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The Effects of Ostracism and Performance Anxiety on Impulsivity

Brigette Cuonzo
University of South Carolina - Aiken

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Brigette Cuonzo

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Abstract

Anxiety disorders are a prevalent mental health issue that affects millions of Americans. Individuals who suffer from anxiety tend to be behaviorally withdrawn or inhibited. More specifically, previous research has shown an inverse relationship between symptoms of anxiety and impulsivity. However, this research is mixed, as it has been found that anxiety is present in impulse control disorders. Therefore, the purpose of this study was to further explore the relationship between anxiety and impulsivity. This was done by inducing anxiety in two different studies that both incorporated the context of social interactions, in order to see their effect on impulsive responding. The social contexts that were examined included the situation of being socially ostracized (social exclusion), and the other incorporated the act of giving a public speech (social performance). In the first experiment, ostracism was induced with the Cyberball task. Additionally, neural brain-wave activity was examined using electroencephalogram (EEG). The second experiment induced anxiety through the performance-task of giving a speech. Both experiments also collected measures of perceived emotional childhood invalidation to further examine the influence these interactions may have on impulsive responding and anxiety. Impulsivity was examined in both experiments with the flanker attention task as was viewed on a spectrum, with slower responding indicating inhibition and faster responding indicating impulsivity. Twenty-eight undergraduate students from the University of South Carolina Aiken participated in experiment one and thirty-three participants in experiment two. In experiment 1, it was found that ostracized individuals responded faster and less accurate on the incongruent trials of the flanker task, indicating an increase in impulsive behavior. Also, perceived childhood emotional invalidation was related to facets of trait impulsivity. No differences were found between groups for the EEG data. In experiment 2, participants did feel more anxious after

giving a speech, however there were no significant differences between accuracy and response time on the flanker task when compared to controls. Collectively, these findings suggest that social exclusion may have an impact on impulsivity and may reflect a person's desire to reintegrate into their social group. On the other hand, it appears performance anxiety engages different processes that don't result in increased impulsiveness, but rather controlled inhibition. Further investigation into the way our social environments play a role in the relationship between anxiety and impulsivity may be an important factor in the discrepancy in current literature regarding this relationship. Ultimately, further research on this relationship may lead to prevention or intervention aimed at decreasing maladaptive forms of impulsivity.

The Effects of Ostracism and Performance Anxiety on Impulsivity

According to the National Institute of Mental Health (2015), anxiety disorders are the most common mental illness in the United States and affect over 40 million adults. Anxiety has traditionally been viewed as a complex emotional state based on a perceived fear of threat or danger. Alternatively, anxiety can be defined as a future-oriented cognitive and emotional state- or trait-characteristic involving several components. These include anxious apprehension, worry, emotional or behavioral conflicts, and altered approach or avoidance behaviors (Robinson, Vytal, Cornwell, & Grillon, 2013). Due to the complexity of anxiety, it is often difficult to distinguish from other emotional states. For example, both fear and worry are seen aspects of anxiety. Worry as a component of anxiety can be viewed as a cognitive process that prepares the individual to anticipate future danger (Beauchaine & Hinshaw, 2013). Similar to this is fear, which is part of the response system that prepares the individual to either freeze to avoid punishment or flee as part of the fight or flight response (Beauchaine & Hinshaw, 2013).

Due to these features, it is often difficult to distinguish anxiety from fear because both signal danger or threat and are thought to provide an adaptive value for several species by triggering an appropriate response (Robinson et al., 2013). However, anxiety and fear can be distinguished by differences in their etiologies, response patterns, time courses, and intensities, which seem to justify a clear distinction between anxiety and fear (Steimer, 2002). Although both states alert the individual, they appear to prepare the body for different actions. Anxiety is a generalized response to an unknown threat or internal conflict, whereas fear is focused on an established external danger or threat (Steimer, 2002). Both provide an adaptive value by heightening preparation and improving survival odds if signs of imminent danger become present (Robinson et al., 2013).

Stress is also commonly linked with anxiety. Stress is thought to initiate both the peripheral nervous system via the sympathetic nervous system and the endocrine system via the hypothalamic-pituitary-adrenal axis (Allen, Kennedy, Cryan, Dinan, & Clarke, 2014). Hypothalamic-pituitary-adrenal axis (HPA) activation is a result of initial activity by the hypothalamus, where corticotropin-releasing hormone (CRH) is discharged in response to stress (Smith & Vale, 2006). Corticotropin-releasing hormone then acts on the pituitary gland, causing it to release adrenocorticotrophic hormone (ACTH), which in turn causes the adrenal cortex to release cortisol (Smith & Vale, 2006). The ultimate goal of HPA axis activation is to increase levels of cortisol in the blood during times of stress. The main role of cortisol is to release glucose into the bloodstream to facilitate the "flight or fight" response (Smith & Vale, 2006). Cortisol also suppresses and regulates the immune system, digestive system, and reproductive system to prepare the body for its reaction (Smith & Vale, 2006). In individuals suffering from anxiety, this system does not properly send feedback to the brain and the HPA axis remains activated after the threat or danger has gone. This long-term activation becomes maladaptive and leads to increases in anxiety (Kudielka, Hellhammer, Krischbaum, Harmon-Jones, & Winkielman, 2004).

Another large contributor to anxiety is emotion, specifically negative emotions. Emotions are not only drawn from unexpected encounters in threatening situations but can also be elicited based on conclusions drawn from interpretations of complex social interactions. For example, if an individual is teased by their peers and interprets the situation as hurtful, they will experience negative emotions such as sadness. However, if the same individual is teased by their peers and assumes it is in jest or part of their social banter, they may not experience the same negative emotions. The ability to recognize and label emotional experiences is associated with well-being

and adaptive functioning, as it provides the individual with information on the state of their relationships and helps guide decisions (Kashdan & Farmer, 2014). Eliciting emotions through social interpretations is viewed as top-down processing.

Bottom-up processing starts with the individual details or components of something, and collectively these components build up to make the whole. In the context of human behavior and affective processing, this can include the elicitation of emotion by the presence of a stimulus that has physical properties that are inherently emotional (McRae et al., 2012). For example, fear and disgust might be elicited from the bottom-up when someone glances down to discover a bug in their food. Bottom-up emotion generation reliably elicits activity from the amygdala, a neural structure that is thought to be important for emotional learning and the processing of emotional information more generally (McRae et al., 2012).

Top-down processing, on the other hand, uses conceptual knowledge, such as memories and linguistic representations, to elicit emotions (McRae, Misra, Prasad, Pereira, & Gross, 2012). Top-down emotion generation refers to the expression of emotion through appraisals of a particular situation (McRae et al., 2012). For example, fear might be elicited from the top-down when someone interprets an e-mail from their boss as threatening to their job security. Top-down emotion generation views emotion processing as a cognitive process. That is, differences in the emotional response are believed to be caused by differences in individuals' goals or their appraisal bias (McRae et al., 2012). Based on this emotion generation, individuals will differ in their responses to the same situation due to their personal beliefs, history, or current circumstances. Like bottom-up processing, top-down emotion generation also elicits activity from the amygdala. Additionally, the dorsomedial prefrontal cortex (dMPFC) is involved. This is

thought to represent the higher-level self-relevant appraisals of executive functioning (McRae et al., 2012).

Both top-down and bottom-up processing play a role in the emotion generation of anxiety disorders. As previously mentioned, these processes can be exemplified within the context of social situations. For example, the bottom-up experience of being socially excluded, or ostracized, may lead to feelings of anxiety through top-down negative cognitive appraisals involving rejection. Likewise, other forms of social situations such as having to perform in front of others could also result in similar experiences of anxiety through similar negative appraisals, also involving the possible fear of rejection. These negative cognitive appraisals and resulting anxiety may be influenced by prior social interactions during childhood, particularly in the form of emotional invalidation by the caregiver. More importantly, these relationships and negative social interactions could result in other aberrant behaviors, such as impulsiveness. When such aberrant behaviors are present, they can be linked to dysfunction of the executive system.

Anxiety and Executive Functioning

Executive functions are self-regulating, and control functions that direct and organize behavior. These functions include planning, decision-making, goal-directed behavior, self-inhibiting, self-monitoring, self-evaluating, flexible problem-solving, initiation, and self-awareness (Robinson et al., 2013). Executive functioning appears to be negatively impacted in individuals with anxiety disorders (Starcke et al., 2008). This can be attributed to the possibility that individuals with anxiety may interpret situations as being more negative than they are, therefore biasing their thoughts (Beauchaine & Hinshaw, 2013). This bias is thought to contribute to the creation and maintenance of heightened anxiety (Beauchaine & Hinshaw, 2013).

Anxiety is often viewed on a spectrum and includes features such as fear, panic, and uneasiness that are related to a variety of disorders. Through these features of anxiety can have a widespread effect on behavioral impairment and executive functioning. For example, a study by Billingsley-Marshall et al. (2013) showed that state anxiety appeared to contribute to diminished executive function in women diagnosed with an eating disorder. Specifically, executive function was measured using several different tests of cognitive functioning and results showed that 30% of participants had impaired performance on one or more tasks (Billingsley-Marshall et al., 2013). Similarly, deficits in decision-making and achievement scores were noted in a clinical sample of patients with obsessive-compulsive disorder (Dittrich & Johansen, 2013). Another study examining obsessive-compulsive disorder found similar results, particularly on tasks associated with memory performance, as participants failed to implement organizational strategies during encoding which is a feature of executive functioning (Smitherman et. al, 2007). Similarly, Airaksinen et al. (2005) found that both panic disorder (with and without agoraphobia) and obsessive–compulsive disorder are related to impairments in episodic memory and executive functioning. They also found that social phobia, which includes fear and worry in social situations, was related to episodic memory dysfunction, which involves executive functioning in both memory storage and retrieval (Baudic et al., 2006). These studies indicate that anxiety has an impact on executive functioning in clinical populations. However, much less research has focused on a non-clinical population. Anxiety is often present in the general population at sub-clinical levels and can impact an individuals functioning when the features are present at a higher level. In these populations anxiety is often broken down into state and trait features to describe how an individual responds normally versus in a specific situation. For example, high state anxiety is expected in certain situations for all individuals, however, those who experience high

state anxiety in a typical social situation will fall higher on the anxiety spectrum, but may not meet criteria for an anxiety disorder. Similarly, Individuals with high trait anxiety are often viewed as more nervous, worried, and cautious throughout their life, but again may not meet criteria for a specific disorder despite these tendencies impairing their functioning.

Individuals who report higher trait anxiety that are not diagnosed with a psychological disorder may experience difficulties in cognitive functioning, especially the higher order cognitive tasks that characterize executive functioning. For example, task-switching and math test performance are both negatively impacted by high trait anxiety levels (Eysenck & Calvo, 1992; Ashcraft & Kirk, 2001). In a study by Newman, Wallace, Schmitt, & Arnette (1997), researchers found that high-anxious individuals responded more slowly than low-anxious individuals. They attributed this to increased behavioral inhibition and error monitoring that is present in high anxious individuals. Even children are susceptible to this relationship, as it was demonstrated that selective attention, memory bias, and cognitive errors were each independently associated with childhood anxiety symptoms (Watts & Weems, 2006). Research has also shown that neural activity in the prefrontal cortex, which is an area largely responsible for executive functions, was reduced in people with high anxiety during a response-conflict task (Bishop, 2009).

Although the effects of trait anxiety on executive functioning has gained attention in previous research, the effects of state anxiety are not as heavily researched. This is especially true in non-clinical populations. One such study, however, did show that increased state anxiety has a negative impact on working memory tasks (Visu-Petra, Miclea, & Visu-Petra, 2013). Similarly, both state and trait anxiety were found to have a differential impact on attention (Pacheco-Unguetti, Acosta, Callejas, & Lupiáñez, 2010). Pacheco et al. (2010) found that trait

anxiety was related to deficiencies in the executive control network, while state anxiety was associated with an over-functioning of the alerting and orienting networks, as measured by the attention network test.

Anxiety and Impulsivity

Inhibition is an executive functioning ability, and the opposite of inhibition is disinhibition, which is a form of impulsivity. Impulsivity is viewed as a multidimensional construct in which individuals place an immediate gain or reward ahead of long-term consequences (Moustafa, Tindle, Frydecka, & Misiak, 2017). Other characteristics of impulsivity include quick responding to stimuli and not thinking about potential consequences prior to engaging in a careless action; this behavior often leads to undesirable outcomes (Sweitzer, Allen, & Kaut, 2008). While being a core feature of human behavior, impulsivity is also a common clinical problem, with significant public health implications. Impulsivity has been linked to psychiatric disorders including: substance use disorders, antisocial personality disorder, disruptive behavioral disorders, gambling disorder, and borderline personality disorder; and is also associated with aggression, self-injury, suicide attempts, domestic violence, and risk-taking behaviors (Moustafa et. al, 2017).

