) whether these patterns were the same in those high, medium, and low in schizotypy traits. Table 1 presents the spatial cueing tasks variables with their respective levels.

Aim one's primary hypotheses investigated what factors influence attention engagement and disengagement. It was hypothesized that:

1. There would be a main effect of condition in which selective attention performance would be impaired by stress (as evidenced by slower reaction times within the stressor as compared to the neutral condition). This effect will be greatest when the cue is invalid as compared to valid (i.e., an interaction between condition and cue validity).
2. Selective attention performance will be impaired by negative affective as compared to positive affective stimuli cues (as evidenced by slower mean reaction times). We were also interested in whether this hypothesized main effect of cue's valence was moderated by condition and validity (i.e., a three-way interaction between cue valence, cue validity and condition). We hypothesized that reaction times would be slower to invalid negative affective cues than valid negative affective cues; and that this effect would be greatest within the stressor condition.

3. We were further interested in whether individual differences in schizotypy traits would moderate the above interaction effects of cue valence and condition. We hypothesized that there would be a three-way interaction between group, cue valence, and condition. Specifically, the high trait schizotypy group, as compared to the other groups, would be slower to negative affective as compared to positive affective stimuli; and that this effect of cue valence would be greatest in the stressor condition as compared to the neutral performance condition.
4. We hypothesized that there would be an interaction between condition and cue valence at the level of invalid trials. Specifically, disengagement (slower reaction times during invalid trials) would be slower within the stressor condition; and that this effect would be moderated by cue valence (longer reaction times to negative as compared to positive affective stimuli).
5. We hypothesized that there would be an interaction between group, condition, and cue valence at the level of invalid trials. The high trait schizotypy group would be slower to disengage attention from negative affective as compared to positive affective cues than those low and medium in schizotypy traits; and that this effect would be greater in the stressor as compared to the neutral performance condition.

A sub set of explorative analyses in Aim One was based on past research that has found that schizophrenia patients' ability to engage attention is intact, whereas the disengage component appears to be impaired (as measured by slower reactions times to invalid as compared to valid cue trials). Furthermore, the ability to shift visual attention towards the right but not the left visual field appears to be impaired within patients with schizophrenia. Thus, building on previous research we explored the relationship between hemifield presentation, performance conditions, group, and cue valence on attention disengagement (i.e., at the level of invalid trials).

6. We examined whether there were differences in the ability to disengage attention from invalid cues that appear in the right hemifield (shift towards the left) than those that appear in the left hemifield (shift towards the right); and whether the high trait schizotypy group displayed an impairment in their ability to shift attention away from invalid cues that appear in the left hemifield than those that appear in the right hemifield as compared to those low and medium in schizotypy trait (as evidenced by longer reaction times to invalid right cues as compared to invalid left cues).

Aim Two: What underlying dispositional vulnerabilities contribute to susceptibility (or resiliency) to stress?

As discussed, individual differences in the ability to regulate state negative affect and perceptions of control are important determinants in adaptive HPA axis function. A large body of research suggests that certain characteristics exacerbate psychological and physiological responses to stress (trait negative affect and low perceived control), whereas other characteristics appear to decrease reactivity to stress (trait positive affect and high perceived control). Research also suggests that individuals with schizotypy are at increased risk for schizophrenia, and exhibit many of the traits associated with increased susceptibility to stress. However, little is known about how these individual differences interact with one another in reaction to stress; and whether these patterns differ between those defined at being at high-risk for schizophrenia (psychometrically-defined schizotypy) and those determined to be at low risk. Importantly, understanding the relationship between emotional reactivity to stress (as evidenced by changes in affective states) and the complex interplay between dispositional traits may help shed light on how underlying dispositional vulnerabilities contribute to susceptibility (or resiliency) to stress.

Aim two investigated group differences in schizotypy traits (high, medium, and low), as well as potential interactions between affective traits, state affect, and perceived control.

1. It was hypothesized that the high trait schizotypy group would report significantly higher trait negative affect and lower trait positive affect as compared to those low and medium in schizotypy traits.
2. It was hypothesized that the high trait schizotypy group would report significantly higher perceived stress as compared to those low and medium in schizotypy traits.

Building on past research, following the uncontrollable social-evaluative stressor it was also hypothesized that:

3. There would be an increase in state negative affect following the uncontrollable stressor (as measured by repeated measure of pre- and post stress scores). There would be an interaction effect such that the high trait schizotypy group as compared to those low and medium in schizotypy traits would have a greater increase in negative affect following the stressor.
4. There would be two group main effects, such that the high trait schizotypy group as compared to those low and medium in schizotypy traits would (a) report significantly less perceived control, and (b) report the test as being more stressful.
5. It was predicted that low perceived control would associate with greater trait negative affect, while low perceived control will have an inverse relationship with trait positive affect within each group.

CHAPTER 2. METHOD

2.1 Participants

Participants were recruited using two different methods. The first was an online questionnaire sent via email to undergraduates at Louisiana State University as part of a larger study. The questionnaire consisted of a consent form, demographic questions, and the SPQ. Individuals scoring in the 95th percentile on one of its three scales (based on gender and ethnicity norms) were invited to participate in the laboratory phase of the study. 36 individuals were recruited utilizing this methodology. Participants were also recruited through the Psychology Department's on-line research participation pool (i.e., SONA system; N = 100). Study participants either received 20 dollars cash compensation or course credit towards their psychology course. As typical with many college sample populations there was a higher proportion of females (N = 87) than males (N = 43). There was also a higher proportion of Caucasians (65.4%) and African Americans (18.3%) as compared to other races (15.3%). There was no inclusion or exclusion based on gender or racial/ethnic origin. Individuals below the age of 18 were excluded due to theoretical developmental differences that may affect the experimental results (Age: M = 19.63, SD = 1.40). Similarly, individuals with an attention deficit disorder and/or non-fluent English speakers were excluded due to the high probability that these individual differences will be confounding variables. During the testing session, a confidential code was assigned to each participant. Participant names did not appear on their questionnaires or within the computerized collected data set. All subjects offered informed consent prior to submission of the surveys and initiation of any study procedure. Participants were tested by trained undergraduate research assistants and debriefed at the study's conclusion. This study was approved by the Louisiana State University Human Subject Review Board (see Appendix A for consent form).

To determine group status, a total sum for each individual's SPQ-BR scores reported on the day of testing was computed (SPQ-BR total $M = 52.14$; $Med = 52$; $SD = 22.76$). Individuals falling one standard deviation above the mean were identified as being high in schizotypy traits ($n = 24$), while individuals one standard deviation below the mean were identified as being low in schizotypy traits ($n = 22$), all other individuals were classified as being medium in schizotypy traits ($n = 84$). Of the individuals selected from the large university screen, 16 of the 35 individuals with extreme scores on the SPQ at time point one had shown regression towards the mean in their SPQ scores ($M = 61.37$, $SD = 9.07$) at time point two (i.e., testing day). These 16 individuals significantly differed from those who reported stable SPQ scores at the second time point and those defined as being high in schizotypy traits by their SPQ sum score at the time of testing, ps < .001. Thus, these individuals whose scores no longer met criteria for being high in schizotypy traits (> 1 SD from mean) were included within the medium trait schizotypy group.

2.2 Measures

Positive and Negative Affect Schedule (PANAS). Trait and state positive and negative emotions was measured using the PANAS (Watson, Clark, & Tellegen, 1988). The state and trait scales both consist of ten positive emotion items (e.g., interest and enthusiasm) and ten negative emotion items (e.g., guilt and anger). For trait measures of affect, participants were requested to respectively rate how often they "*generally*" experience the twenty emotional items on a 5-point Likert scale from 1 (very slightly or not at all) to 5 (extremely). Similarly for state measures of affect, participants were requested to respectively rate *"right now" to* what degree they were experiencing the twenty emotional items on a 5-point Likert scale from 1 (very slightly or not at all) to 5 (extremely) at two distinct time points (Pre-Stressor and Post-Stressor). Trait positive affect and state positive affect were computed by respectively summing across the ten positive emotion items and the ten negative emotion items to form composite scores for each respective scale. Reliability coefficients for trait negative affect and positive affect (Chronbach's alphas $\geq$ .83) were good. Similarly, pre-stress state negative affect and positive affect reliability for scales were also good (Chronbach's alphas $\geq$ .81). Post-stress state positive affect (Chronbach's alphas $\geq$ .92) internal consistency reliability was excellent, while post-stress state negative affect was good (Chronbach's alphas $\geq$ .83).

The Schizotypal Personality Questionnaire-Brief Revised (SPQ-BR; Cohen, Matthews, Najolia & Brown, 2010). The SPQ-BR was administered to measure schizotypal traits. The SPQ-BR is based on the SPQ (Raine, 1991). The SPQ was designed to mirror DSM-III-R symptoms of schizotypal personality disorder. The SPQ assesses a range of factors that incorporate all nine DSM-III-R diagnostic criteria for schizotypal personality disorder: ideas of reference, social anxiety, odd beliefs/magical thinking, unusual perceptual experiences, odd/eccentric behavior, no close friends, odd speech, constricted affect, and suspiciousness (See Appendix B for SPQ-BR individual items and scales). Similar to the SPQ, the SPQ-BR questionnaire assesses the full range of schizotypal personality disorder symptomatology (i.e., negative, positive and disorganized symptoms), which closely reflects DSM III-TR symptoms. However as suggested by the name, the SPQ-BR is briefer (32 items) than Raine's original 74 item dichotomized (yes or no) scale and improves sensitivity by utilizing a five-point Likert scale ranging from "strongly disagree" to "strongly agree". All 32 SPQ-BR items were summed to create a total score (Chronbach's alpha = .94).