Not only is impulsivity associated with a range of personality traits and clinical disorders, but previous studies have shown that it is negatively related to anxiety (Perugi et. al, 2011). This is typically how anxiety is viewed; the more anxious the individual the less impulsive or daring their behavior is. However more recently, a positive association has been found between impulsivity and anxiety, specifically in impulse control disorders (e.g., pathological gambling) and other disorders associated with impulsivity such as eating disorders, bipolar disorder, ADHD, and conduct disorders (Moustafa et. al, 2017). Bellani et al. (2012) also reported that the

presence of anxiety, regardless of whether it was a comorbid disorder or current presenting symptom, increased impulsivity in patients with mood and personality disorders in general. Therefore, our former assumptions about anxiety and its relation to impulsivity may not be completely accurate. Research has shown both relationships exist, yet there is no clear distinction on what leads these individuals with high anxiety to respond more impulsivity or be more inhibited.

Given this grey area related to the relationship between anxiety and impulsivity, it is important to better understand how different situations may exacerbate these behavioral responses. Particularly related to state anxiety, as it was previously addressed that the effect of state anxiety on impulsivity is not well researched. Two potentially important antecedents of state anxiety that were discussed are social exclusion and social performance situations. Therefore, these two social situations warrant further investigation.

Social Exclusion

Social exclusion is the situation in which an individual is rejected or ignored by peers and can also be described as a form of ostracism. Ostracism can lead to a reduction in feeling of belongingness, control, self-esteem, and meaningful existence (Zadro, Boland, Richardson, 2006). This minimization of belongingness should be seen as an invalidation of connection between the individual and the desired group. Studies have also shown that social exclusion has been linked to poor performance on cognitive tasks that require effortful processing and reasoning (Baumeister, Twenge, & Nuss, 2002).

Ostracism has been shown to negatively affect both adolescents and adults by eliciting social pain and is believed to threaten four fundamental psychological needs: self-esteem, belonging, control, and a sense of meaningful existence (Sebastian et. al, 2010; Williams, 2006).

These threats to fundamental needs by ostracism lead to low mood and increased anxiety in female adolescents (Sebastian et. al, 2010).

In another study by Watson-Jones, Whitehouse, and Legare (2016), researchers found that when ostracized by in-group members, individuals increase behavioral mimicry (i.e., imitating the actions of a peer) as a means of increasing their likability and rapport with the person or group. Researchers also found that in-group children who were ostracized by the group displayed increased anxiety compared to out-group members who were ostracized (Watson-Jones et. al, 2016).

Research has also found that ostracism impacts the individuals neurological functioning. An MRI study of the brain found that after only a few minutes of being ostracized in a computerized ball-tossing game called Cyberball, participants responded negatively, as indicated by self-report (Eisenberger, Lieberman, & Williams, 2003). These individuals also showed activation of their dorsal anterior cingulate cortex, the same region of the brain that is activated when pain is detected (Eisenberger et. al, 2003). Due to the emotional and physical consequences it is no wonder individuals will quickly pick up on cues and alter their behavior in an attempt to remain in the group.

Detecting ostracism is thought to be highly adaptive since it requires focusing attention onto the threatening situation and requiring that the individual take action (Spoor & Williams, 2007). This effort may cause issues with attention and effort as the focus is taken away from other processes. One such process is self-regulation. In order to self–regulate successfully, individuals must attend to their psychological states and behaviors; that is, they must self–monitor (Carver & Scheier, 1998). Ostracism may interfere with individuals' capacity for self–monitoring, thereby disrupting regulatory behavior which is particularly relevant to anxious

individuals who might view themselves as unable to make positive impressions on others, lacking in social status, or socially undesirable (Oaten, Williams, Jones, & Zadro, 2008).

The act of ostracism or social exclusion can be viewed as a bottom-up process, as the external environment is directing the individual's emotions. This same situation can also elicit top-down processes as the individual's interpretation of lacking in social status or viewing themselves as undesirable will result in negative emotions. Both of these processes can increase an individual's anxiety both internally and in social situations and may result in impaired executive functioning due to the strong emotional reaction ostracism can elicit.

Social Performance

Performance anxiety is seen in many individuals from professional athletes and musicians to elementary school children. Performance anxiety is an anxious state characterized by worry over the threat to a current goal, such as failing a test or causing your team to lose a sporting event. In these instances, the individuals try to develop effective strategies to reduce anxiety and achieve their goal. These strategies may include practice and preparation which require the use of executive functions. Eynseck, Derakshan, Santos, & Calvo (2007) reported that anxiety is often associated with adverse effects on the performance of cognitive tasks due to deficits in executive functioning, specifically, attentional control. His research found that anxiety impairs an individual's ability to efficiently process information more than it impairs their effectiveness on the task (Eynseck et. al, 2007). Other research has focused on the effects of anxiety on impulsive disorders.

On study looked at the relationship between anxiety and impulsivity on neuropsychological assessment and found no mitigating relationship between anxiety and impulsivity (Vloet, Konrad, Herpertz-Dahlmann, Polier, & Günther 2010). However, the

researches recommended future studies that compare state and trait anxiety as their data sample did not distinguish differences between different features of anxiety. In another study by Ruf, Bessette, Pearlson, & Stevens (2017), researchers found that adolescents diagnosed ADHD who reported higher trait anxiety performed better on measures of sustained attention, reaction time, and motor variability.

It has been found that anxiety can also be prompted in an experimental setting by engaging participants in a social performance task. The purpose behind these methods is to induce a stress response in the body by eliciting the activation of the HPA-axis (Allen et. al, 2014). Motivated performance tasks have become a standard protocol for the experimental induction of psychological stress in healthy subjects (Treir Social Stress Test; Foley & Kirschbaum, 2010). In a motivated performance task, participants give an impromptu speech in front of an audience (Kirschbaum, Pirke, & Hellhammer, 1993) or complete serial subtraction problems in the presence of an evaluative experimenter (Hellhammer, Kirschbaum, Harmon-Jones, & Winkielman, 2007) to produce high arousal states and change autonomic nervous system activity.

The Trier Social Stress Test (TSST) is an effective research tool for inducing stress in humans and has been used in numerous studies (Hellhammer & Schubert, 2010; Kirschbaum & Hellhammer., 1993). In a study by Sato, Takenaka, & Kawahara (2012), the TSST was used to induce anxiety to study the effects of stress on performance during a Flanker Task, which measures attention and inhibition (Sato et. al, 2012). Stress was measured by looking at cortisol levels prior to manipulation, just after manipulation, and thirty minutes after manipulation (Sato et al., 2012). They found that stress enhanced selective attention in the experimental group under low perceptual load condition (i.e. less visual distractors), but that the same group exhibited

more difficulty in remaining focused on the target when the perceptual load was high (Sato et. al, 2012). These findings suggest that individuals who exhibit a high level of internal stress, induced using a motivated performance task, have more difficulty regulating attention and remaining focused on a task.

Emotional Invalidation

Emotional invalidation (EI) is another form of negative social interaction that may lead to anxious states. If this social interaction is chronic, for example from caregivers throughout childhood, this could have potentially long-lasting ramifications in the relationship between anxiety and impulsivity. Unfortunately, not much research has been conducted to examine the influence of EI on this relationship.

EI is believed to be the most common form of child maltreatment and is estimated to occur in 5.6% to 34.8% of the population based on adult retrospective reports (Wright, Crawford, & Del Castillo, 2009). EI is defined as responding to an individual in a way that minimizes, punishes, or ignores the inner emotional experience, which in some cases may be classified as emotional abuse (Linehan, 1993). This has been linked to higher rates of anxiety, depression, low self-esteem, interpersonal sensitivity, dissociation, borderline personality disorder, and eating disorders (Egeland, 2009; Grynberg et. al, 2010; Mountford et. al, 2007; Shelby et. al, 2008; Sturrock & Mellor, 2014; Wright et. al, 2009). For example, studies have looked at a sample of college students and found higher levels of anxiety and depression in those who reported higher EI during their childhood (Wright et. al, 2009). Wright et. al (2009) found that this relationship was mediated by schemas of vulnerability to harm, shame, and self-sacrifice. Similarly, young children whose emotional needs were ignored at an early age were more emotionally impaired than their same age peers who were physically abused or neglected (Egeland, 2009). Children in

first, second, and third grade who experienced early EI displayed more social withdrawal, were less popular with peers, and displayed more internalizing problems than same age peers in the control group (Egeland, 2009). These social issues, especially those leading to negative social interactions, will further contribute to internalizing disorders such as anxiety and depression that will carry over into adulthood. Krause, Mendelson, and Lynch (2002) found that emotional inhibition mediated childhood emotional invalidation and adult psychological distress. That is, individuals who experience childhood EI will have more trouble regulating their emotions and may over rely on avoidance strategies that are characteristic of anxiety disorders (Krause et. al, 2002). This avoidance can include conscious suppression of thoughts, feelings, urges, and sensations to escape emotionally aversive experiences.

Chronic emotional inhibition has been linked to negative affect, depression, obsessive compulsive tendencies, anxiety, and PTSD (Krause et. al, 2002). Research on socialization of emotion suggests that parental responses to children's emotions have a strong effect on the child's perception, expression, and regulation of emotion and that emotional invalidation is associated with both social and emotional problems in childhood (Krause et. al, 2002). This social aspect can include social withdrawal and peer rejection, which may lead to victimization. Levinson, Langer, and Rodebaugh (2013) report that peer victimization increases the risk of psychosocial maladjustment and leads to problems such as increased anxiety and depression, especially in children and adolescents. This includes both overt (physical aggression) and relational (teasing or ostracism) victimization, which was found to lead specifically to increased social anxiety in children and adolescents (Levinson et. al, 2013).

Not only does childhood EI lead to increased psychological problems, other outcomes such as emotional impulsivity and distress intolerance may also be present as these individuals

may have trouble regulating their emotions. These behaviors can be viewed as impulsive in nature and are related to several disorders including anorexia, bulimia nervosa, and borderline personality disorder (Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007).

Studying Impulsivity Using Lateralized Readiness Potential

The lateralized readiness potential (LRP) has been used to study motor preparation in individuals with impulsivity and is widely used in many areas of psychology involving reaction time tasks. The LRP is a negative potential observed over the motor cortex contralateral to the responding hand and can continuously track motor cortex activation. LRP amplitude has been found to be higher in individuals who report greater levels of impulsivity and LRP latency is delayed in impulsive individuals indicating a lapse of motor activation (Dimoska & Johnstone, 2007). Dimoska and Johnstone (2007) also found that reaction time of impulsive participants was generally slower than that of controls. Similarly, LRP Latency was delayed in impulsive individuals, which is thought to indicate a stronger susceptibility to stimulus interference in impulsive individuals (Kóbor, Takács, Honbolygó, & Csépe, 2014). These findings suggest a delay in motor cortex activity, which could result in slower responding. This is seemly contradictory to how impulsive individuals are seen: quick to act and responding without much thought. Furthermore, anxiety is typically inversely associated with impulsivity, yet there is a high correlation between individuals with impulse control disorders and various forms of anxiety. Therefore, more research is needed to provide clarity on how impulsive individuals respond on a neurological level and the relationship between impulsivity and various forms of anxiety.

Current Study

It has been established that anxiety has an impact on cognitive functioning and that this relationship is related to childhood emotional invalidation and social ostracism. Specifically, research has shown that anxiety increases stress levels and decreases executive functioning and inhibition. However, it is still not well understood how social contexts of anxiety may influence inhibition. Previous studies have examined the effects of social anxiety and performance anxiety separately and found that these constructs impact an individual's performance and stress levels. To our knowledge, no one has compared studies examining both types of anxiety-provoking processes and their impact on impulsivity. Therefore, the purpose of this study was to examine if both social anxiety (being socially excluded, or ostracized) and performance anxiety (giving a speech) influence impulsivity, measured through impulsive responding. Perceived childhood emotional invalidation was also assessed to evaluate any influence it may have on impulsive responding. Additionally, we investigated how brainwave activity is affected by social ostracism during a behavioral inhibition task. Despite the frequency of anxiety and anxiety related disorders in the population, our understanding of the neural systems and psychological mechanisms underlying cognition interactions in anxiety is surprisingly lacking.

Purpose

The purpose of the current study is to assess how social or performance anxiety impact impulsivity, in the form of impulsive responding. Research has shown that different forms of anxiety impact an individual's ability to monitor and regulate their behavior. Previous studies have found that anxiety can lead to both impulsivity and inhibition. A main goal of this study is to shed more light on these findings by looking at two types of social anxiety, namely social ostracism and performance anxiety. Furthermore, information was collected on EI as research has shown its effects to be long-lasting and influence both anxiety and impulsivity when studied

separately. Therefore, another goal of this study is to examine any influence childhood EI may have on this relationship. In doing this, we hope identify differences in how each form of state anxiety impacts an individuals' behavioral responding.

Hypotheses

Experiment 1:

1. Social ostracism will result in slower reaction time during incongruent trials on the Flanker task in the experimental group compared to the control group.
2. Socially ostracized individuals will display increased accuracy on the incongruent trials on the Flanker task compared to the control group.
3. Individuals who report higher levels of impulsivity on the UPPS will have faster reaction times on incongruent trials.
4. Individuals that were socially ostracized will display a smaller LRP peak than individuals in the control group.
5. Ostracized individuals will display longer LRP latency then individuals in the control group.
6. Individuals who report higher levels of childhood emotional invalidation will report higher levels of impulsivity on the UPPS.

Experiment 2:

7. The performance anxiety group will have a slower reaction time on incongruent trials than the control group on the Flanker task.
8. The performance anxiety group will have decreased accuracy on incongruent trials than the control group during the Flanker task.

9. Childhood emotional invalidation will positively correlate with trait anxiety.

Experiment 1

Participants

Data for this study utilized students from the University of South Carolina Aiken who were currently enrolled in an undergraduate introductory psychology course. Twenty-eight participants were recruited and randomized into either the ostracized (n = 13, Mean age 19.2, SD = 1.44, 7 females) or non-ostracized group (n = 15, Mean age 19.24, SD = 1.51, 10 females). In this experiment, certain exclusionary factors for the study were listed on the participant scheduling system and were again filtered at the time of arrival. Such exclusionary factors included: previous or current psychiatric diagnosis, major previous head trauma within the last year, left-handedness, and current use of select psychoactive medications (specifically, medications affecting brain activity such as sedatives, stimulants, or anticonvulsants). These exclusionary criteria allowed for the recording of brain activity from healthy participants, to control for confounds in brain activity, and to acquire brain activity from a homogenous group. Individuals who did not meet these criteria were excluded from further participation in this study (N=5). Once data was collected on all study participants, only 23 individuals yielded EEG data that could be analyzed for the LRP waveform.

Procedure

The overall goal of this study was to examine whether social ostracism leads to higher levels of impulsivity, as seen in the Flanker task. This study utilized EEG recording, a Flanker task, a Cyberball task, and self-report measures including the Primary Caregiver Environment Scale (PCES), Urgency, Premeditation, Perseverance, Sensation Seeking, Positive Urgency,

Impulsive Behavior Scale **(**UPPS), and a manipulation check. These measures are all described below.

Demographics questionnaire (See Appendix A). Each participant was asked to complete a demographics questionnaire aimed at collecting qualitative information. This information was used in two ways. Some demographic questions (specifically gender and age) were used as qualitative descriptors and aid in the process of equalizing the groups described below. The remaining questions (i.e., handedness, caffeine use on the day of the study, previous night's sleep, and time since last meal) were used to account for potential confounds in electroencephalogram (EEG) data. Participants also completed a manipulation check to ensure they believed they were playing with real people in the Cyberball task. Participants in the ostracism group also received debriefing after the study to inform them that the Cyberball task was performed by computers and was set-up to exclude the participant.

Urgency, Premeditation, Perseverance, Sensation Seeking, Positive Urgency, Impulsive Behavior Scale (UPPS) (Cyders, et al., 2007; see Appendix B). The UPPS is a 59-item multidimensional self-report measure that assesses five dimensions of impulsivity. The first dimension, Negative Urgency, determines an individual's tendency to give in to impulses when experiencing negative emotions such as anxiety or anger (e.g., "Sometimes I do impulsive things that I regret later"). The second dimension, Premeditation, evaluates an individual's ability to plan before acting (e.g., "I usually think carefully before I do anything"). The third dimension, Perseverance, assesses an individual's ability to complete a task despite experiencing feelings such as boredom or fatigue (e.g., "I am a person who always gets the job done"). The fourth dimension, Sensation Seeking, taps into an individual's drive to find stimulation or excitement in their environment (e.g., "I would like to go scuba diving"). The final dimension, Positive

Urgency, studies a person's tendency to give in to impulses when feeling positive emotions such as happiness (e.g., "I am surprised at things I do while in a great mood"). Each question is rated on a 4-point Likert scale ranging from 1 ("*agree strongly"*) to 4 (*"disagree strongly"*). The UPPS is calculated by summing the items within each of the five subscale dimensions. Higher scores indicate increased levels of impulsivity in that domain. Internal validity was measured for the five dimensions using Chronbach's α and values ranged from .82 to .91 (Whiteside & Lynam, 2005).

Primary Caregiver Environment Scale (PCES; Mountford et al., 2007; see Appendix C). The PCES is an 18-item self-report measure of perceived emotional invalidation of childhood environments prior to the age of eighteen. This measure is divided into two subsections with the first 14-items being rated twice (once for each parent) concerning the perceived relationship between the participant and each parent. These items are rated on a 5-point Likert scale ranging from 1 ("*Never*") to 5 ("*All of the time*"). These items have showed good levels of internal consistency among clinical populations (paternal invalidation $\alpha = 0.796$; maternal invalidation $\alpha = 0.772$) and moderate internal consistency among non-clinical populations (paternal invalidation $\alpha = 0.587$; maternal invalidation $\alpha = 0.664$; Mountford et al., 2007). In the current study, participants were given the PCES to complete for each primary caregiver (e.g. maternal and paternal). If two questionnaires were completed, a composite score was calculated by computing the total sum of both primary caregiver scores on the first 14-items to achieve a "total invalidating environment" score. If one form was completed, this score was doubled to achieve the composite score. The PCES was incorporated in both experiments.

Stimuli and Tasks

Cyberball task (see appendix D). The Cyberball task was used in Experiment 1 to induce social ostracism (see Figure 2). Cyberball is a virtual ball-toss computer game (Williams & Jarvis, 2006). The game appeared as an Internet web page and depicted three animated ball-tosser's standing in a triangle. Two of the animations were labeled as "player 1" and "player 2" and individuals were told these were other participants of the experiment who were playing from different locations. However, only the participant is real and the other two players are computer confederates. The researcher preprograms the computer confederates to exclude the real participant a set number of total ball throws. Each time the ball was thrown to the participant, they were required to click on one of the other players to throw the ball to them. For the ostracism group, the game was preprogrammed for participants to receive the ball 33% of the time during the first 10 tosses and then not receive the ball again for the rest of the task (see figure 3). For individuals in the control group, the computer was programed to give them the ball 33% of the time throughout the entire task.

Flanker Task. For this study, the visual flanker task was used as a measure of attention and inhibition. In the current study participants were asked to press a left- or right-arrow button on a keyboard to indicate whether a central target stimulus is pointed either left (i.e., <) or right (i.e., >) and this stimuli is accompanied on both sides by flanking stimuli that was either congruent (i.e., <<<<< or >>>>>) or incongruent (i.e., <<><< or >><>>).

All stimuli were presented in white on a black background on a 40.5 x 32cm LCD Dell monitor. The monitor was viewed at a distance of 100 cm. In the first experiment, the central target stimulus was a left or right-angle bracket (i.e., < or >), measuring 1 degree of visual angle and was presented in the middle of the monitor. The flanker stimuli consist of four symbols (two on each side of the target stimuli) that are either left or right-angle brackets depending on the

condition (congruent or incongruent). The flankers and targets were aligned horizontally and spaced .29 degrees of visual angle apart (center to center). The participants were asked to make a button-press as quickly as possible to indicate the direction of the target stimulus. To maximize effect, the flanker stimulus was presented 150 ms prior to target onset. The target stimulus was presented for 200 ms, and during this time the flanker stimuli were also visible. There was an inter-trial interval jittered between 1200-1400 ms (sampled randomly) immediately following the participant's response. This was done to decrease predictability of upcoming trial onsets and to decrease neural habituation for EEG data collection (Kóbor et al., 2014). A minimum error rate of 10% was set for each block, and if this was met, the participant was asked to speed up on the subsequent blocks. Likewise, a maximum error rate of 20% was set for each block, and if this is met, the participant was asked to slow down on subsequent blocks.

Subjects completed 10 blocks of testing in which congruent or incongruent trials were presented in random order with equal frequency. Each block contained 40 trials, resulting in 400 total trials per experimental session. After each block, participants were given a self-paced rest period. Participants completed a practice block of 12 trials before the beginning of testing. During practice trials, an examiner was present to check for comprehension of the task directions.

Electrophysiological Recording

Electroencephalogram (EEG) activity was recorded using a 32-channel recording system (Brain Vision). This system uses electrodes mounted in an elastic cap based on a subset of the International 10/20 system sites (see Figure 3). Four facial electrodes were also placed above and below the right eye and near the temples on both the right and left sides of the eye to detect eye movement artifacts (horizontal and vertical electooculogram). Then signals were recorded via

Pycorder software and referenced online using the average between right and left mastoid sites. The horizontal and vertical electrooculograms (EOGs) were recorded as the voltage between electrodes placed lateral to the external corner of each eye and above and below the left eye, respectively. These electrodes are used to account for eye blinks and eye movement that occur during recording. This study also accounted for impedance, which is the opposition of electrical current from living tissue that results in increased electrical disturbance (i.e., distorted data; Luck & Kappenman, 2011). Impedance was assessed at the beginning of data collection and kept below 15KΩ.

EEG Data Analysis

Data was analyzed offline using Brain Analyzer software. Low-pass and high-pass filters were applied at 30 and 0.5 Hz, respectively, which was applied to account for non-task specific frequencies. Data was then segmented around each stimulus (stimulus-locked) using a baseline of -200 to 0 ms prior to stimulus onset and 800 ms post stimulus onset. Each segment was averaged into epochs based on condition. Trials with artifacts (such as from excessive blinking or eye movement) were excluded prior to analysis and only data with artifacts less than 40% were included (Artifact Rejection: M=6.829%). Furthermore, reaction times lower than 200ms and trials with no response were eliminated from analysis to prevent data biasing (Kóbor et al., 2014; Kappenman & Luck, 2011). Participants whose performance was less than 60% accurate or resulted in artifacts from more than 40% of their data were excluded from final analysis (N = 16).

The Lateralized Readiness Potential (LRP) is a focused waveform which requires calculations narrowed to the C3 and C4 sites, which are located over the motor cortex in the left and right hemispheres (Kappenman et al., 2012), respectively. However, all 32 electrodes were

utilized during the study as to ensure quality wave form data. In order to isolate the LRP, a separate waveform was generated from the lateralized hemisphere activity based on responding with the right hand only. This was performed using an equation, outlined by Cole (1989), that was modified to calculate the right-hand response average difference between the C3 and C4 sites (i.e., mean[$(C'_3-C'_4)_{\text{right-hand movement}}$]). In this equation, negative deviation suggests a preference for correct response and positive deviation indicates preference for incorrect response (Cole, 1989, p. 256). LRP amplitude was measured as the peak amplitude within the measurement window (stimulus-locked = 200-500 ms) for all responses of the specific trial type (i.e. congruent or incongruent) relative to the baseline voltage. The onset latency of the LRP was measured as the time point at which the voltage reached 50% of the peak amplitude.

Protocol

In this experiment, participants played a computer game called Cyberball and were assigned to either the experimental condition or control condition and matched by gender. After the completion of the Cyberball task, the participant was prepared for EEG data collection. The participant's head was measured and properly fitted for the EEG cap. The cap was placed so that the Cz (see Figure 2) electrode was midway between the participant's ears and halfway between their nasion (frontal bone indent between the eyes) and inion (posterior bone protrusion at the back of the head). Then, electroconductive gel was injected into each electrode site and checked for proper impedance levels throughout, which were kept below 15KΩ.

After finishing the Cyberball task, participants completed the practice block of the task while the experimenter assessed the EEG recording for appropriateness of readings. Finally, the participant completed the flanker task. As aforementioned, the participant was given short breaks between each block. The entire EEG recording during the flanker task lasted 10-15-minutes, on

average (not including break times). After the EEG recording was complete, the experimenter removed all recording devices from the participant and issued the Primary Caregiver Environment Scale (PCES) and the UPPS. Finally, a deception check and debriefing form containing further details about the current study and contact information were provided. The entire study took approximately one and a half hours to complete.

Experiment 1 Results

Descriptive Information

Table 1 provides a summary of the descriptive statistics for this study's variables. Prior to conducting hypothesis testing, data was screened for data entry accuracy, parametric assumptions, missing values, and outliers. All parametric assumptions were met.

Assessing for pre-existing differences between conditions. Groups were checked for differences between non-experimental variables. This was done for two purposes: 1) to ensure that groups were not distinct prior to group assignments and 2) to examine whether factors known to influence EEG data were equally distributed. In this experiment, there were no significant differences between groups for age $t(28)= .479$, $p= .751$, gender $t(28)=2.061$, $p= .148$. Also, no significant differences were seen between groups on the UPPS $t(46)= .945$, $p= .543$, and PCES total mean difference between the exclusion and inclusion groups was not significant, $t(28) = -.75$, $p = .46$. Measures that can influence brain activity were also not significantly different between groups, specifically smoking $t(31) = -.645$, $p = .524$, caffeine use $t(31) = -.839$, $p = .408$, previous night's sleep $t(31) = .177$, $p = .861$, time since last meal $t(31) = .527$, $p = .639$, and exercise habits $t(31) = -.407$, $p = .169$. This suggests equal distribution of these factors within each group.

Hypothesis 1. A repeated measures mixed design ANOVA was conducted to examine the differences between reaction time on congruent versus incongruent trials between ostracized and non-ostracized groups. Group was the between-subject's factor and trial type was the within-subject's factor. There was a significant main effect of trial type on reaction time between, $F(1, 26)= 132.4$, $p<0.001$, *partial* $\eta^2= .836$ (see table 2 and figure 4). There was not a significant interaction between trial type and group, $F(1, 26)= .208$, $p= .168$, *partial* $\eta^2=0.072$. There also was not a significant group difference on reaction time, $F(1,26)=1.764$, $p= .103$, *partial* $\eta^2= .064$ (see table 2 and figure 4). Ostracized participants went from responding slower than control participants on congruent trials to faster than controls on incongruent trials. Therefore, post-hoc analysis was performed using independent sample t-tests to evaluate differences in reaction time between groups. There was not a significant difference between groups on congruent trials (control: $M= 419.244$, $SD= 50.33$; experimental: $M= 387.93$, $SD= 47.49$); $t(26)= 1.692$, $p= .103$. There was also no significant difference between groups on incongruent trail (control: $M= 456.221$, $SD= 53.33$; experimental: $M= 435.301$, $SD= 59.00$) conditions; $t(26)= .978$, $p= .337$.