Assessment of Perceived State and Trait Stress. The Perceived Stress Scale (PSS; Cohen & Williamson, 1988) assessed perceived stress over the last month. The PSS is a brief ten item scales that measures the degree to which one appraises events as unpredictable, uncontrollable, and feels incapable of coping with situations. There are six face valid items (i.e., negatively stated items) and four reversed scored positively stated items (e.g., how often have you been able to control irritations in your life) that are measured on a five-point Likert scale. Internal reliability for the PSS ten item scale was adequate to good (Chronbach's alpha: Across groups = .78; High = .70; Med = .74; Low = .81). A laboratory Stress-Task Questionnaire (see Appendix D) was administered immediately following the stressor to assess in-the-moment perceived control. Two items (one being reversed scored) assessed perceptions of control on a 5-point Likert scale 1 (not at all) to 5 (extremely). Reliability for these items was adequate (Chronbach's alpha = .70), which is actually quite impressive considering the strong influence that the number of items has on alpha. Intermixed within this project's questionnaire was a series of questions designed to distract the participant from the study's goal (e.g., "I am popular") as well as access factors associated with positive as compared to negative experiences (e.g., confidence and perceived task mastery). Although a number of other questions were administered for examination in future studies, this project was only concerned with ratings of perceived control and the task's stressfulness.

2.3 Design

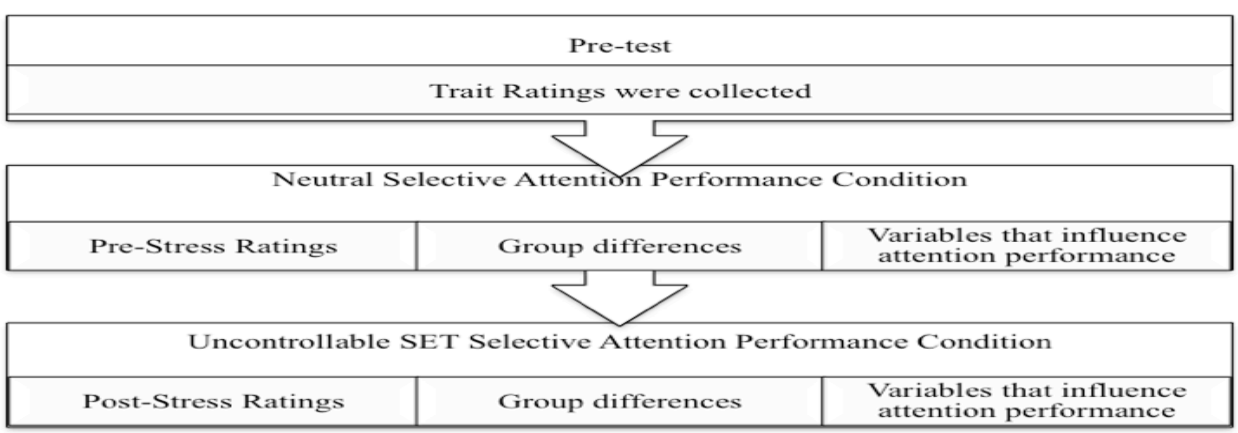

Figure 1. Overview of Study Design

Modified Posner Spatial Cueing Paradigm (Posner, Snyder, & Davidson, 1980).

E-Prime (Schneider, Eschman, & Zuccolotto, 2002) was used to program a modified version of Posner's and Colleagues (1980) spatial cueing task. In this task, participants are seated approximately 50 cm in front of a computer monitor. Computerized instructions appeared on a standard Dell computer monitor in black font on a white background (see Appendix C for full task instructions). The participants were directed to press the furthest left key on the Serial Reponse (SR) box when the target appeared in the left hemifield and to hit the furthest right key on the SR box when the target symbols (asteriks) appeared in the right hemifield. Participants were instructed to respond as soon as they saw the target symbols appear on the computer screen. Participants were further instructed, "Respond quickly but do not try to predict or guess the target location". Subsequent to the instructions, a centered fixation cross ("+") flanked by two rectangles appeared on the screen for 1000 milliseconds (ms). Next, either a positive affective (e.g., a smiling face or cute puppy) or negative affective (e.g., a grimacing face or snarling dog) stimuli image cue appeared within either the left hemifield rectangle or the right hemifield rectangle for 100 ms. The screen then became blank white for 50 ms or 500 ms. Next, the target ("*") appeared on the screen until the participant responded or 2000 ms. The target appeared in the same hemifield (ipsilateral rectangle) of cue presentation within valid cue trials (50% of experimental trials). The target appeared in the opposite hemifield (contralateral rectangle) of cue presentation in invalid cue trials (25% of experimental trials; Figure 2 provides an example of an invalid trial sequence). In order to prevent anticipatory responses, the target was presented 500 ms after the cue in twenty five percent of the experimental trials (i.e., "*catch trials*"). The amount of time between the cue and target (stimulus-onset asynchrony: SOA) was 150 ms for experimental trials and 550 ms for catch trials. There was one practice block with 16 trials (8 valid, 4 invalid, 4 catch trials) at the beginning of the neutral performance condition, in which participants received corrective feedback regarding their performance. There were a total of 240 experimental trials per condition (Neural and Stressor). The 240 trials were divided into five blocks (48 trials per block). All trial presentations were randomized. A brief pause followed each trial and a brief break followed each block. Hemisphere presentation of the cue (left and right) was equally presented across block trials and cue conditions. Cue valence (six positive and six negative images) were randomized within each block and equally presented within each hemifield. Positive and negative cues respectively appeared 60 times each on valid trials, 30 times each on invalid trials, 30 times each on catch trials. Catch and practice trials were not analyzed.

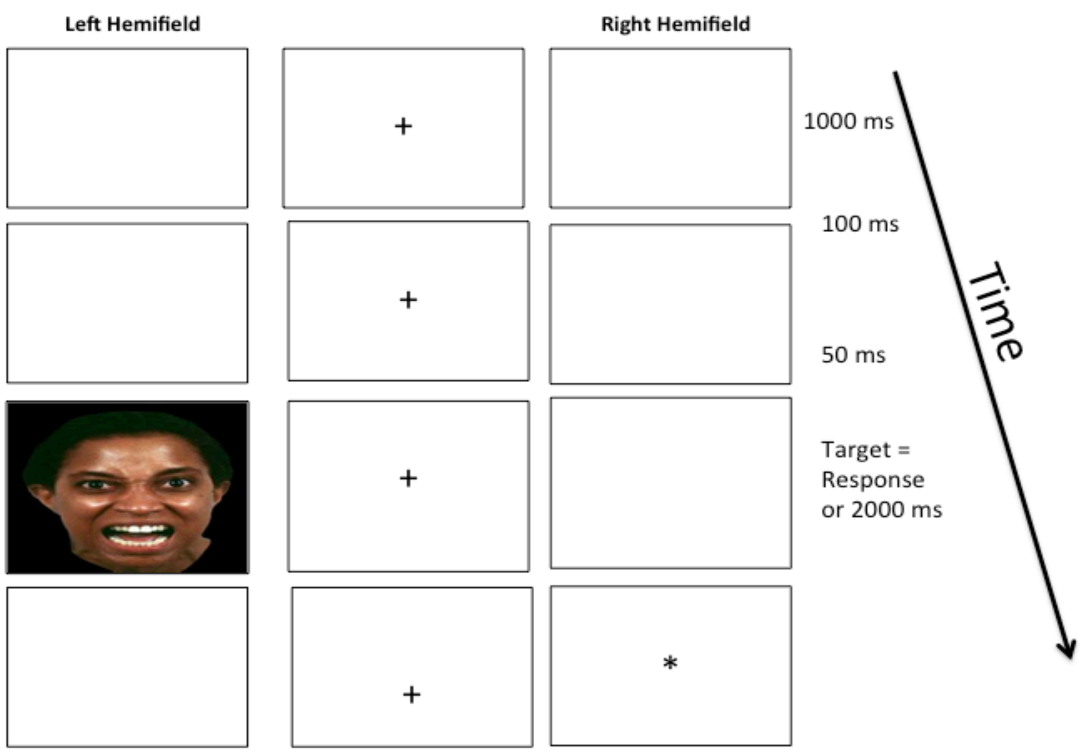

Figure 1. Invalid Trial Sequence using a Negative Valence Cue. SOA was always 150 ms for Analyzed Trials. SOA was 500 ms for "catch trials". Target appears until response or 2000 ms.

Figure 2. Example of an invalid trial sequence using a negative affective stimuli image[1] for cue

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[1] Image: PERT-96 Angry emotional stimuli at extreme intensity (Gur et al., 2002)

Affective stimuli cues were either social images of male and female faces (positive: smiling faces vs. negative: threatening faces) or non-social images (positive or threatening images of dogs). The three types of stimuli image cues were divided into thirds between the different types (male faces, female faces, and dogs). Social affective cues (smiling and angry/fearful) were drawn from the Penn Emotion Recognition Test (PERT; Gur et al., 2002). Negative dog images (i.e., dogs with threatening snarls) were drawn from the International Affective Picture System (see Lang, Bradley, & Cuthbert, 2008) and an on-line search (search term = dog) for pleasant dog images (e.g., a smiling dog). In this project, only social images were examined.

The modified Posner spatial cueing task was administered twice. The first was a neutral performance condition without any type of feedback. The second was an uncontrollable, social-evaluative threat performance condition; which will simply be referred to as the "stressor performance condition". Participants did not receive feedback regarding their performance during the neutral performance condition. During the stressor performance condition, participants received randomized computer generated false negative feedback regarding their performance. 25% of the experimental trials (24 valid, 12 invalid, 12 catch per trial block) were followed by negative feedback regardless of participant's actual performance. The words "FAIL! Try harder!" or "You're Losing!" printed in large red font were randomly presented on the computer monitor for one second immediately following their response to the target cue. Negative performance feedback was equally distributed among valid and invalid trials, cue valence and images, and hemifield presentation.

2.4 Procedure

Self-report trait measures (PANAS trait and PSS) were administered to participants prior to the spatial cueing tasks. Following the self-report measures, participants were asked to play a "game" on the computer. Instructions for the game (i.e., the spatial cueing task) were computer generated (See Appendix C for task instructions). Following the neutral performance condition, participants were asked to rate their current mood via the PANAS state scale. Subsequently, a video camera was set-up next to the participant. Participants were then informed: "Now that you have had a chance to practice, we are going to compare your performance to other LSU undergraduates. During the test, you will receive immediate feedback regarding how well you are doing compared to other students we have already tested. We will also be video taping your performance today in order to further evaluate your performance at another time. Try to do your best!" During the stressor performance condition, the participants received randomized computer generated false negative feedback printed in red bold letters on the screen (e.g., FAIL! Try harder!) throughout their performance. The examiner recorded any participants' comments during the task. When participants made comments to the examiner regarding "technical difficulties", the examiner stated to the participant in a neutral tone: "*I'll make a note of it. Just try to do your best"*. Immediately following the stressor task, participants' affective states and perceptions of the event were assessed via questionnaire (see Appendix D). Participants were debriefed once they completed the study (see Appendix E). The computer generated exit survey was then administered (see Appendix F).

2.5 Analyses

Preliminary analyses were conducted over multiple steps. First, significant relationships between demographic characteristics (sex, ethnicity, years of education and age) and variables of interest were examined within all levels of analyses. No significant relationships were found between demographic variables and the other study variables. Next, similar to past research (e.g., Ellenbogen et al., 2006), incorrect responses and reaction times less than 150 ms or greater than 850 ms were filtered out from all levels of analysis within the spatial cueing task. Multiple imputation using the trial series mean was performed to replace the missing filtered values. Descriptive statistics were computed for all variables to determine that assumptions of normality (skewed scores: $| \leq 1|$) and homogeneity of variance were met. When analyses (as determined by visual inspection of scatterplots, skewness, kurtosis statistics $|< 1.5|$, Box's Test of Equality of Covariance Matrices, Levene's Statistic) revealed that these assumptions were not met, these variables were subjected to the appropriate nonparametric tests (e.g., adjusted degree of freedom using Welch's F-ratio). Two subjects' reaction time data were excluded due to extreme scores (> 2 standard deviations from mean). Once these subjects' data were removed kurtosis and skewness for the repeated measure reaction times both fell within acceptable ranges. Overall accuracy of responses to the target were examined using a mixed design ANOVA with accuracy being the repeated measure. Finally, pre- and post-stress PANAS scores were dichotomized into their respective scales (positive affect and negative affect) and changes in state affect were calculated for both positive and negative affect (PANAS state post-stress index score minus pre-stress state affect index score). Two measures of correlation were used: Pearson's correlation coefficient was used to compute variables that were on an interval scale, while Spearman's correlation coefficient was used to calculate ordinal and non-normally distributed data. Data analyses were conducted over a multitude of steps. Main effects and interaction effects of the spatial cueing task were examined using two four-way mixed design ANOVAs. The first four-way mixed design ANOVA (Performance Condition X Cue Valence X Cue Validity X Group) examined the hypotheses that there would be: (1) a main effect of cue validity (i.e., faster mean reaction times to valid as compared to invalid cues), (2) a main effect of performance condition (i.e., faster mean reaction times within the neutral as compared to the stressor condition), (3) a main effect of valence (i.e., faster mean reaction times to positive as compared to negative valenced cues), (4) a group interaction such that individuals who are high in schizotypy traits would show slower mean reaction times to negative affective as compared to positive affective stimuli cues than those low and medium in schizotypy traits, as well as examined the potential interactions between these factors. Condition (Neutral vs. Stressor), Cue Valence (Positive vs. Negative), and Cue Validity (Valid vs. Invalid) mean reaction times were repeated measures that were used to analyze selective attention (engagement and disengagement), while SPQ trait group (High, Medium, and Low) served as the between subject's factor. Next, a four-way mixed design ANOVA (Condition X Valence X Hemifield X Group) was conducted on mean reaction times at level of invalid trials to investigate factors that were hypothesized to affect the ability to disengage attention from invalid cues. Condition (Neutral vs. Stressor), Valence (Positive vs. Negative), and Hemifield (Left vs. Right) mean reaction times were repeated measures that were used to analyze attention disengagement, while SPQ trait group (High, Medium, and Low) served as the between subject's factor. Planned comparisons utilizing Fishers Least Significant Difference (LSD) or Games-Howell test (this test was used when equal variance across groups could not be assumed; Field, 2002) were employed to examine group differences in these variables. In order to examine the significant interaction between condition, cue valence, and group, (1) the interaction between cue valence and group were examined at the level of condition, and (2) the data was sorted by group and the fore mentioned repeated measure analyses was repeated.

Aim Two's hypothesis were conducted over a multitude of steps. Five one-way ANOVAs respectively examined group differences in (1) trait positive affect, (2) trait negative affect, (3) perceived stress over the past month, (4) perceived control, and (5) ratings regarding the test's degree of stressfulness. A three-way mixed model ANOVA examined differences between pre-stress and post-stress state positive and negative affect. The interaction terms (Time:Pre-Stress vs. Post-Stress X Group) were used to assess whether the mean changes in state affect (pre- to post-stress ratings) differed between the groups. Correlational analysis examined intercorrelations between the vulnerability and resiliency factors. It was specifically hypothesized that low perceived control would associate with greater trait and state negative affect, and would have an inverse relationship with trait and state positive affect within each group.

2.6 Power Analysis

Using G*Power software 3.1.5 (Faul, Erdfelder, Lang, & Buchner, 2009) sample size (N) for each of these analyses was computed as a function of the required power level (1-β), alpha level (two-tailed significance tests with $\alpha \leq .05$), and was guided by past estimations of population effect sizes and/or statistical theory. In accord with Cohen (1992), we attempted to have statistical powers (1-β) approach or exceed .80. In order to obtain an upper-boundary for required sample size, power analyses were completed for the primary sets of experimental hypotheses. Recommended statistical parameters ($\beta = 80$ and two-tailed $\alpha \leq .05$) were applied within each of the power analyses. In anticipation of data loss due to random experimental error (e.g., technical problems), the most conservative recommended sample size was then increased by 10% (N = 70 + 7). A sample size of 78 participants (with *n*s evenly split between the groups) should have allowed for sufficient detection of the estimated effects ($d \geq 0.80$; Cohen, 1992) proposed within the study hypotheses. In total, we achieved a sample size of 136 individuals. Six individuals data were not included due to technical errors, two individuals' reaction data were excluded due to extreme scores (> 2 SDs from mean) leaving a total sample of 129 individuals (23 high, 83 medium, and 22 low in schizotypy traits) included in the spatial cueing task's analysis.

The following is a description of observed power. However, given that observed power is directly related to the obtained p-value, the values obtained in post-hoc power analysis are essentially flawed (cited from UCLA Statistical Group). Nevertheless, for the curious reader, post-hoc analysis of power suggested that Aim One's repeated measures design allowed for excellent detection of the proposed main effects of condition, cue validity and cue valence (Observed power range: .83 -1.00) and the proposed interaction effect between condition, valence, and validity (Observed power range: .90). However given the unequal group sizes, we were underpowered to sufficiently detect a main effect of across group differences (Observed power range = .18) and the proposed interaction effects with group and valence (Observed power range: .15-.59). For Aim one's secondary set of hypotheses, post-hoc power analysis indicated that we were sufficiently powered to detect the effect of performance condition on disengagement (observed power = 1.00), but lacked adequate power to detect all other proposed effects (Observed power range: .05 - .73). Post-hoc power analysis also indicated that we had a large enough sample to detect a large effect size for the majority of Aim Two's set of hypotheses (Observed power range: .87 - 1.00) with the exception of the ability to detect differences in changes in affect, and both trait and state positive affect (Observed power range: .133 - .543).

CHAPTER 3. RESULTS

Overall, accuracy across all the spatial cueing task trials was excellent, with participants correctly responding correctly to the target in 99.6% of the neutral condition trials (M = 239.14, SD = 1.34) and 97.2% in the stressor condition trials (M = 233.19, SD = 20.99). A mixed design ANOVA comparing the accuracy of target responses revealed a significant main effect of condition, such that accuracy was significantly lower in the stressor condition as compared to the neutral condition, F (1, 125) = 66.02, $p < .01$. It was also noted that there appeared to be significantly more variability in performance accuracy within the stressor as compared to the neutral condition. No significant between group differences were found in accuracy, F (2, 125) = .18, ps > .05. Given the infrequency of errors within both conditions no further analysis on error rates were conducted.

3.1 Aim One: Analyses of factors that influence selective attention

A four-way mixed design ANOVA was employed in order to test Aim One's first set of hypotheses. The first set of analyses examined whether reaction times: (1) were slower to targets when the condition was stressful as compared to neutral, (2) were slower to targets when the cue was negative as compared to positive affective stimuli, and (3) whether there were between group differences in reaction times as a function of condition, cue validity and/or valence. The posited interaction effects amongst these variables were also investigated. The four-way mixed design ANOVA (Performance Condition X Cue Validity X Cue Valence X Group) revealed a significant main effect of condition, cue validity, and cue valence on reaction times. Reaction times were significantly faster within the stressor (M = 319.30, SE = 4.58) as compared to the neutral performance condition (M = 353.85, SE = 5.57), F (1, 125) = 90.55, $p < .001$. Reaction times were also significantly faster for valid (M = 327.78, SE = 4.75) as compared to invalid cued trials (M = 345.38, SE = 4.96), F (1, 125) = 92.19, $p < .001$. A main effect of cue valence was found, with reaction times being slower to positive (*M* = 338.09, *SE* = 4.78) as compared to negative (*M* = 335.06, *SE* = 4.78) image cues, *F* (1, 125) = 10.96, *p* = .001. No main effect of group was found, *F* (2, 125) = 1.76, *p* = .176. However, planned between group comparisons revealed a trend relationship between individuals high in schizotypy traits reaction times being overall faster than those low in schizotypy traits, *p* = .071. Table 2 presents the respective mean reaction times during the neutral and stressor performance conditions for cue validity (valid vs. invalid) and cue valence (positive vs. negative).