Hypothesis 2. A repeated measures mixed design ANOVA was conducted to examine the differences between accuracy on congruent versus incongruent trials between ostracized and non-ostracized groups. Group was the between subject's factor and trial type was the within subject's factor. There was a significant main effect of trial type on accuracy between groups, $F(1, 26)=63.721$, $p< .01$, *partial* $\eta^2= .710$. Results also showed a near-significant interaction between trial type and group, $F(1, 26)=2.924$, $p= .099$, *partial* $\eta^2= .101$ (see figure 5). Therefore, post-hoc analysis was performed using independent sample t-tests to evaluate differences in accuracy. There was a significant difference between groups on congruent trials (control: $M= .903$, $SD= .089$; experimental: $M= .955$, $SD= .039$); $t(26)= -2.053$, $p= .05$. However, no

significant difference between groups on incongruent trail (control: *M*= .745, *SD*= .086; experimental: *M*= .712, *SD*= .181) conditions was seen; *t*(26)= .611, *p*= .547.

Hypothesis 3. A bivariate Pearson's correlation coefficient was calculated to assess the relationship between high levels of impulsivity, as reported on the UPPS, and reaction time on incongruent trails of the flanker task. No significant relationship was seen on any of the five subscales of the UPPS. See table 3 for summary of these statistics.

Hypotheses 4. To test the hypothesis that ostracized individuals would display smaller LRP peak amplitude compared to the control group, a mixed design repeated measures ANOVA was conducted. In this model, group was the between subject's variable and trial type was the within subject's variable. Overall, there was no main effect of group on LRP amplitude, $F(1,22) = .281$, $p = .601$. No significant main effect was seen on LRP Peak between trial $F(1,22) = .014$, $p = .906$; or interaction $F(1,22) = .006$, $p = .939$. Post-hoc analysis was performed using an independent samples t-test which showed no significant difference of LRP peak between groups for congruent trails (control: *M*= 310.17, *SD*= 71.628; experimental: *M*= 325.33, *SD*= 73.783) *t*(22)= -.511, *p*= .614, or for incongruent trials (control: *M*= 313.33, *SD*= 79.50; experimental: *M*= 326.00, *SD*= 76.444), *t*(22)= -.398, *p*= .695.

Hypothesis 5. A repeated measures mixed design ANOVA was conducted to examine LRP latency between trial types and group. This also showed no significant differences between groups $F(1, 22)=2.150$, $p= .157$; trial types $F(1, 22)=1.195$, $p= .286$; or interaction effect $F(1, 22) = .006$, $p = .998$. Post-hoc testing was performed using an independent samples t-test which showed no significant differences between groups for LRP latency on the congruent trials (control: *M*= -1.458, *SD*= 1.79; experimental: *M*= -2.608, *SD*= 2.315), $t(22)=1.362$, $p = .187$, or

incongruent trials (control: *M*= -1.775, *SD*= 1.99; experimental: *M*= -2.927, *SD*= 2.07), *t*(22) = 1.389, *p* = .179 .

Hypothesis 6. Emotional childhood invalidation was analyzed to see if this chronic negative social interaction during childhood may relate to impulsivity. Data was collected on perceived childhood emotional invalidation and various aspects of impulsivity, as measured within the UPPS. Analysis revealed a positive correlation between perceived emotional invalidation during childhood and three subscales of the UPPS: Negative Urgency (*r* = .44, *p*= .01), Premeditation (*r* = -.55, *p* = .05), and Perseverance (*r* =.394, *p* = .005). The other two subscales, Positive Urgency and Sensation Seeking, had no significant relationship with perceived emotional invalidation, respectively (*p*= .708; *p*= .176).

Experiment 1 Discussion

The purpose of this study was to evaluate the influence of ostracism on impulsivity. We predicted that the external anxiety group would have a slower reaction time and higher accuracy during incongruent trials on the Flanker task. These hypotheses were partially supported as the ostracized group displayed increased accuracy on the congruent trials but not incongruent trials. Ostracized individuals also displayed significantly faster reaction times on both congruent and incongruent trials. These finding are contradictory to previous studies which report that ostracized individuals have a decrease in response accuracy during the flanker task (Ball, 2011). Previous research also showed that ostracism leads to degradation of the individual's self-regulatory functioning; that is, individuals who are excluded from a desired group do not place emphasis on self-monitoring and therefore are more prone to inaccurate responding (Baumeister et. al, 2005; Zardo et al., 2004). However, further research is necessary to clarify self-regulatory

functioning given conflicting results between our study and previous research, as our participants appear to have increased self-monitoring leading to higher accuracy.

We also believed that individuals who were socially ostracized would show a smaller LRP peak and longer latency then individuals in the control group. Again, current data did not support this as no significant differences were shown among the LRP waveform. Although ostracism research shows that social exclusion results in executive dysfunction, this may not show on the LRP waveform as it is a measure of motor function and not necessarily related to executive functions such as response inhibition (Baumeister et al., 2002). Although previous research indicates a relationship between social exclusion and impulsive behavior, this is typically measured through response inhibition by looking at P300 or cognitive control via N200 (Baumeister et al., 2005; Chester, Lynam, Milich, & DeWall, 2017; Luck, 2014).

Post-Hoc analysis for this study also showed that perceived childhood emotional invalidation was correlated with trait measures of impulsivity. Specifically, it was found that perseverance (staying on task regardless of internal states), negative urgency (impulsivity related to negative mood), and premeditation (acting without thinking) are related to the presence of the self-reported childhood emotional invalidation. Recent research is in-line with this finding as other studies have found that impulsivity has a moderating effect on peer victimization and deviant behavior (Zhu et. al, 2016). That is, individuals who experience peer victimization are more likely to display deviant behavior.

Other studies have also found that individuals who reported higher levels of childhood emotional invalidation are more susceptible to impulsive behaviors. In one study by Haslam, Mountford, Meyer & Waller (2008), the researchers found that individuals diagnosed with bulimia nervosa scored higher on childhood emotional invalidation scales than individuals

diagnosed with anorexia nervous. This higher score may be due to impulsivity in that individuals with bulimia may have higher levels of negative urgency and premeditation. However, more research is needed to understand this relationship. Another study found that youth who reporter higher levels of emotional invalidation and impulsivity were at higher risk for non-suicidal self-injury (You & Leung, 2012). These finding further support a relationship between childhood emotional invalidation and impulsive behavior.

Results from this study suggest that individuals may interpret negative social interactions as more threatening and therefore their pre-motor cortex is primed to act, which results in higher accuracy. The acute stress resulting from being ostracized directly impacted participants ability to ignore flanker, resulting in decreased accuracy on the incongruent trials, while increasing impulsivity, in the form of faster reaction time. The significant increase in accuracy on congruent trials may be due to their perceived ostracism. That is, individuals in the experimental group may have put forth better effort in an attempt to increase social standing through performance. The discrepancy between the ostracism group's accuracy on the trails may simply be due to the increased difficulty of responding to incongruent trails.

Limitations

individuals were non-clinical, and therefore, differences between survey data, LRP waveform data, and performance during the Flanker Task may be reduced in the current population. Furthermore, a larger sample size would have likely provided higher power and a better indication of the relationships among the study variables. As some of this study statistical analyses' results trended towards significance, it is conceivable that these would have been statistically significant given more power.

Since EEG data was collected in this study, strict participant guidelines were required to obtain viable data. Due to this, only 39 out of the 64 original participants provided usable data for the study. If all participant data could have been analyzed the power of the sample in this study would have increased. Despite this limitation, the exclusionary process is important to prevent data with a significant number of artifacts from influencing the final data results. Regardless, this limitation should be noted due to the reduction in sample size.

Experiment 2

Participants

In the second experiment, 33 participants were randomly assigned to either give a speech (n = 16, Mean age 19.06, SD = 1.97, 14 females) or read a speech (n = 15, Mean age 18.35, SD = 1.97, 13 females). In this second experiment, no EEG data was collected, therefore, the exclusionary criteria differed. EEG recording was intended to take place in Experiment 2; however, equipment failure during this time-period of data collection prevented the acquiring of such data. In the second experiment, participants were not excluded for EEG-specific reasons even though EEG set-up was still incorporated in the procedures. This was done in order to keep methods consistent across experiments. For this study, inclusionary criteria included: the subject be at least 18 years old, enrolled in Psychology 101, no current diagnosis of anxiety or depression, and not currently taking any psychotropic medications including anxiety, depression, or ADHD medication. Data was collected and analyzed on a total of 31 participants. The final sample demographic information for this experiment is detailed in Table 5.

All participants were awarded course credit that was applicable to their experimental participation requirement and were provided with written informed consent at the beginning of testing, which outlined the specific study's procedures as well as the risks and benefits of

participating. The Institutional Review Board at the University of South Carolina approved this study.

Procedure

Experiment two incorporated the examination of the impact of intrinsic anxiety (giving a speech) on impulsivity. This experiment utilized the modified Trier Social Stress Test, the Flanker task, self-report measures of state and trait measures of anxiety (STAI & self-rating), and the Invalidating Childhood Environment scale. Participants also completed a demographic questionnaire similar to experiment 1 (see appendix G). All measures are described in detail below.

State Trait Anxiety Inventory (STAI) (see appendix H). The STAI is a widely used instrument that was primarily designed to measure anxiety both as it corresponds to a relatively stable personality disposition and when it refers to a transitory emotional state, prompted by external or internal stimuli (Valentina & Gilles, 2011). Form Y is the most recent version and consists of 20 items for assessing trait anxiety and 20 for state anxiety (American Psychological Association, n.d.). Older versions include form X and were inadequate in differentiating diagnoses of depression versus anxiety (Levine, 2007). State anxiety items include: “I am tense; I am worried” and “I feel calm; I feel secure.” Trait anxiety items include: “I worry too much over something that really doesn’t matter” and “I am content; I am a steady person.” All items are rated on a 4-point scale (e.g., from “Almost Never” to “Almost Always”). Scoring was reversed for anxiety-absent items (19 items of the total 40). Range of scores for each subtest is 20–80, with higher scores indicating greater anxiety.

Internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from .65 to .75 over a 2-month interval (APA, n.d.). Since the

S-Anxiety scale tends to detect transitory states, test–retest coefficients were lower for the state anxiety scale compared to the test anxiety score. Internal consistency alpha coefficients were quite high ranging from 0.86 for high school students to 0.95 for military recruits (Julian, 2011).

Modified Trier Social Stress Test (TSST). The TSST was utilized in Experiment 2 to induce intrinsic anxiety. The TSST is a standardized psychosocial laboratory stress inducing protocol that consists of preparing a speech on a specific topic during a brief preparation period, followed by a test period in which participants deliver this speech and then perform mental arithmetic tasks (Kirschbaum et. al, 1993). This study utilized the speech portion of the Trier Social Stress Test to induce anxiety. In this model there is a speech preparation period and a speech administration portion. In the speech preparation period, the following script is read to the participant in the experimental group:

> "This is the speech preparation portion of the task; you are to mentally prepare a five-minute speech describing what you have learned thus far in your Psychology 101 class. Your speech will be videotaped, and the recording may be used in future psychology classes. You have ten minutes to prepare and your time begins now."

A timer will then be set for 10 minutes and the administrator will leave the room. To increase the perceived social-evaluative threat during the TSST speech portion, the participant was told they are being video recorded using a webcam and their recording may be used in future classes (recordings were deleted shortly after completion of the experiment). After the 10-minute preparation period, the administrator will return to the room and read the following script to the participant:

> "This is the speech portion of the task. You are to deliver a speech describing what you have learned so far in your Psychology 101 class. You should speak for the entire the

five-minute time period. You will be recorded using the webcam which will count down from three prior to beginning the recording. Your time will begin after the count down. Remember, your speech should last the entire 5 minutes "

The video camera will be turned on to increase evaluative/performance stress and a timer will be set for five minutes. If the participant stops talking during the speech, he/she will be allowed to remain silent for 20 seconds. If he or she does not resume speaking, the administrator will return to the room and prompt the participant to continue speaking by instructing them: "You still have time remaining." Participants who are assigned to the control group would read a chapter from the Psychology 101 text book that would take approximately five minutes to read aloud.

Flanker Task (Eriksen & Schultz, 1979; Luck & Kappenman, 2012)**.** Impulsivity was viewed on a spectrum with slower responding suggesting inhibition and faster responding indicating impulsivity. The second study also utilized a similar Flanker task in which subjects completed 10 blocks of congruent and incongruent trials which were presented in random order, with 40 trails in each block. However, in this experiment participants were not presented with the stimulus cue prior to target onset. Again, the inter-trial interval was set between 1200-1400 ms immediately following the participant's response and self-paced breaks were provided between blocks. This experiment also included a practice block of 12 trails before beginning testing to ensure the participant understood instructions prior to beginning the task.