Table 2

Repeated Measures mean (*M*) reaction time and standard deviation (*SD*) for cue validity and cue valence on the spatial cueing task by condition

Table 2. Mean Reaction Time on the Spatial Cueing Task

Mean Reaction Time in Milliseconds		
N = 128	*M* =	*SE* =
Neutral Condition		
Positive Valid	349.63	5.48
Positive Invalid	359.27	5.97
Negative Valid	344.25	5.67
Negative Invalid	362.27	5.89
Stressor Condition		
Positive Valid	310.69	4.65
Positive Invalid	332.78	5.01
Negative Valid	306.55	4.58
Negative Invalid	327.18	4.86

Several interaction effects were found with performance condition, in order to provide an accurate interpretation of these findings, results were first plotted and examined respectively at the level of each performance condition. There was a significant interaction between cue validity and performance condition, *F* (1, 125) = 12.27, *p* = .001. Visual inspection of these results revealed that the difference in reaction times to valid cues (*M* = 308.62, *SE* = 4.55) as compared to invalid cues (*M* = 329.98, *SE* = 4.83) increased within the stressor condition, when compared to differences in reaction times to valid cues (*M* = 346.94, *SE* = 5.53) as compared to invalid cues (*M* = 360.77, *SE* = 5.83) within the neutral condition. There was also a trend interaction between cue valence and performance condition, such that there was a minimal difference between negative affective (*M* = 353.26, *SE* = 5.63) and positive affective (*M* = 354.45, *SE* = 5.59) stimuli cues in the neutral condition, whereas reaction times were faster to negative affective (*M* = 316.87, *SE* = 4.62) as compared to positive affective stimuli cues (*M* = 321.74, *SE* = 4.65) within the stressor condition, F (1, 125) = 3.70, p = .057. There was also little difference between negative affective (*M* = 344.72, *SE* = 4.95) as compared to positive affective stimuli cues (*M* = 346.03, *SE* = 5.06) reaction times when the cue was invalid; in comparison, when the cue was valid, engagement was faster to negative affective (*M* = 325.40, *SE* = 5.45) as compared to positive affective stimuli cues (*M* = 330.16, *SE* = 4.75), F (1, 125) = 3.93, p = .05. Furthermore, the just described interaction effects of cue validity and cue valence, also varied as a function of performance condition, F (2, 125) = 7.57, p = .007. Figure 3 depict this three-way interaction between cue valence, cue validity, and condition at the level of condition. In the neutral condition, there was a significant main effect of cue validity, F (1, 125) = 38.61, p < .001; however, no main effect of cue valence was observed within the neutral condition, F (1, 125) = 13.42, p < .01. Rather, there was a significant interaction between cue valence and cue validity, in which the effect of cue valence appeared to be dependent on whether the cue was valid, F (1, 125) = 10.31, p = .002. As Figure 3 illustrates, reaction times were significantly faster to negative affective as compared to positive affective stimuli cues only when the cue was valid within the neutral condition. Furthermore, the observed difference in line slopes for negative as compared to positive affective stimuli cues differed as a function of the cue's validity, such that the difference between negative affective valid cues and negative affective invalid cues was significantly greater than the difference between positive affective valid cues and positive affective invalid cues within the neutral condition, F (1, 125) = 13.42, $p < .001$. In contrast, this effect of cue validity on valence was not observed within the stressor condition. There was no interaction between cue validity and valence within the stressor condition, rather there was a main effect of reaction times being faster to negative as compared to positive affective stimuli cues, F (1, 125) = 12.40, $p = .001$, and a main effect of reaction times being faster to valid as compared to invalid cues, F (1, 125) = 111.99, $p < .001$.

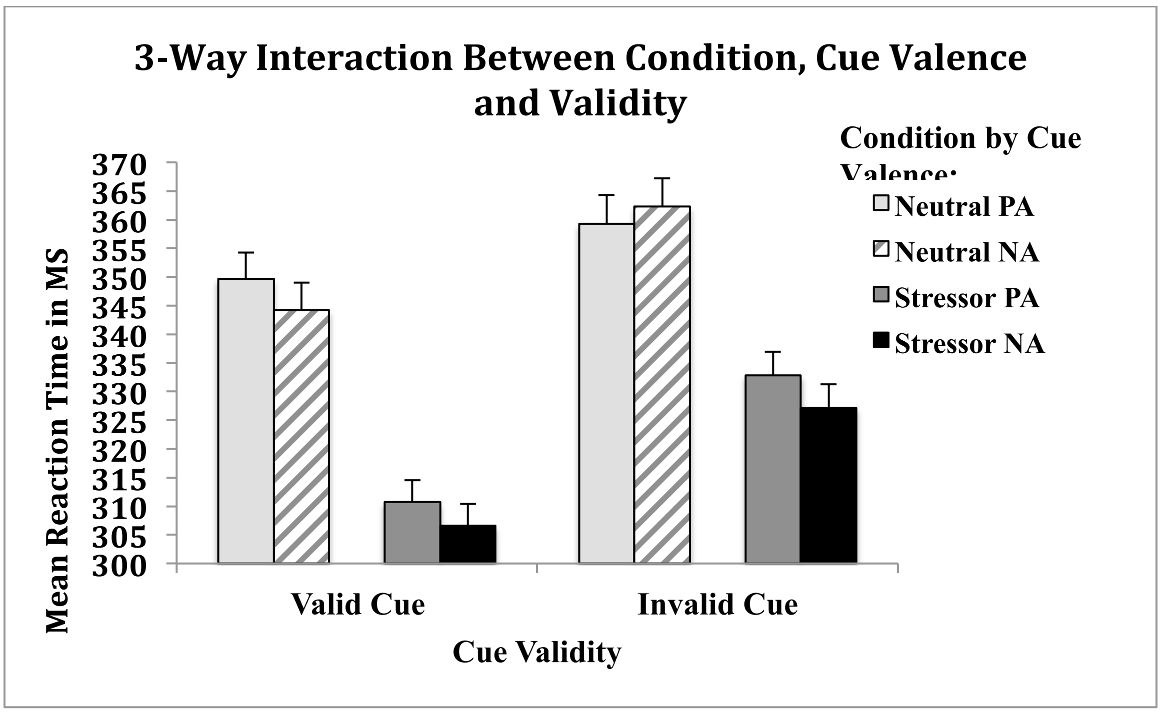

Figure 3. Average reaction time as a function of condition, cue valence and cue validity

The last trend interaction effect was between condition, valence and group, F (2, 125) = 2.60, $p = .078$. Figure 4 displays the interaction effect between cue valence and SPQ traits as a function of condition across cue validity. Inspection of Figure 4 shows that reaction times decreased during the stressor condition as compared to the neutral condition within all groups (i.e., a main effect of condition). It also reveals that the interaction effect between cue valence and condition depends upon the degree of schizotypy traits. Within the neutral condition, no significant within group differences between reaction times to negative affective as compared to positive affective stimuli cues were found. Planned comparisons revealed a trend relationship between individuals high in schizotypy traits overall reaction times being faster than both the low trait (p = .097) and medium trait (p = .083) schizotypy groups, who did not significantly differ from each other (p = .429). Within the stressor condition, a trend between group differences in faster reaction times to negative affective stimuli cues was found, such that the high trait schizotypy group was fastest to negative affective stimuli cues, followed by those medium in schizotypy traits, who were faster than the low trait schizotypy group, Welch's F (2, 46) = 2.96, p = .079. Planned comparisons revealed a trend relationship between individuals high in schizotypy traits overall reaction times being faster than those in low schizotypy traits (p = .097). Those medium in schizotypy traits did not significantly differ from the low (p = .326) or high trait (p = .229) schizotypy group. Additionally, the high trait schizotypy group was significantly faster to negative affective as compared to positive affective stimuli cues within the stressor condition, p = .008. Future analysis will need to further investigate the significance of these findings.

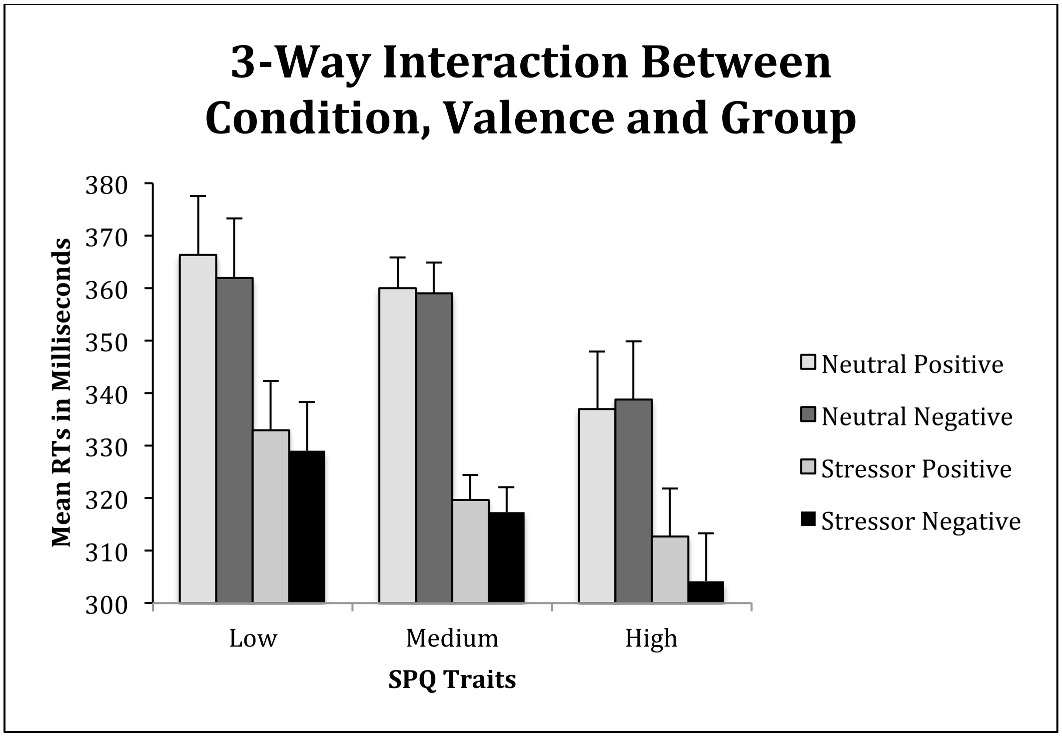

Figure 4. Interaction between Cue Valence and SPQ traits as a function of condition with combined cue validity trials

These results replicated past research in that (1) overall accuracy to the target was good, and (2) reaction times were slower to invalid cue trials as compared to valid trials. Importantly, the interpretation of the three main effects were complicated by the multiple interaction effects between these variables. However, a clear pattern emerged in that these results indicate that the stressful condition rather than impairing performance appeared to generally facilitate reaction time performance. Importantly, the effect of cue validity was influenced by both condition and cue valence. Reaction times to valid as compared to invalid cues was overall significantly faster; however, the difference in reaction time to valid as compared to invalid trials was greatest within the stressor condition (i.e., there was a greater response cost to invalid trials within the stressor condition). Similarly, the impact of cue validity was greatest when the cue was negative affective as compared to positive affective stimuli. The impact of cue valence also appeared to depend on condition. Moreover, these factors all interacted with one another, such that the hypothesized effect of a disordinal interaction between negative affective stimuli cues and cue validity (the difference between valid and invalid cue reaction times) was found within the neutral but not the stressor condition. Finally, while no main effect of group was found, the degree of schizotypy traits appeared to play a moderating role in reaction times to negative affective as compared to positive affective stimuli cues, and this effect appeared to be moderated by performance condition.

Analyses of hemifield presentation at the level of attention disengagement

A four-way mixed design ANOVA (Condition X Valence X Hemifield X Group) was conducted on Invalid Trial mean reaction times. Condition (Neutral vs. Stressor), Valence (Positive vs. Negative), and Hemifield (Left vs. Right) mean reaction times were repeated measures that were used to analyze attention disengagement, while SPQ trait group (High, Medium, and Low) served as the between subject's factor. There was a main effect of condition on invalid trials, with disengagement being overall faster within the stressor condition (M = 336.53, SE = 5.68) as compared to the neutral condition (M = 366.78, SE = 6.37), F (1, 125) = 54.00, $p < .001$. No interaction between performance condition and cue valence was found at the level of disengagement, F (1, 125) = .317 p = .574. No main effect of group was found, F (2, 125) = 2.15, p = .121. However, planned comparisons suggested that individuals high in schizotypy traits (M = 331.38, SE = 9.97) were significantly faster than those low in schizotypy traits in attention disengagement (M = 359.79, SE = 10.19), p = .048; this relationship only reached trend level with those medium in schizotypy traits (M = 350.29, SE = 5.25), p = .096. Although in an unexpected direction, there was a complex interaction between condition and cue valence with the SPQ trait groups on invalid trial mean reaction times (see Figure 5), F (2, 125)

= 3.48, *p* = .034. In order to further investigate this three-way interaction effect, amixed design ANOVA with Cue Valence (positive vs. negative) as the repeated measure and SPQ trait as the between subjects factor was performed at each level of condition. Closer investigation within the neutral condition, identified a trend relationship between individuals high in schizotypy traits being overall faster to disengage attention from both negative affective (*M* = 345.94, *SE* = 11.36) and positive affective stimuli cues (*M* = 341.69, *SE* = 12.03) than those low (*M* = 371.57, *SE* = 11.61 vs. *M* = 374.76, *SE* = 12.30) and medium (*M* = 369.51, *SE* = 5.98 vs. *M* = 367.80, *SE* = 6.33) in schizotypy traits, *ps* = .058 and .077, respectively. No meaningful difference in attention disengagement reaction times were found between those low and medium in schizotypy traits, *p* = .734. Analysis of attention disengagement at the level of stressor condition found a significant interaction effect between cue valence and group, *F* (2, 125) = 4.92, *p* = .009. Further investigation respectively within each group, revealed that individuals high in schizotypy traits reaction times were significantly faster to negative affective (*M* = 313.94, *SE* = 10.23) as compared to positive affective (*M* = 323.94, *SE* = 9.91) stimuli cues within the stressor condition, *F* (1, 22) = 4.58, *p* = .044; whereas, the opposite effect of cue valence was found within those medium in schizotypy traits, such that reaction times were faster to positive affective (*M* = 329.76, *SE* = 5.22) than negative affective stimuli cues (*M* = 334.10, *SE* = 5.39), *F* (1, 82) = 4.74, *p* = .032. No main effect of cue valence was found within those low in schizotypy traits, (Positive affective stimuli cues: *M* = 344.85, *SE* = 10.14 vs. negative affective stimuli cues: *M* = 347.98, *SE* = 10.46), *F* (1, 21) = .46, *p* = .504. No other group differences were found within the stressor condition, *p*s > .05. No main effect of hemifield presentation during the invalid trials was found, *F* (1, 125) = .20, *p* = .654; however, it is important to note that the observed power was substantially below threshold to detect an effect (observed power = .11).

Additionally, no interaction effect between hemifield presentation and group was found, F (2, 125) = .45, p = .641.

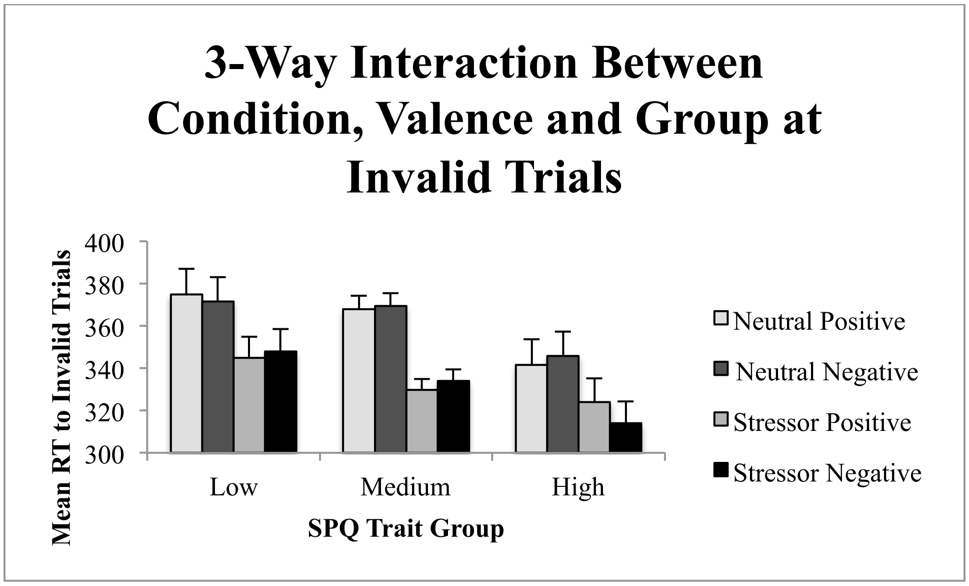

Figure 5. Invalid trials mean Reaction Time (RT) by condition, cue valence and group

These results indicate that condition, cue valence, and schizotypy traits play a role in attention disengagement. Similar to Aim One's primary set of analyses (see Figure 4), reaction times during invalid trials significantly decreased during the stressor condition as compared to the neutral condition within all groups (i.e., a main effect of condition), and individuals high in schizotypy traits reaction times were overall faster than those medium and low in schizotypy traits. An interesting interaction with was found within the stressor condition, such that attention disengagement was faster to negative affective stimuli as compared to positive affective stimuli only within the high trait schizotypy group.

3.2 Aim Two: Analyses of resiliency and vulnerability factors

Homogeneity of variance could not be assumed for trait negative affect, state negative affect (pre-stress and post-stress), and changes in negative affect. Therefore, for these variables adjustments to the degrees of freedoms were made using using Welch's F-ratio and Games-Howell statistic was used for pairwise comparisons. Table 3 presents the mean and standard deviations for between group differences in trait affect, state affect, low perceived control, and perceived stress measures. The difference between trait positive affect and group reached trend, $F\,(2,126) = 2.78$, $p = .066$. Planned comparisons revealed that individuals high in schizotypy traits ($M = 32.92$, $SD = 7.04$) were significantly lower in trait positive affect than those low in schizotypy traits ($M = 37.29$, $SD = 7.00$), $p = .02$. Comparisons between the medium trait schizotypy group ($M = 35.20$, $SD = 5.76$) and the other two groups was not statistically significant at $ps > .10$. There were significant between group differences in trait negative affect in individuals high ($M = 26.92$, $SD = 7.64$), medium ($M = 19.12$, $SD = 6.24$), and low ($M = 13.90$, $SD = 3.16$) in schizotypy traits, Welch's $F\,(2, 49) = 48.68$, $p < .001$. Planned comparisons suggested a linear relationship pattern, such that individuals highest in schizotypy traits reported significantly higher trait negative affect, followed by those medium in schizotypy traits, with those low in schizotypy traits being the lowest in trait negative affect, with all ps < .001. As predicted, there was also a linear relationship with perceived stress over the past month and the degree of schizotypy traits, $F\,(2, 127) = 28.00$, $p < .001$. Individuals high in schizotypy traits reported the highest perceived stress, followed by those medium in schizotypy traits, with those low in schizotypy traits reporting the least perceived stress, with all ps < .05.