EEG Recording. This study utilized a mock EEG recording due to equipment malfunction. In this experiment, participants were informed EEG recording would take place and examiners used the same steps as mentioned above for experiment one, however, no actual data was recorded.

Protocol

In the second experiment, participants were recruited (see experiment 1 recruitment protocol) and assigned to either the control or experimental group by counterbalancing to match for gender. After informed consent was provided, participants completed a demographic questionnaire, the state portion of the STAI, and an individual rating of anxiety on a scale of 1 to 10. Next, the participants were measured and fitted with the EEG cap to their head size and prepared for EEG data collection as described above, although no EEG data was collected. This was done to ensure equality between experiments

After preparation of the EEG, participants in the experimental group underwent the modified TSST, as described above. For the control condition, the individuals were asked to read aloud a print out from their Psychology 101 textbook. No evaluator was present during this test, and subjects were not recorded via video-camera. Once the manipulation was complete, participants were asked to complete the state portion of the STAI and again provide their subjective level of anxiety on a scale of 1 to 10. Next, participants in both groups were given the flanker task. Participants first completed a practice block of trails to confirm their understanding of the task before moving on. Short breaks were provided between blocks on the Flanker task. The entire process took approximately 1 hour to complete. After task completion, the experimenter removed all recording devices from the participant and issued self-report measures: the trait portion of the State-Trait Anxiety Inventory and the Primary Caregiver Environment Scale. Contact information was provided to all participants in case the individual had questions or concerns.

Results

Groups were checked for unsystematic variance and other descriptive information differences. All parametric assumptions were met and no outliers were present. This was done to ensure that groups were not distinct prior to group assignments.

In this study, the STAI total mean differences between the experimental and control group were not significantly different for trait anxiety (p= .08*)*. However, state anxiety was significantly different for the experimental group post manipulation, $t(15) = -2.388$, p= .031. Stated anxiety for the control group pre- and post-manipulation showed no significant differences, $t(14) = -.275$, p =.787. This finding suggests that the speech manipulation was successful in creating performance anxiety (see figure 7).

Hypotheses 7. To test the hypothesis that performance anxiety, specifically giving a speech, would increase reaction time during incongruent trials, a mixed design repeated measures ANOVA was used. Again, group was the between subject's factor and trial type was the within subject's factor. Results showed that there was not a main effect of group on reaction time, $F(1,29)= .859$, p= .541, *partial eta*= .002. There was no significant effect of trial type $F(1,29)= 150.185$, p= .838, *partial eta*= .000; or interaction effect $F(1,29)= .398$, p= .533, *partial eta*= .014 (see table 6).

Hypothesis 8. A repeated measures mixed design ANOVA was also used to test the hypothesis that giving a speech would decrease accuracy on incongruent trials. Group was the between-subjects factor and trial type the within-subjects factor. This analysis revealed no significant group differences in accuracy, $F(1,29)= .055$, p= .816, *partial eta*= .002. There was no significant effect of trial type $F(1,29)= 33.713$, p= .000, *partial eta*= .538; or interaction effect $F(1,29)= .382$, p= .541, *partial eta*= .013 (see table 6).

Hypotheses 9. It was believed that childhood emotional invalidation would correlate with trait anxiety. A bivariate Pearson's correlation was performed and revealed no significant relationship, r=0.280, p=0.127.

Post Hoc Analysis: Emotional childhood invalidation was further examined to see if this chronic negative social interaction during childhood may relate to the development of state impulsivity. State impulsivity was defined as faster reaction time during incongruent trials. Post-hoc analysis of childhood emotional invalidation revealed a negative relationship with reaction time on incongruent trials (r= -.383, p= 0.033) in Experiment 2. This suggests that PCEI may influence state impulsive behavior. This relationship did not exist in Experiment 1 however, p= .531, likely because participants were primed with the target cue for each response trial prior to the flanker stimuli's appearance.

Experiment 2 Discussion

The purpose of this study was to examine the effects of performance anxiety on impulsivity in the form of impulsive responding during the flanker task. This study hypothesized that the performance anxiety group would have a slower reaction time and higher accuracy during incongruent trials on the Flanker task than the control group. These hypotheses were not supported, as no significant differences were seen between accuracy or reaction time for either group in experiment two. This null finding is likely due to the internal stress impacting a different executive function. Previous research has shown that the TSST impacts memory performance, although findings on this topic are inconsistent as well due to reports of both improved and impaired memory (Guez, Saar-Ashkenazy, Keha, & Tiferet-Dweck, 2016). Other studies have shown that acute stress impairs cognitive inhibition (tuning out irrelevant stimuli) but enhances response inhibition (Shields, Sazma, & Yonelinas, 2016). These differences in

inhibition could also account for the differences seen between the external and internal anxiety groups. Based on our findings we can infer that giving a speech may only be a temporary stressor and once the participant completes the task there is a degree of relief because the stress has passed.

Finally, we believed that perceived childhood emotional invalidation would correlate with increased anxiety and impulsive responding on the Flanker task. Results indicate that perceived childhood emotional invalidation was not significantly correlated with anxiety, however, perceived childhood emotional invalidation was significantly correlated with faster reaction time on incompatible trials. Although previous research has shown that childhood emotional invalidation plays a mediating role in development of psychological disorders including anxiety, current findings did not support this (Krause et. al, 2003). However, this discrepancy may be due to the small number of participants in the study or using a community-based sample. Also, other studies have shown that chronic childhood emotional invalidation leads to increased emotional inhibition and difficulty with emotional regulation as an adult (Krause et. al, 2003). These difficulties are related to a number of psychological disorders including anxiety, depression, and borderline personality disorder.

Limitations

A significant limitation in this study is that the TSST did not induce anxiety in the experimental group for the second study. This may be due to the nature of the task and the demographic sampled. College students may be required to engage in public speaking more often than the general public, and as such, may not find this task as anxiety provoking. Future studies should also look to rectify this by utilizing a different internal anxiety task such as engaging in mental math. Congruency between the control and experimental groups for the new internal

anxiety measure should also be taken. The current study had control participants in the second experiment read a speech for only 5 minutes, as opposed to completing a task for 15 minutes like their experimental counterpart. Though this is a small discrepancy, this is still a limitation as study results may have differed.

Conclusion

The purpose of the current experiment was to assess impulsivity when participants experienced either social anxiety or performance anxiety. Results from these studies showed that ostracism had a significant impact on response inhibition, as ostracized individuals overall responded faster than non-ostracized peers. Ostracized individuals also responded more accurately on congruent versus incongruent response trials. In the second experiment, we saw that giving a speech did increase anxiety, however, this internalized anxiety did not have a significant impact on behavioral inhibition.

Taken together, these findings suggest that social factors influence impulsivity. Specifically, that these negative social interactions influence an individual's behavioral reaction leading to an increase in impulsivity. In this study, this was seen through their performance on the flanker task. Individuals who were ostracized responded faster and more accurately on congruent trials, suggesting that when tasks are simple their responding increases and is more accurate. It should be noted that when more visual distractions are present, these same individuals do not perform differently. However, they are still more impulsive in their responding as demonstrated by increased response time but not better accuracy.

Results also suggest that there may be differences in how threats are perceived. Individuals who are exposed to a performance-based stressor (i.e. giving a speech) may be better equipped to deal with these emotions, as they do not threaten the individual's needs. This type of

stress may be viewed as temporary discomfort versus ostracism, which causes prolonged negative effects. Research has shown that ostracism is painful as it interferes with our need for belonging and lower's self-esteem (Baumeister et. al, 2005). It is this threat to our confidence and social requirements that can be viewed as the driving force behind increased responding. Based on findings from both studies, there is converging evidence that is in-line with our suggestion that social exclusion experiences may contribute more to behaviors related to impulsivity.

To our knowledge, no research so far has compared these two anxiety provoking situations. Future studies should continue to investigate differences between social exclusion and performance anxiety, and directly compare their impact on behavioral inhibition. Exploring differences between how threats are interpreted within these groups will also shed more light on current findings.

Limitations

Even though significant findings were seen in the present study, there are several limitations that should be noted. The primary limitation in this study was the discrepancy between flanker tasks on both experiments. Due to this, data could not be compared between experiments. This study should be repeated in the future using the same flanker experiment across both trials.

The sample population used for this study should also be noted as a significant limitation. Participants were exclusively recruited from an undergraduate population at a small southeastern campus (University of South Carolina Aiken). Therefore, results may not be an accurate measure of a more diverse data sample.

Another potential limitation is the use of self-reported perceived emotional invalidation during childhood. However, due to the nature of this study, it was not possible to conduct a more objective measure of emotional invalidation. This is a common problem with emotional invalidation research as it is a relatively new area of research. Due to the nature of self-report, it is possible that participants either overestimated or underestimated the extent of emotional invalidation during this study.

References

Airaksinen, E., Larsson, M., & Forsell, Y. (2005). Neuropsychological functions in anxiety disorders in population-based samples: evidence of episodic memory dysfunction. *Journal of Psychiatric Research, 39*(2), 207-214. doi:10.1016/j.jpsychires.2004.06.001

Allen, A. P., Kennedy, P. J., Cryan, J. F., Dinan, T. G., & Clarke, G. (2014). Biological and psychological markers of stress in humans: focus on the Trier Social Stress Test. *Neuroscience & Biobehavioral Reviews*, *38*, 94-124.

Ashcraft, M. H., & Kirk, E. P. (2001). The relationships among working memory, math anxiety, and performance. *Journal of Experimental Psychology: General*, *130*(2), 224.

Baudic, S., Dalla Barba, G., Thibaudet, M. C., Smagghe, A., Remy, P., & Traykov, L. (2006). Executive function deficits in early Alzheimer's disease and their relations with episodic memory. *Archives of Clinical Neuropsychology*, *21*(1), 15-21.

Baumeister, R. F., Twenge, J. & Nuss, C.N. (2002). Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought. *Journal of Personality and Social Psychology, 83,* 817-27. doi: 10.1037//0022-3514.83.4.817.

Baumeister, R. F., Dewall, C. N., Ciarocco, N. J., & Twenge, J. M. (2005). Social exclusion impairs self-regulation. *Journal of Personality and Social Psychology, 88*, 589-604.

Beauchaine, T. P. & Hinshaw, S. P. (2013). Child and adolescent psychopathology, 3rd edition. New York, NY: Wiley.

Bellani, M., Hatch, J. P., Nicoletti, M. A., Ertola, A. E., Zunta-Soares, G., Swann, A.C., Brambilla, P., & Soares, J.C. (2012). Does anxiety increase impulsivity in patients with bipolar disorder or major depressive disorder? *Journal of Psychiatric Research, 46*, 616-621, 10.1016/j.jpsychires.2012.01.016

Billingsley-Marshall, R. L., Basso, M. R., Lund, B. C., Hernandez, E. R., Johnson, C. L., Drevets, W. C., & ... Yates, W. R. (2013). Executive function in eating disorders: The role of state anxiety. *International Journal of Eating Disorders, 46(*4), 316-321. doi:10.1002/eat.22086

Bishop, S. J. (2009). Trait anxiety and impoverished prefrontal control of attention. *Nature Neuroscience, 12*(1), 92-98. doi:10.1038/nn.2242

Bloemsma, J., Boer, F., Arnold, R., Banaschewski, T., Faraone, S., Buitelaar, J., & Oosterlaan, J. (2013). Comorbid anxiety and neurocognitive dysfunctions in children with ADHD. *European Child & Adolescent Psychiatry, 22*(4), 225-234 10p. doi:10.1007/s00787-012-0339-9

Carver, C. S., & Scheier, M. F. (1998). On the self–regulation of behavior. New York: Cambridge University Press.

Chester, D. S., Lynam, D. R., Milich, R., & DeWall, C. N. (2017). Social rejection magnifies impulsive behavior among individuals with greater negative urgency: An experimental test of urgency theory. *Journal of Experimental Psychology. General*, *146*(7), 962-967. doi:10.1037/xge0000308

Cole, A. L. (1989). Researcher and teachers: Partners in theory building. *Journal of Education for Teaching, 15,* 225-237.

Corstorphine, E., Mountford, V., Tomlinson, S., Waller, G., & Meyer, C. (2007). Distress tolerance in the eating disorders. *Eating behaviors*, *8*(1), 91-97.

Cyders, M. a, Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: development and validation of a measure of positive urgency. *Psychological Assessment*, *19*(1), 107–118.

http://doi.org/10.1037/1040-3590.19.1.107

Dimoska, A., & Johnstone, S. J. (2007). Neural mechanisms underlying trait impulsivity in non-clinical adults: stop-signal performance and event-related potentials. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *31*(2), 443-454.

Dittrich, W. H., & Johansen, T. (2013). Cognitive deficits of executive functions and decision-making in obsessive-compulsive disorder. *Scandinavian Journal of Psychology, 54*(5), 393-400. doi:10.1111/sjop.12066

Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science, 302*, 290–292.

Eriksen, C. W., & Schultz, D. W. (1979). Information processing in visual search: A continuous flow conception and experimental results. *Perception & Psychophysics*, *25*(4), 249–263. http://doi.org/10.3758/BF03198804

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition & Emotion*, *6*(6), 409-434.