Table 3

Planned Comparisons of Between Group Mean Differences in Affect, Perceived Control and Stress

Table 3. Between Group Mean Differences in Affect and Perceived Control and Stress

Schizotypy Traits:	Low (n = 21) *M (SD) =*	Med (n = 85) M (SD) =	High (n = 24) M (SD) =
Trait Affect			
NA	13.90 (3.16)[1]	19.12 (6.24)[2]	26.92 (7.64)[3]
PA	37.28 (7.00)[1]	35.20 (5.76)[1,2]	32.92 (7.05)[2]
Pre-Stress State Affect			
State NA	12.30 (3.03)[1]	13.73 (3.21)[1]	18.92 (6.69)[2]
State PA	30.96 (10.33)	28.41 (7.86)	28.13 (7.62)
Post-Stress State Affect			
State NA	12.55 (3.23)[1]	14.46 (3.77)[2]	20.54 (8.41)[3]
State PA	28.05 (11.82)	26.60 (8.47)	25.29 (8.54)
Change NA	-.29 (3.49)	.71 (2.82)	1.63 (5.11)
Change PA	-2.33 (4.25)	-1.81 (5.44)	-2.83 (7.44)
Low Perceived Control	4.24 (1.58)[1]	4.60 (1.79)[1]	5.58 (1.84)[2]
Perceived Stress Scale	15.90 (5.60)[1]	18.48 (4.75)[2]	23.71 (4.99)[3]
Perceived Test Stress	1.86 (.85)[1]	2.38 (.90)[2]	2.63 (1.10)[2]

Note: Means significantly differed between groups with different superscripts, *ps* < .05.

Repeated measure of analyses of post-stress state negative affect scores (M = 15.37, SD = 5.57) as compared to pre-stress state negative affect scores (M = 14.66, SD = 4.87) revealed an increase in negative mood following the stressor, F (1, 125) = 5.53, p = 020. There was also a decrease in state positive affect following the post-stress condition (M = 27.00, SE = .96) as compared to pre-stress condition (M = 29.38, SE = .88), F (1, 125) = 15.28, p < .001. The interaction term which measured the mean change of state negative affect between groups was not statistically significant, F (2, 125) = 1.02, p = .36. There also was no significant interaction between group and change in state positive affect, $p = .771$. Planned comparisons revealed that the high trait schizotypy group was significantly higher in both pre- and post-stress state negative affect than the medium and low trait schizotypy groups, *p*s < .01. No significant differences in pre-stress state negative affect were found between those medium or low in schizotypy traits; however the difference between post-stress negative affect reached trend, $p = .092$. Overall changes in state negative affect (as measured by post stress condition state negative affect score minus neutral condition state negative score) were greatest within individuals high in schizotypy traits ($M = 1.63$, $SD = 5.10$) as compared to those medium ($M = .71$, $SD = 2.82$) and low in schizotypy traits ($M = -.29$, $SD = 3.50$). However, given the unequal variances and necessary adjustments to degrees of freedom, no significant relationships were found in this variable. Overall, results indicate that there was a increase in state negative affect in those medium and high schizotypy traits, as well as decrease in state positive affect within all groups as a result of the stressor.

Following the stressor, there were significant group differences in perceived control, $F(2, 123) = 6.28$, $p < .01$. Individuals high in schizotypy traits ($M = 5.58$, $SD = 1.83$) as compared to those medium ($M = 4.60$, $SD = 1.80$) and low in schizotypy traits ($M = 4.24$, $SD = 1.58$) were significantly lower in perceived control following the stressor condition, *p*s < .01. No significant difference in perceived control were found between those medium or low in schizotypy traits. Significant between group difference in ratings of the test's degree of stressfulness were found, $F(2, 123) = 4.47$, $p = .01$. Planned comparisons revealed that the low trait schizotypy group ($M = 1.86$, $SE = .20$) rated the test as significantly less stressful than the medium ($M = 2.38$, $SE = .10$) and high trait ($M = 2.68$, $SE = .20$) schizotypy groups. These results suggest that the perceived effects of stress appears to increase with SPQ traits.

The final set of analyses examined the relationship between resiliency and vulnerability factors (see Table 4). All hypothesized relationships were supported. Trait negative affect was significantly positively associated with low perceived control (r = .33, p < .001), high perceived stress over the past month (r = .59, p < .001), and higher ratings of perceived test (r = .26, p = .002). Trait negative and positive affect were inversely related (r = -.21, p = .018). Trait positive affect also had inverse relationships with post-stressor low perceived control (r = - .32, p < .001) and perceived stress over the past month (r = -.29, p = .001), but was not associated with perceptions of the test's stressfulness (r = -.09, p = .33). Increases in state negative affect were positively associated with higher ratings of perceived test stress (r = .38, p < .001). Perceived stress over the past month was not related to changes in state negative affect (r = .14, p = .11) but was related to decreases in state positive affect (r = -.22, p = .01). Low perceived control was significantly related to an incremental increase in state negative affect (r = .24, p = .007), high perceived stress over the past month (r = .34, p < .001), and a trend relationship with higher ratings of perceived test stress (r = .16, p = .076). Perceptions of the test's stressfulness and perceived stress over the past month were positively correlated (r = .40, p < .001).

Table 4

Intercorrelations between individual difference variables across groups

N = 130	Low Perceived Control	Trait PA	Trait NA	Change NA	Change PA	Test Stress
Low Perceived Control	-	-	-	-	-	-
Trait PA	-.32**	-	-	-	-	-
Trait NA	.33**	-.21*	-	-	-	-
Change NA	.24**	.07	.10	-	-	-
Change PA	-.10	.03	-.06	-.08	-	-
Test Stress	.16	-0.09	.26**	.38**	-.03	_
Perceived Stress Scale	.34**	-.29**	.59**	.14	-.22*	.40**

Note: *p < .05, ** p ≤ .01

Participants' perceptions of feedback following debriefing

Following the debreifing of the task's purpose, an exit survey was administered to assess participants perceptions of the stressor task: 83% of the participants reported that they did not believe the false feedback; 59.4% felt that the feedback did not change their performance, 18% felt the feedback enhanced their performance and 21.1% of participants felt that the feedback made their performance worse. Furthermore, a positive correlation between beliefs about the feedback and performance decrement was found only within those high in schizotypy traits, $r = .55$, $p = .006$; such that individuals who reported believing the negative feedback also felt that the feedback adversely affected their performance. The magnitude of this relationship significantly differed between both those medium and low in schizotypy traits, fisher's r-to-z range: 2.32 - 2.59, *p*s < .05. Overall, these results are in accord with our hypothesis that individual differences in vulnerability and resiliency factors influenced stress reactivity.

CHAPTER 4. DISCUSSION

4.1 Summary of findings

Similar to past research (e.g., Compton, 2000; Fox, Russo, Bowles, & Dutton, 2001), accuracy for detecting and responding to the targets was excellent in both of the spatial cueing task's performance conditions. Additionally, a main effect of cue validity (i.e., faster reaction times to valid as compared to invalid trials) that supported the validity of the testing paradigm was found. As hypothesized, there were main effects for performance condition, cue validity and valence; however, as will be discussed, some of these main effects were in an unexpected direction and interpretation of the main effects was complicated by the many interactions amongst the study's variables. Contrary to our hypotheses, no main effect of group or hemifield presentation was found within the spatial cueing tasks. Closer examination of attention disengagement (invalid trials), revealed a main effect of performance condition and an interaction effect between condition, valence and group. As hypothesized, there was a significant increase in state negative affect and decrease in state positive affect following the stressor. There was also significant differences across groups in the resiliency and vulnerability factors. Moreover, the interrelationship between these variables displayed the predicted pattern of resiliency factors displaying an inverse relationship with vulnerability factors; and vulnerability factors significantly associating with one another within all groups.

4.2 What factors influence selective attention?

Aim one investigated factors that influence selective attention (i.e., the orienting response). Attention engagement (valid trials) and disengagement (invalid trials) were examined within this first set of hypotheses. As suggested in the project's introduction, there was a significant amount of interplay between performance condition, cue valence, cue validity, and group. Thus, while many main effects were found, interpretation of the main effects was complicated given the significant interaction effects that occurred amongst the variables of interest. Nevertheless, several clear patterns emerged within the data that support the main effect of performance condition. Contrary to expectations, the stressor as compared to the neutral condition appeared to enhance rather than impair performance. Within the stressor condition reaction times to the target were overall significantly faster than reaction times to the target within the neutral condition. This *facilitation effect* was an interesting and unexpected finding, and although it was not anticipated there are several viable explanations for it. First, there is a wide body of research that suggests that stress enhances selective attention to the central task, while decreasing attention to irrelevant cues (for review, see Staal, 2004). A second possibility, which is consistent with this thesis' literature review, is that the uncontrollable social evaluative nature of the stressor task might have improved performance motivation through the task gaining more importance to the participants' personal goals of social-self preservation. In this view, and consistent with Social Self Preservation Theory, attention vigilance during the task improved as a function of activation of stress response systems that were triggered in effort to provide the physiological resources to avoid negative social evaluation. A final possibility, which is not mutually exclusive from the former explanations, moderate levels of arousal might enhance performance (e.g., the Yerkes-Dodson model, 1908). According to the Yerkes-Dodson model (1908), performance and arousal follow an inverted u-pattern, such that as arousal increase from low to moderate levels performance improves; however there is an optimal peak that once reached, performance begins to degrade as levels of arousal increase from moderate to high. These potential explanations will be built on in relationship to the study's other significant findings.

A question that this thesis project asked was, “Is the difference between cue validity (valid vs. invalid cues) the same in neutral as compared to stressful performance conditions?” The answer appears to be that there was a greater response cost to invalid cues as stress increases. As expected, cues that were valid as compared to invalid associated with significantly faster reaction times within both performance conditions. This effect of cue validity was strongest within the stressor as compared to neutral condition, such that there was a greater difference between valid and invalid trial reaction times within the stressor as compared to the neutral condition. Importantly, the greater difference in reaction times to valid as compared invalid observed within the stressor condition could indicate that attention disengagement becomes more impaired as stress increases, or alternatively it may indicate that under stress attention engagement is enhanced. Importantly, both possibilities are consistent with emotional processing theories (e.g., Easterbrook, 1959) that suggest that psychological stress through the process of selective attention can both impair and enhance performance through narrowing the field of focus (“the tunneling hypothesis”; for review, see Staal, 2004). In this view, and consistent with our findings, stress facilitated responses to valid cues, and reaction times to invalid cues was impaired but not to the same degree as in the neutral condition.

Our hypothesis that selective attention performance would be impaired (as evidenced by slower mean reaction times) to negative as compared to positive affective stimuli cues was only partially supported. Rather, a main effect of cue valence suggested that reaction times generally appeared to be faster to negative affective as compared to positive affective stimuli cues. However, it is important to note that the relationship between cue valence and reaction time appeared to be moderated by the performance condition, the cue’s validity, and the degree of schizotypy traits. Specifically, in the neutral condition, the expected effect of a disordinal interaction between cue valence and validity was found, such that the difference in reaction times to invalid as compared to valid negative affective stimuli cues was greater than the difference between invalid and valid positive affective stimuli cues. Thus, supporting the notion that attention disengagement is more impaired to negative affective as compared to positive affective invalid cues. Importantly, this interaction effect between the cue's validity and valence also appeared to be moderated by stress. Within the stressor condition, there were no meaningful differences between the cue's validity and valence. Instead, the two distinct main effects of cue valence (faster reaction times to negative as compared to positive affective stimuli cues) and cue validity appeared to be supported. In analyses of these findings, we suggest that the experience of uncontrollable stress increased the efficiency of attention allocation to sources of threat, in which bottom-up activations to the exogenous cues would have allowed the socially threatening cues (i.e., the negative affective stimuli cues) to gain preferential processing as compared to the non-threatening social cues. This point may be easily argued in that the failure to detect sources of threat would have had important evolutionary consequences, and is also consistent with theories of emotional processing that suggest that emotions are tied to underlying biological mechanisms which serve the important function of guiding behaviors in responses to threat (see Damasio, 2004; Eysenck, Derakshan, Santos, & Calvo; LeDoux 1996, 2000; Ohman & Wiens, 2001; Zajonc, 1984). Specifically, it appears that negative facial images (and not neutral or happy faces) enhance amygdala activation; in turn, amygdala activation projections to the cortex serve to enhance attention and perception to the source of threat (for review, see Phelps & LeDoux, 2005). Conversely in non-threatening situations, it is plausible that an individual may benefit from further top-down processing of potentially socially threatening cues, thus attention disengagement but not engagement would be prolonged to invalid negative affective cues.

Importantly, there was also a three-way interaction between condition, cue valence and group. This three-way interaction suggested that the just described interaction effect between condition and cue valence differed between those high, medium, and low in schizotypy traits. Within the neutral condition, individuals high in schizotypy traits overall responded faster than those low and medium in schizotypy traits. Furthermore, those high in schizotypy traits responded the fastest to negative affective stimuli cues, followed by those medium in schizotypy traits, who were faster than the low trait schizotypy group within the stressor condition. Reaction times to negative affective as compared to positive affective stimuli cues were also significantly faster only within the high trait schizotypy group in the stressor condition. Similar results were found at the level of invalid trials with the exception of a disordinal interaction between group and cue valence. Within the stressor condition, rapid disengagement was found to negative affective as compared to positive affective stimuli cues within the high trait schizotypy group; conversely, attention disengagement was slower to negative affective as compared to positive affective stimuli cues within the medium trait schizotypy group. Thus, it appears that attention disengagement from negative affective as compared to positive affective stimuli cues differs as a function of stress and the degree of schizotypy traits. Overall, it appears that individuals high in schizotypy traits had greater attention vigilance to social threat cues than those low and medium in schizotypy traits; and, that this attentional vigilance to social threat increased as a function of stress.

A sub aim of this project was to examine the influence of asymmetry during invalid trials across conditions (stress vs. neutral); and examine whether these potential differences in asymmetry were related to condition, cue valence or individual differences in the degree of schizotypy traits. While no significant differences in the ability to disengage attention from the left visual field as compared to the right visual field during invalid trials were found, it is important to note that the observed power for this aim was insufficient. Given the significant amount of interactions found between this study's variables that needed to be controlled for in this set of analysis, future studies that examine individual differences in hemispheric disengagement may want to consider a simpler design to test the influence of left vs. right hemifield presentation.

To our knowledge, this is the first study to investigate the direct impact of uncontrollable social evaluative stress on selective attention function. A strength of this study is that individual differences in baseline attention functioning was controlled for by the repeated measure design. Furthermore, the repeated measure design was informative in that there was a greater response cost to negative affective invalid cues within the stressor as compared to the neutral condition, and while there was the expected disordinal interaction between cue valence and cue validity within the neutral condition, this effect was not observed within the stressor condition. Rather, facilitated responding was seen to negative affective as compared to positive affective stimuli cues within the stressor condition, and this enhanced allocation of attentional resources to threat was only significant in those high in schizotypy traits. Thus, while the directionality of some of the spatial cueing tasks findings were unexpected, these results are important in that they help to further inform us of the nature of reactions to stress, and suggest that acute stress does not always "impair" selective attention. Rather, these results might indicate that selective attention narrows as a function of increases in negative affective states in response to stress. Thus, whether or not attention impairment occurs appears to be dependent upon the situational demand of the task and perhaps individual appraisals of perceived controllability and social evaluative threat.

In summary of these findings, we suggest that the various main and interaction effects found within the spatial cueing task may be better understood from examining the underlying neurobiology involved in processing spatial cues and emotion. First, vigilant states have been shown to increase activation of regions of the brain (the right frontal parietal system) believed to play a critical role in the orienting response (Fernandez-Duque & Posner, 2001). Furthermore, as previously discussed, the experience of negative affective states and/or uncontrollable stress is associated with activation of the HPA axis and the amygdala. Thus, it is possible that the uncontrollable stressor was able to enhance performance by increasing attention vigilance through activation of stress response systems. Consistent with this notion, as will next be discussed, there was a significant increase in negative affective states and decreased perceptions of control following the stressor.

4.3 What underlying dispositional vulnerabilities contribute to susceptibility (or resiliency) to stress?

Aim two was interested in examining the relationship between characteristics that either are associated with increased vulnerability to stress or increased resiliency to stress. Consistent with vulnerability stress models and Aim Two's first set of hypotheses, the high trait schizotypy group significantly differed from those low and medium in schizotypy traits in trait negative affect, trait positive affect, perceived control and perceived stress. Individuals high in schizotypy traits reported significantly higher trait negative affect and differed in the extent to which they appraised situations in their life as often being very stressful over the past month as compared to those medium and low in schizotypy traits. Individuals high in schizotypy traits were also significantly lower in trait positive affect than those low in schizotypy traits, but not those medium in schizotypy traits. Individuals medium in schizotypy traits were significantly higher than the low trait schizotypy group in both trait negative affect and appraisals of greater life stress over the past month. As expected, while state negative affect significantly increased following the stressor within all groups, this effect was greatest within individuals high in schizotypy traits. Moreover, the group highest in schizotypy traits reported significantly lower perceived control immediately following the stressor than the other two groups. No significant group differences were found in state positive affect. It is possible that the failure to find differences in state positive affect may be reflective of the heterogeneity observed within schizophrenia spectrum disorders (e.g., positive vs. negative symptoms). Future analysis of this data set will investigate for these potential differences.

Aim's two second set of hypotheses was interested in the extent to which individual differences in vulnerability and resiliency factors interacted with one another in reaction to stress, and whether these factors were associated with differences in stress reactivity. As hypothesized, there was a significant increase in state negative affect and a significant decrease in state positive affect following the stressor condition. Significant changes in emotional arousal (as measured by changes in pre to post-stress affective states) were found in response to the stressor across groups; and, correlational analysis suggested that these incremental changes in state negative affect were related to lower perceived control and heightened perceptions of the test's stressfulness. Of interest, changes in state negative affect was not related to trait ratings of negative affect and perceived stress over the past month. This is important in that it supports this project's assertion that state and trait processes have a dynamic relationship, and that the observed effects to stress are not simply residual effects from the trait factors. Trait negative affect significantly associated with appraisals of lower perceived control, higher test stress, and life stress over the past month. Whereas, higher levels of trait positive affect associated with significantly less trait negative affect, higher perceived control, and less perceived stress over the past month. Furthermore, decreases in state positive affect following the stressor associated with greater perceived stress over the past month. Lastly, the low trait schizotypy group, who was also highest in trait positive affect, did not experience an increase in post-stress negative affect and reported the test as significantly less stressful than the other two groups. In summary, these results support the notion that trait positive affect lends resiliency to stress, while vulnerability traits appear to heighten susceptibility to stress.

On average, ratings of the spatial cueing task's stressfulness fell within the mild to moderate range. The majority of participants in the exit survey reported that they did not believe the false feedback (83%), yet 18% felt the feedback enhanced their performance and 21.1% of participants felt that the feedback made their performance worse (59.4% felt it did not change their performance). Thus, even though the majority of participants were able in retrospect to report that they did not believe the feedback, approximately 40% still reported that the feedback altered their performance. Interestingly, a relationship between believing the negative feedback and appraisals that the feedback adversely affected their performance was found only within those high in schizotypy traits. Overall, these result appear to indicate that individuals high in schizotypy traits were more sensitive to negative social evaluation, and supports the notion that individual differences in schioztypy and affective traits significantly influence perceived stress.

Importantly, uncontrollable stress and negative evaluation of oneself, is integrally related to physiological changes (i.e., cortisol release) in response to psychosocial stress (see Dickerson & Kemeny, 2004). However, there are individual differences in the degree of susceptibility to it. Of interest, and in line with this project's expectations, individuals higher in trait positive affect appeared to demonstrate greater psychological resiliency to stress, while individuals higher in trait negative affect and schizotypy traits appeared to have greater psychological vulnerability to the stressor.