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: attentional control theory. *Emotion*, *7*(2), 336.

Foley, P., & Kirschbaum, C. (2010). Human hypothalamus–pituitary–adrenal axis responses to acute psychosocial stress in laboratory settings. *Neuroscience & Biobehavioral Reviews*, *35*(1), 91-96. doi:10.1016/j.neubiorev.2010.01.010

Grynberg, D., Luminet, O., Corneille, O., Grèzes, J., & Berthoz, S. (2010). Alexithymia in the interpersonal domain: A general deficit of empathy? *Personality and Individual Differences*, *49*(8), 845–850. http://doi.org/10.1016/j.paid.2010.07.013

Guez, J., Saar-Ashkenazy, R., Keha, E., & Tiferet-Dweck, C. (2016). The effect of trier social stress test (TSST) on item and associative recognition of words and pictures in healthy participants. *Frontiers in Psychology, 507* doi: 10.3389/fpsyg.2016.00507

Haslam, M., Mountford, V., Meyer, C., & Waller, G. (2008). Invalidating childhood environments in anorexia and bulimia nervosa. *Eating Behaviors*, *9*(3), 313-318.

Hellhammer, J., & Schubert, M. (2012). The physiological response to Trier Social Stress Test relates to subjective measures of stress during but not before or after the test. *Psychoneuroendocrinology*, *37*(1), 119-124.

Julian, L. J. (2011). Measures of anxiety. *Arthritis Care & Research 63*(11), 467-472. doi: 10.1002/acr.20561

Julian, L. J., & Arnett, P. A. (2009). Relationships among anxiety, depression, and executive functioning in multiple sclerosis. *The Clinical Neuropsychologist*, *23*(5), 794-804.

Kashdan, A. S., & Farmer, T. B. (2014). Affective and self-esteem instability in the daily lives of people with generalized social anxiety disorder. *Clinical Psychological Science, 2*(2). doi: 10.1177/2167702613495200

Kirschbaum, C. (2015). Trier social stress test. *Encyclopedia of psychopharmacology*, 1755-1758.

Kirschbaum C, Pirke K. M, Hellhammer D.H. (1993). The ‘‘trier social stress test’’ – A tool for investigating psychobiology stress responses in a laboratory setting. *Neuropsychobiology* (28)76–81.

Kóbor, A., Takács, Á., Honbolygó, F., & Csépe, V. (2014). Generalized lapse of responding in trait impulsivity indicated by ERPs: The role of energetic factors in inhibitory control. *International Journal of Psychophysiology*, *92*(1), 16-25.

Krause, E. D., Mendelson, T., & Lynch, T. R. (2003). Childhood emotional invalidation and adult psychological distress: the mediating role of emotional inhibition. *Child Abuse & Neglect, 27*(2), 199-213. doi:10.1016/S0145-2134(02)00536-7

Kóbor, A., Takács, Á., Honbolygó, F., & Csépe, V. (2014). Generalized lapse of responding in trait impulsivity indicated by ERPs: The role of energetic factors in inhibitory control. *International Journal of Psychophysiology*, *92*(1), 16–25. http://doi.org/10.1016/j.ijpsycho.2014.01.008

Kudielka, B. M., Hellhammer, D. H., Kirschbaum, C., Harmon-Jones, E., & Winkielman, P. (2007). Ten years of research with the Trier Social Stress Test—revisited. *Social neuroscience: Integrating biological and psychological explanations of social behavior*, 56-83.

Levine, R. P. (2007). Differences in perceived stress, affect, anxiety, and coping ability among college students in physical education courses. University of Maryland, College Park. PhD Dissertation.

Levinson, C. A., Rodebaugh, T. L., Langer, J. K. (2013). Interpersonal Constraint Conferred by Generalized Social Anxiety Disorder is Evident on a Behavioral Economics Task. *Journal of Abnormal Psychology*, *122*(1), 39–44. http://doi.org/10.1037/a0030975

Luck, S. J., Kappenman, E. S. (2012). The oxford handbook of event related potential components. New York, NY: Oxford University Press, Inc.

McRae, K., Misra, S., Prasad, A. K., Pereira, S. C., & Gross, J. J. (2012). Bottom-up and top-down emotion generation: implications for emotion regulation. *Social Cognitive and Affective Neuroscience*, *7*(3), 253–262. http://doi.org/10.1093/scan/nsq103

Mountford, V., Corstorphine, E., Tomlinson, S., & Waller, G. (2007). Development of a measure

to assess invalidating childhood environments in the eating disorders. *Eating Behaviors*, *8*(1), 48–58. http://doi.org/10.1016/j.eatbeh.2006.01.003

Moustafa, A. A., Tindle, R., Frydecka, D., & Misiak, B. (2017). Impulsivity and its relationship with anxiety, depression and stress. *Comprehensive Psychiatry, 74*, 173-179. doi:10.1016/j.comppsych.2017.01.013

Muller, J. M., & Wytykowska, A. (2005). *Personality and Individual Differences 39*(4):795-805. doi: 10.1016/j.paid.2005.03.006

National Institute of Mental Health. (2005). Any anxiety disorder among adults. Retrieved from http://www.nimh.nih.gov/health/statistics/prevalence/any-anxiety-disorder-among-adults.shtml

Newman, J. P., Wallace, J. F., Schmitt, W. A., & Arnett, P. A. (1997). Behavioral inhibition system functioning in anxious, impulsive and psychopathic individuals. *Personality and Individual Differences*, *23*(4), 583-592.

Oaten, M., Williams, K. D., Jones, A., & Zadro, L. (2008). The effects of ostracism on self-regulation in the socially anxious. *Journal Of Social & Clinical Psychology, 27*(5), 471-504.

Pacheco-Unguetti, A. P., Acosta, A., Callejas, A., & Lupiáñez, J. (2010). Attention and anxiety different attentional functioning under state and trait anxiety. *Psychological science*, *21*(2), 298-304.

Paulus, M. P., Feinstein, J. S., Simmons, A., & Stein, M. B. (2004). Anterior cingulate activation in high trait anxious subjects is related to altered error processing during decision making. *Biological Psychiatry*, *55*(12), 1179-1187.

Perugi, G., Del Carlo, A., Benvenuti, M., Fornaro, M., Toni, C., Akiskal, K., Dell'Osso, K., Akiskal, H. (2011). Impulsivity in anxiety disorder patients: Is it related to cormorbid cyclothymia? *Journal of Affective Disorders,* 133(3), 600-606. https://doi.org/10.1016/j.jad.2011.04.033

Robinson, O. J., Vytal, K., Cornwell, B. R., & Grillon, C. (2013). The impact of anxiety upon cognition: perspectives from human threat of shock studies. *Frontiers in Human Neuroscience*, 7, 203. http://doi.org/10.3389/fnhum.2013.00203

Ruf, B. M., Bessette, K. L., Pearlson, G. D., & Stevens, M. C. (2017). Effect of trait anxiety on cognitive test performance in adolescents with and without attention-deficit/hyperactivity disorder. *Journal of Clinical & Experimental Neuropsychology, 39*(5), 434-448. doi:10.1080/13803395.2016.1232373

Sebastian, C., Viding, E., Williams, K.D., Blakemore, S.J. (2010) Social brain development and the affective consequences of ostracism in adolescence. *Brain Cognition 72*,134–145.

Shelby, E. a, Braithwaite, S. R., Joiner, T. E., & Fincham, F. D. (2008). Features of borderline personality disorder, perceived childhood emotional invalidation, and dysfunction within current romantic relationships. *Journal of Family Psychology : JFP : Journal of the Division of Family Psychology of the American Psychological Association (Division 43)*, *22*(6), 885–893. http://doi.org/10.1037/a0013673

Shields, G. S., Sazma, M. A., and Yonelinas, A. P. (2016). The effects of acute stress on core executive functions: A meta-analysis and comparison with cortisol. *Neuroscience Biobehavioral Review 68*, 651–668. doi: 10.1016/j.neubiorev.2016.06.038

Smith, S. M., & Vale, W. W. (2006). The role of the hypothalamic-pituitary-adrenal axis in neuroendocrine responses to stress. *Dialogues in Clinical Neuroscience*, *8*(4), 383–395.

Smitherman, T. A., Huerkamp, J. K., Miller, B. I., Houle, T. T., & O'Jile, J. R. (2007). The relation of depression and anxiety to measures of executive functioning in a mixed psychiatric sample. *Archives Of Clinical Neuropsychology: The Official Journal Of The National Academy Of Neuropsychologists, 22*(5), 647-654

Spoor, J., & Williams, K. D. (2007). The evolution of an ostracism detection system. In J. P. Forgas, M. Haselton, & W. von Hippel (Eds.), The evolution of the social mind: Evolutionary psychology and social cognition (279–292). New York: Psychology Press.

Steimer, T. (2002). The biology of fear- and anxiety-related behaviors. *Dialogues in Clinical Neuroscience*, *4*(3), 231–249.

Sweitzer, M. M., Allen, P. A., & Kaut, K. P. (2008). Relation of individual differences in impulsivity to nonclinical emotional decision making. *Journal Of The International Neuropsychological Society: JINS*, 14(5), 878-882. doi:10.1017/S1355617708080934

Visu-Petra, L., Miclea, M., & Visu-Petra, G. (2013). Individual differences in anxiety and executive functioning: a multidimensional view. *International Journal Of Psychology: Journal International De Psychologie, 48*(4), 649-659. doi:10.1080/00207594.2012.656132

Vloet, T. D., Konrad, K., Herpertz-Dahlmann, B., Polier, G. G., & Günther, T. (2010). Impact of anxiety disorders on attentional functions in children with ADHD. *Journal of Affective Disorders, 124(*3), 283-290. doi:10.1016/j.jad.2009.11.017

Watson-Jones, R. E., Whitehouse, H., & Legare, C. H. (2016). In-Group Ostracism Increases High-Fidelity Imitation in Early Childhood. *Psychological Science, 27*(1), 34-42. doi:10.1177/0956797615607205

Watts, S. E., & Weems, C. F. (2006). Associations among selective attention, memory bias, cognitive errors and symptoms of anxiety in youth. *Journal of abnormal child psychology*, *34*(6), 838-849.

Whiteside, S. P., Lynam, D. R., (2005). Validation of the UPPS impulsive behaviour scale: A four-factor model of impulsivity. *European Journal of Personality*, *19*(7), 559–574. http://doi.org/10.1002/per.556

Williams, K. D., & Jarvis, B. (2006). Cyberball: a program for use in research on interpersonal ostracism and acceptance. *Behavior Research Methods*, *38*(1), 174–180. http://doi.org/10.3758/BF03192765

Wright, M. O., Crawford, E., & Del Castillo, D. (2009). Childhood emotional maltreatment and later psychological distress among college students: The mediating role of maladaptive schemas. *Child Abuse & Neglect, 33*(1), 59-68. doi:10.1016/j.chiabu.2008.12.007

You, J., & Leung, F. (2012). The role of depressive symptoms, family invalidation and behavioral impulsivity in the occurrence and repetition of non-suicidal self-injury in Chinese adolescents: a 2-year follow-up study. *Journal of Adolescence*, *35*(2), 389-395.

Zadro L, Boland C, & Richardson R. (2006). How long does it last? The persistence of the effects of ostracism in the socially anxious. *Journal of Experimental Social Psychology*. *42*, 692–69

Zhu, J., Yu, C., Zhang, W., Bao, Z., Jiang, Y., Chen, Y., & Zhen, S. (2016). Peer victimization, deviant peer affiliation and impulsivity: Predicting adolescent problem behaviors. *Child Abuse & Neglect,* 5839-50. doi:10.1016/j.chiabu.2016.06.008

Tables and Figures

Table 1: Experiment 1 Demographic Data

Demographic	Social Inclusion group (n=13)	Social Exclusion Group (n=15)
Age		
Mean	19.11	20.19
Standard Deviation	1.44	1.51
Gender		
Males	2	6
Females	11	9
Race		
Caucasian	12	8
African American	1	4
Hispanic	0	3
Other	0	0

Table 2: Descriptive Statistics from the Flanker Task in Experiment 1

Measure	Exclusion group		Inclusion Group	
	M	*SD*	*M*	*SD*
Compatible				
Accuracy (%)	92.02	8.39	93.29	9.67
Reaction Time (ms)	427.20	40.79	382.29	54.11
Incompatible				
Accuracy (%)	77.71	8.53	69.88	17.48
Reaction Time (ms)	468.93	39.62	427.67	68.92

Table 3: Correlation between UPPS and Reaction Time in Experiment 1

UPPS Subscale	Congruent Reaction Time		Incongruent Reaction Time	
	r	*p*	*r*	*p*
Positive Urgency	-0.023	0.929	-0.092	0.718
Negative Urgency	0.028	0.913	-0.031	0.904
Premeditation	0.119	0.637	-0.036	0.889
Perseverance	0.171	0.498	0.087	0.730
Sensation Seeking	0.075	0.768	-0.024	0.925

Table 4: Experiment 1 Descriptive Statistics for LRP

Measure	Inclusion Group		Exclusion group	
	M	*SD*	*M*	*SD*
Compatible				
Peak	310.17	71.628	325.33	73.783
Latency (ms)	-1.458	1.790	-2.608	2.315
Incompatible				
Peak	313.33	79.50	326.00	76.44
Latency (ms)	-1.775	1.990	-2.927	2.070