4.4 Limitations

An important limitation within the current study is the observed lack of power in detecting: (1) across group differences within spatial cueing task paradigm, and (2) the secondary aims of investigating potential interactions effects with hemifield presentation on attention disengagement. While overall we obtained a decent sample size (N = 130), we were unable to recruit a sufficient number of individuals high or low in schizotypy traits (*n*s = 21-24). Unfortunately, such recruitment issues are common in that extreme scores are rarer within the general population. My intention is to further investigate individual differences in schizotypy traits using a regression model that will allow the traits to be examined along a continuum. Another potential limitation is that while the within subject repeated measure design allowed us to reduce measurement error, it prohibited us from having a counterbalanced design due to potential "carry-over effects" that could have resulted from the stressor condition. Thus, it is important to address the question as to whether the posited faciliation effects observed within the stressor condition were simply as a result of a having greater amounts of experience with the test's spatial cueing task paradigm (i.e., "practice effects"). Fortunately, there are several viable arguments against this latter point. First, research suggests that as testing progresses performance on selective attention tasks becomes more impaired (i.e., as time on task increases so does reaction times) as a result of mental fatigue ("fatigue effects"; e.g., Csathó, van der Linden, Hernádi, Buzás, Kalmár, 2012). Thusly, prevention of fatigue effects (and not practice effects) was an important consideration in the study design, in that efforts were taken to reduce potential fatigue effects by allowing adequate breaks between the trials, blocks and conditions. Another argument against practice effects is that attention tasks are not entirely automated and target discrimination also requires top-down processing (Pashler, Johnston, & Ruthruff, 2001). Thus, Pashler and colleagues posit that practice does not have as dramatic effects as was once commonly believed on reacton times in attention tasks. Moreover, optimal performance in tasks that are "purely" psychomotor vigilance tasks (PVTs) still rely on attention systems, such that better PVT performance appears to be reliant on activation of the middle frontal gyrus, right inferior parietal lobe and the left inferior parietal lobe (Drummond et al., 2005). Importantly, activation of these regions indicates that it is the top-down modulation of attention that facilitates individuals' motor responses to the stimulus. In summary, the possiblity that the main effect of condition is being driven by practice effects is highly unlikely based on past research and this study's overall findings. An argument might also be made that the participants habituated to the negative stimuli within the stressor condition; however this would be inconsistent with our results in that there was a greatest response cost to invalid negative affective stimuli cues within the stressor as compared to neutral condition. A final limitation is the use of predominantly healthy college undergraduate sample. Thus, whether these results can generalize to other populations, particularly clinical populations is uncertain.

4.5 Conclusions

As discussed, heightened reactivity to stress has been proposed to be a risk factor for psychosis. Within this study, individuals high in schizotypy traits displayed both subjective and objective heightened sensitivity to threat. While it was expected that those higher in schizotypy traits, as compared to those lower in schizotypy traits, would show impairment in their ability to disengage attention from threatening cues this was not the case. Rather, individuals high in schizotypy traits overall displayed greater attention vigilance than the other two groups.

Importantly, this heightened attention vigilance appeared to be influenced by increased stress (presumably mediated by their increase in negative affective states and low perceived control) and threatening negative affective cues. Thus, while the high trait schizotypy group displayed "better" attention performance than those medium and low in schizotypy traits, future research should investigate the potential consequences (e.g., attentional vigilance appears to come at the cost of narrowing attentional focus) and the underlying mechanisms (e.g., activation of the stress response systems) that may have contributed to this performance enhancement.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD CONSENT FORM

Study Exempted 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
Exemption Expires: 5/7/2015

CONSENT FORM

Project Title: Identifying the vocal markers of schizophrenia spectrum disorders

Performance Site:
322 Audubon Hall, LSU, Baton Rouge, LA 70803.

Investigator: The following investigator is available for questions Monday-Friday, 9:00 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 understand the relationship between cognition, emotion and social functioning and personality characteristics in college students.

Inclusion Criteria: You are being asked to participate in this study because you are a Louisiana State University undergraduate who is over the age of 18 who showed a scoring pattern of interest on our on-line personality screening measures.

Exclusion Criteria: Individuals showing the scoring pattern of interest on the personality screening measure are eligible to participate. There are no specific exclusion criteria.

Maximum Number of Subjects: The maximum number of participants for this phase will be 1000.

Study Procedures/Description of the Study: I am aware that this study will take approximately 1.5 hours. I will be asked to fill out a number of questionnaires that assess my emotion, personality, cognitive functions and mental health history. My voice will be recorded during several parts of this study. I will also be asked to play some memory and attention games on the computer. For participating in this session, I will receive 3 experimental credits. If I am not enrolled in a psychology course, I will be compensated $20 cash.

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

Risks/Discomforts: I understand that I will be expected to complete the 1.5 long session. This may be inconvenient. I also recognize that I will be asked to talk about my mental health history. Other than this discomfort, there are no known risks.

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 penalty or loss of any benefit to which I would otherwise be entitled to.

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: For participating in this study, I will receive three experimental course credits, or $20 cash if I am not enrolled in a psychology course.

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

APPENDIX B: SCHIZOTYPY PERSONALITY QUESTIONNAIRE-BRIEF REVISED (SPQ-BR)

SPQ-BR Items and Scales

Ideas of Reference (IR)

Do you sometimes feel that people are talking about you? (IR4)

Do you sometimes feel that other people are watching you? (IR5)

When shopping do you get the feeling that other people are taking notice of you? (IR6)

Suspiciousness (S)

I often feel that others have it in for me. (S1)

Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy? (S2)

Do you often have to keep an eye out to stop people from taking advantage of you? (S3)

No Close Friends (CF)

Do you feel that you cannot get "close" to people. (CF1)

I find it hard to be emotionally close to other people (CF2)

Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems? (CF3)

Constricted Affect (CA)

I tend to keep my feelings to myself. (CA1)

I rarely laugh and smile. (CA2)

I am not good at expressing my true feelings by the way I talk and look. (CA3)

Other people see me as slightly eccentric (odd). (EB1)

Eccentric Behavior (EB)

I am an odd, unusual person. (EB2)

I have some eccentric (odd) habits. (EB3)

People sometimes comment on my unusual mannerisms and habits. (EB4)

Social Anxiety (SA)

Do you often feel nervous when you are in a group of unfamiliar people? (SA1)

I get anxious when meeting people for the first time. (SA2)

I feel very uncomfortable in social situations involving Social Anxiety unfamiliar people. (SA3)

I sometimes avoid going to places where there will be many people Social Anxiety because I will get anxious. (SA4)

Magical Thinking (MT)

Do you believe in telepathy (mind-reading)? (MT1)

Do you believe in clairvoyance (psychic forces, fortune telling)? Magical Thinking (MT2)

Have you had experiences with astrology, seeing the future, UFO's, Magical Thinking ESP, or a sixth sense? (MT3)

Have you ever felt that you are communicating with another person telepathically (by mind-reading)? (MT4)

Odd Speech (OS)

I sometimes jump quickly from one topic to another when speaking. (OS1)

Do you tend to wander off the topic when having a conversation? Odd Speech (OS2)

I often ramble on too much when speaking. (OS3)

I sometimes forget what I am trying to say. (OS4)

Unusual Perception (UP)

I often hear a voice speaking my thoughts aloud. (UP1)

When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes? (UP)

Are your thoughts sometimes so strong that you can almost hear Unusual them? (UP3)

Do everyday things seem unusually large or small? (UP4)

APPENDIX C: SPATIAL CUEING TASK INSTRUCTIONS

TASK INSTRUCTIONS: This experiment explores how fast and accurate individuals respond to targets.

You will be presented with a cross (+) centered between 2 boxes.

You should fixate on "+" throughout the experiment. After a few seconds you will see an image in one of the boxes. This will be followed by the target "*".

Anytime you see a "*" you will press the "left light" key when it appears on the left side of screen and press the "right light" key when it appears on the right side of the screen. Be careful because the "*" will appear faster on some trials.

Press any key to begin.

APPENDIX D: STRESS TASK QUESTIONNAIRE

1. How well do you think this test measured your abilities?
2. How much do you agree with the following statement: I have little control
3. How much do you agree with the following statement: I am popular
4. How stressful would you rate this test?
5. How much do you agree with the following statement: I am in control[2]
6. How much do you agree with the following statement: My performance was a lot worse compared to other students
7. How confident are you that you did well?
8. How well did you master the task?

Please select the number that best applies:

1 = Not At All
2 = Very little
3 = Somewhat
4 = Pretty Much
5 = Very Much

[2] Item was reversed scored

APPENDIX E: TEXT FOR DEBRIEFING

This study was interested in whether receiving negative feedback affects peoples' performance.

The feedback that you received was false and your performance will not be compared to other students.

Thank you for your participation!

Press any key to continue.

APPENDIX F: EXIT SURVEY QUESTIONNAIRE

We would like to know your thoughts about the last experiment and whether receiving feedback affected your performance.

Please select the number that best describes your experience:

1. The feedback made my performance better.

2. The feedback did not change my performance.

3. The feedback made my performance worse.

Which best describes your thoughts on the accuracy of the feedback that compared you to other students:

Select the number that best applies to you:

1. I did not believe the feedback.

2. I believed the feedback.

VITA

Rebecca Kathryn MacAulay is a current student in the clinical psychology program at Louisiana State University (LSU), where she anticipates earning her Doctor of Philosophy in psychology in 2015. She received her Bachelors of the Arts in psychology from University of California at Los Angeles (UCLA), graduating magna cum laude with a college honors distinction. During her senior year at UCLA, she completed her senior thesis under the guidance of Dr. Cindy Yee-Bradbury, an expert in the area of schizophrenia and emotion, whom Rebecca remains grateful for her mentorship and guidance. While at UCLA, she also had the opportunity to conduct an independent research project that investigated the relationship between affective traits and individual differences in fear acquisition within Dr. Michelle Craske's laboratory. Since her time at LSU, Rebecca has continued to foster her research interest in the complex interplay between neurocognitive functioning, stress and emotion under the guidance of Dr. Alex Cohen.