Table 5: Experiment 2 Demographic Data

Demographic	Performance Anxiety group (n=17)	Control Group (n=16)
Age		
Mean	19.06	18.35
Standard Deviation	1.97	1.97
Gender		
Males	2	2
Females	14	14
Race		
Caucasian	6	11
African American	9	6
Hispanic	1	0
Other	0	0

Table 6: Accuracy and Reaction Time on the Flanker Task in Experiment 2

Measure	Performance Anxiety Speech Group		Speech Control Group	
	M	*SD*	*M*	*SD*
Compatible				
Accuracy (%)	93.29	9.67	93.29	9.67
Reaction Time (ms)	382.29	54.11	382.29	54.11
Incompatible				
Accuracy (%)	69.88	17.48	69.88	17.48
Reaction Time (ms)	427.67	68.92	427.67	68.92

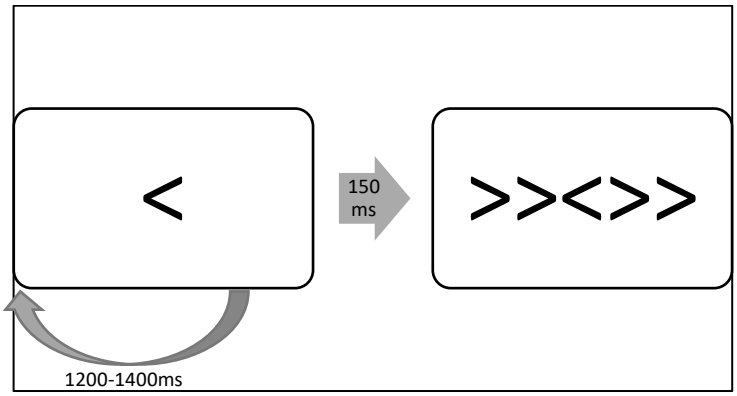

Figure 1. Flanker task used in Experiment 1: each of the 10 blocks contained 40 trials. Each of the trials had the target stimulus present 150ms prior to the appearance of the flankers. The next trial began 1200-1400ms after the previous trial.

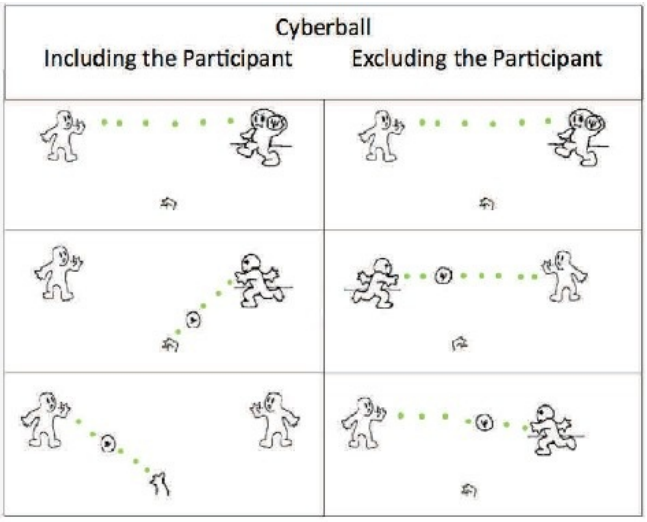

Figure 2. Cyberball conditions

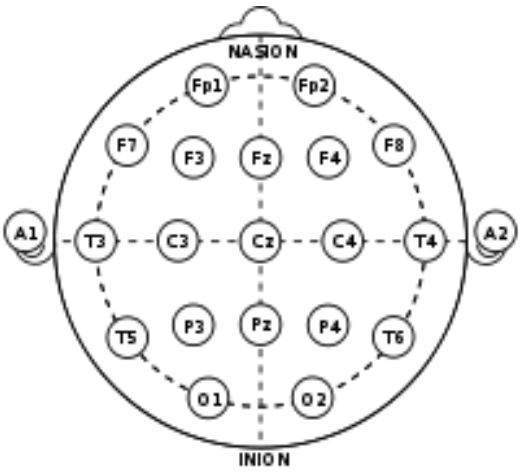

Figure 3. International 10/20 system

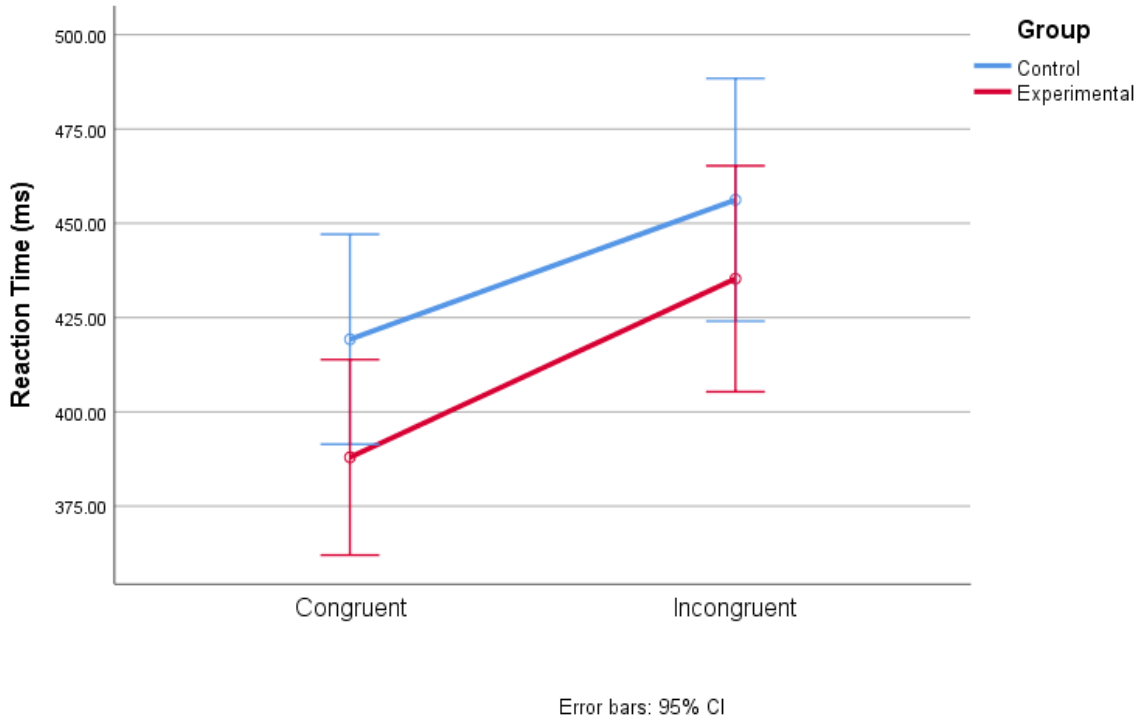

Figure 4. Ostracized and non-ostracized group reaction time for congruent and incongruent trials in Experiment 1.

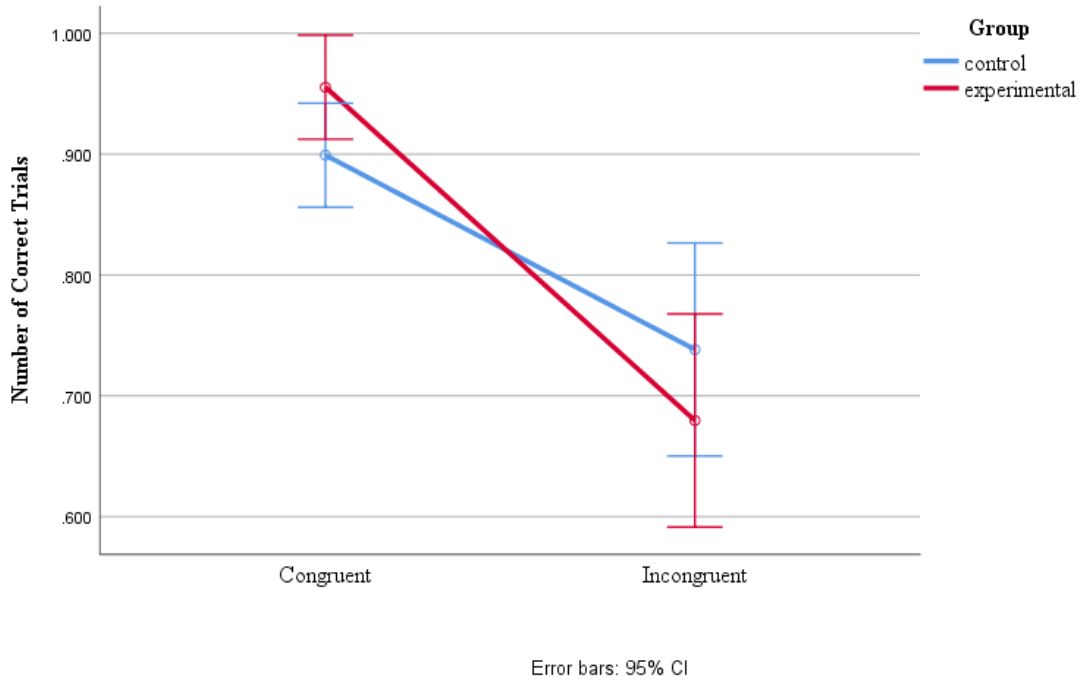

Figure 5. Flanker task accuracy on congruent and incongruent trials for ostracized and non-ostracized groups in Experiment 1.

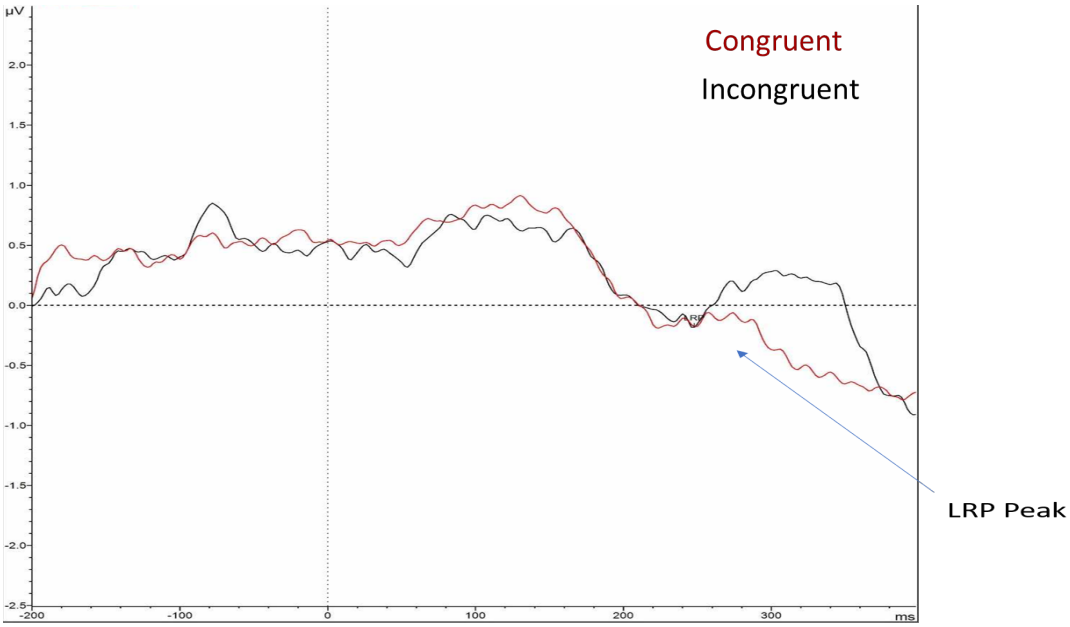

Figure 6. Stimulus-locked grand average ERP waveforms for the compatible and incompatible categories collapsed across the C3 and C4 electrode sites in Experiment 1.

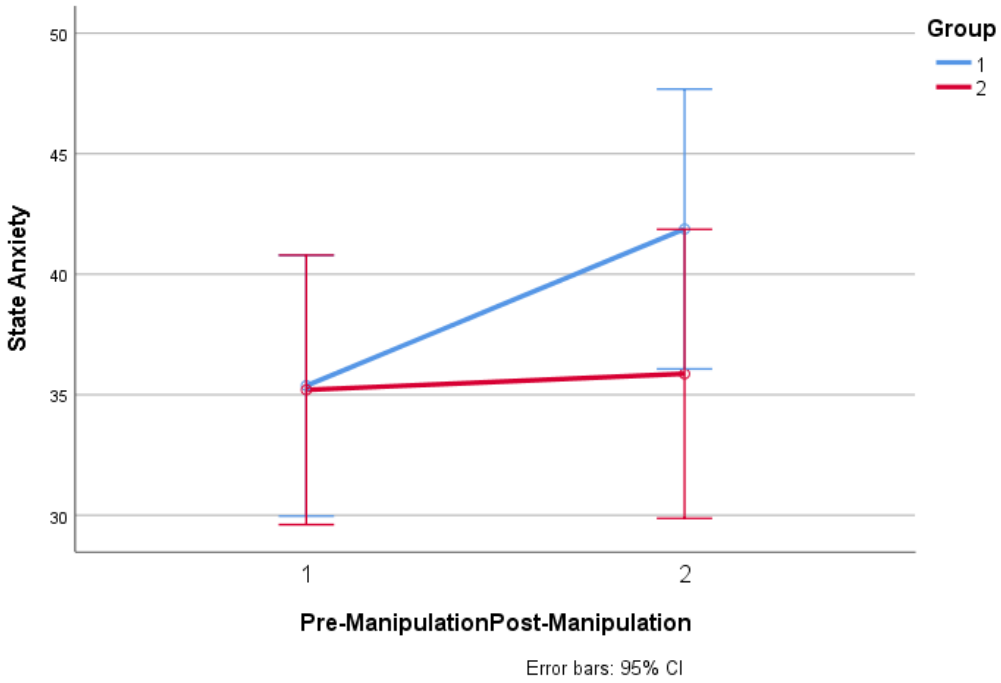

Figure 7. Pre- and post-manipulation state anxiety levels for internal anxiety and control groups in Experiment 2.

Appendix A: Demographics Questionnaire (Experiment 1)

1) Gender: _____Male _____Female

2) Age: _____years old

3) Race: _____African American _____Caucasian

_____American Indian/Alaskan Native _____Hispanic/Latino

_____Asian/Pacific Islander

_____Other _____

4) What is your highest level of education **completed**?

_____Less than high school _____High School/GED

_____Some College _____2-year degree

_____4-year degree _____Master's Degree

_____Doctoral Degree

5) Current Employment:

_____Full-time _____Part-time

_____Self-employed _____Retired or Disabled

_____Unemployed

6) What is your current marital status?

_____Single _____Married

_____Widowed _____Divorced

_____In a committed relationship _____Separated

7) When was the last time you have eaten a full meal?

_____Less than 4 hours _____Less than 8 hours

_____Less than 12 hours _____More than 12 hours

8) Have you exercised today?

_____Yes _____No

9) How often a week do you exercise?

_____0-1 times _____2-3 times

_____4-5 times _____6+ times per week

10) How much sleep did you receive the night before the study (in hours)?

_____0-2 hours _____2-3 hours

_____4-5 hours _____6+ hours

11) Have you consumed caffeinated food or drinks the day of the study?

_____Yes _____No

12) Do you smoke?

_____Yes _____No

13) Are you left-handed or right handed?

_____Left _____Right

Appendix B: UPPS-P

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below. Also, there are questions on the following pages.

		Agree Strongly			Disagree Strongly
1	I have a reserved and cautious attitude toward life.	1	2	3	4
2	I have trouble controlling my impulses.	1	2	3	4
3	I generally seek new and exciting experiences and sensations.	1	2	3	4
4	I generally like to see things through to the end.	1	2	3	4
5	When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.	1	2	3	4
6	My thinking is usually careful and purposeful.	1	2	3	4
7	I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
8	I'll try anything once.	1	2	3	4
9	I tend to give up easily.	1	2	3	4
10	When I am in great mood, I tend to get into situations that could cause me problems.	1	2	3	4
11	I am not one of those people who blurt out things without thinking.	1	2	3	4
12	I often get involved in things I later wish I could get out of.	1	2	3	4
13	I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
14	Unfinished tasks really bother me.	1	2	3	4
15	When I am very happy, I tend to do things that may cause problems in my life.	1	2	3	4
16	I like to stop and think things over before I do them.	1	2	3	4
17	When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
18	I would enjoy water skiing.	1	2	3	4
19	Once I get going on something I hate to stop.	1	2	3	4
20	I tend to lose control when I am in a great mood.	1	2	3	4

		Agree Strongly			Disagree Strongly
21	I don't like to start a project until I know exactly how to proceed.	1	2	3	4
22	Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
23	I quite enjoy taking risks.	1	2	3	4
24	I concentrate easily.	1	2	3	4
25	When I am really ecstatic, I tend to get out of control.	1	2	3	4
26	I would enjoy parachute jumping.	1	2	3	4
27	I finish what I start.	1	2	3	4
28	I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
29	When I am upset I often act without thinking.	1	2	3	4
30	Others would say I make bad choices when I am extremely happy about something.	1	2	3	4
31	I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
32	I am able to pace myself so as to get things done on time.	1	2	3	4
33	I usually make up my mind through careful reasoning.	1	2	3	4
34	When I feel rejected, I will often say things that I later regret.	1	2	3	4
35	Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
36	I would like to learn to fly an airplane.	1	2	3	4
37	I am a person who always gets the job done.	1	2	3	4
38	I am a cautious person.	1	2	3	4
39	It is hard for me to resist acting on my feelings.	1	2	3	4
40	When I get really happy about something, I tend to do things that can have bad consequences.	1	2	3	4

		Agree Strongly			Disagree Strongly
41	I sometimes like doing things that are a bit frightening.	1	2	3	4
42	I almost always finish projects that I start.	1	2	3	4
43	Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
44	I often make matters worse because I act without thinking when I am upset.	1	2	3	4
45	When overjoyed, I feel like I can't stop myself from going overboard.	1	2	3	4
46	I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
47	Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4
48	I usually think carefully before doing anything.	1	2	3	4
49	When I am really excited, I tend not to think of the consequences of my actions.	1	2	3	4
50	In the heat of an argument, I will often say things that I later regret.	1	2	3	4
51	I would like to go scuba diving.	1	2	3	4
52	I tend to act without thinking when I am really excited.	1	2	3	4
53	I always keep my feelings under control.	1	2	3	4
54	When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.	1	2	3	4
55	Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4
56	I would enjoy fast driving.	1	2	3	4
57	When I am very happy, I feel like it is ok to give in to cravings or overindulge.	1	2	3	4
58	Sometimes I do impulsive things that I later regret.	1	2	3	4
59	I am surprised at the things I do while in a great mood.	1	2	3	4

Scoring Instructions

This is a revised version of the UPPS Impulsive Behavior scale (Whiteside & Lynam, 2001). This version, UPPS-P (Lynam, Smith, Whiteside, & Cyders, 2006), assesses Positive Urgency (Cyders, Smith, Spillane, Fischer, Annus, & Peterson, 2007) in addition to the four pathways assessed in the original version of the scale-- Urgency (now Negative Urgency), (lack of) Premeditation, (lack of) Perseverance, and Sensation Seeking. The scale uses a 1 (agree strongly) to 4 (disagree strongly) response format. Because the items from different scales run in different directions, it is important to make sure that the correct items are reverse-scored. We suggest making all of the scales run in the direction such that higher scores indicate more impulsive behavior. Therefore, we include the scoring key for, (Negative) Urgency, (lack of) Premeditation, (lack of) Perseverance, Sensation Seeking, and Positive Urgency. For each scale, calculate the mean of the available items; this puts the scales on the same metric. We recommend requiring that a participant have at least 70% of the items before a score is calculated.

(Negative) Urgency (all items except 1 are reversed)
items 2 (R), 7(R), 12 (R), 17 (R), 22 (R), 29 (R), 34 (R), 39 (R), 44 (R), 50 (R), 53, 58 (R)

(lack of) Premeditation (no items are reversed)
items 1, 6, 11, 16, 21, 28, 33, 38, 43, 48, 55.

(lack of) Perseverance (two items are reversed)
items 4, 9 (R), 14, 19, 24, 27, 32, 37, 42, 47 (R)

Sensation Seeking (all items are reversed)
items 3 (R), 8 (R), 13 (R), 18 (R), 23 (R), 26 (R), 31 (R), 36 (R), 41 (R), 46 (R), 51 (R), 56 (R)

Positive Urgency (all items are reversed)
items 5 (R), 10 (R), 15 (R), 20 (R), 25 (R), 30 (R), 35 (R), 40 (R), 45 (R), 49 (R), 52 (R), 54 (R), 57 (R), 59 (R)

(R) indicates the item needs to be reverse scored such 1=4, 2=3, 3=2, and 4=1.

Appendix C: Invalidating Childhood Environments Scale (ICES)

The following questions address your experiences of how your parent(s)/carer(s) responded to your emotions when you were young. For each item, please choose the rating from 1 to 5 that most closely reflects your experience up to the age of 18 years. Because your parent(s)/carer(s) may have been very different, please rate them separately. Please write your response in the spaces provided underneath each statement.

1	2	3	4	5
Never	**Rarely**	**Some of the time**	**Most of the time**	**All of the time**

A primary caregiver is the person who was mostly responsible for raising you, a secondary caregiver is the person who was responsible for your care alongside the primary caregiver or when the primary caregiver was unavailable. Typically, a primary caregiver is a parent, grandparent, other family member, or other legal guardian.

Please indicate who was your primary caregiver for the majority of your life (e.g. father, mother, etc): _____

Please indicate who was your secondary caregiver for the majority of your life: _____

1. My parent/carers would become angry if I disagreed with them.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
2. When I was anxious, my parent/carers ignored this.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
3. If I was happy, my parent/carers would be sarcastic and say things like: “What are you smiling at?”
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
4. If I was upset, my parent/carers said things like: “I'll give you something to really cry about!”
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
5. My parent/carers made me feel OK if I told them I didn't understand something difficult the first time.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
6. If I was pleased because I had done well at school, my parent/carers would say things like: “Don't get too confident”.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
7. If I said I couldn't do something, my parent/carers would say things like: “You're being difficult on purpose”.

Primary Caregiver #1 ____ Primary Caregiver #2 ____

1	2	3	4	5
Never	**Rarely**	**Some of the time**	**Most of the time**	**All of the time**

8. My parent/carers would understand and help me if I couldn't do something straight away.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
9. My parent/carers used to say things like: “Talking about worries just makes them worse”.
   Primary Caregiver #1 ____ Primary Caregiver #2 ____
10. If I couldn't do something however hard I tried, my parent/carers told me I was lazy.
    Primary Caregiver #1 ____ Primary Caregiver #2 ____
11. My parent/carers would explode with anger if I made decisions without asking them first.
    Primary Caregiver #1 ____ Primary Caregiver #2 ____
12. When I was miserable, my parent/carers asked me what was upsetting me, so that they could help me.
    Primary Caregiver #1 ____ Primary Caregiver #2 ____
13. If I couldn't solve a problem, my parent/carers would say things like: “Don't be so stupid — even an idiot could do that!”
    Primary Caregiver #1 ____ Primary Caregiver #2 ____
14. When I talked about my plans for the future, my parent/carers listened to me and encouraged me
    Primary Caregiver #1 ____ Primary Caregiver #2 ____

Thank you for filling out this questionnaire!

Appendix D: Script

Instructions for the Cyberball Task:

1) **Confederate:** "For this task, you will be playing a game of toss with two other participants that are in another lab. You will begin by clicking on one of the other character models on the screen with the left-mouse button. This will throw the ball to them. Following this, the participant that is now holding the ball will click on either the other participant or you. This will continue for 30 tosses. Do you have any questions?"
2) **Confederate:** "Okay, before you begin, I am going to see if the other researchers have prepared the other participants. If they are ready, we will begin. When all three character models appear on the screen, you may begin by clicking on either of the other participant's characters of your choice."

Appendix E: Manipulation Check

You have nearly completed the study. At this point, we will discuss what the study examined by asking you some questions. Again, the information that you provide here is confidential and will remain anonymous.

1) In your own words, what do you believe the current study was about?

2) What percentage of throws do you think you received during the Cyberball game?

_____%

3) On a scale of 1-10, to what extent were you included by the participants in the game?

1 2 3 4 5 6 7 8 9 10

4) To what degree did you think you were playing other people over the internet?
   a. Not at all likely
   b. Possible, but not likely
   c. Possible
   d. Possible, and fairly likely
   e. Very likely

Appendix F: Debriefing

The Relationship between Emotional Invalidation and Impulsivity as Measured Through Event-Related Potentials: An EEG Study

Purpose of the Study

Originally, this study was described as a study of the interactions between impulsivity and social interactions on task performance and neurological data. While this is correct, there is another component of this study. This study seeks to understand the link between emotional invalidation, the minimization, punishment, or ignoring of emotions, with several measures of impulsivity. Similarly, while the participants in the Cyberball task were described as real participants, they were computer preprogrammed entities that tossed the ball based on a percentage. The limited disclosure of the nature of the study was required to simulate real interactions between individuals. If, for example, the group that did not receive the ball was alerted that the other players were not people, the feelings of ostracism would be less defined.

This study attempts to provide useful information regarding the effects of ostracism and emotional invalidation on the prevalence of impulsive behaviors.

Final Report

If you would like to receive a report of this study (or a summary of the findings) when it is completed, contact the primary investigator listed below.

Concerns

If you have any questions about the study, or about the deception involved, please feel free to ask the principal investigator now, or at a later time. If you have concerns about this study or your rights as a participant in this study, you may contact the Office of Research Compliance at (803) 777-7095.

Please keep a copy of this form for your future reference. Once again, thank you for participating in this study.

Signature

Contact Information

Dr. Laura Swain
Department of Psychology
Phone Number (Office): 803-641-3422
Email Address: laurasw@usca.edu

Brigette Cuonzo
Department of Psychology
Email Address: bcuonzo@usca.edu

Appendix G: Demographic Questionnaire (Experiment 2)

1) Gender: _____Male _____Female

2) Age: _____years old

3) Race: _____African American _____Caucasian

_____American Indian/Alaskan Native _____Hispanic/Latino

_____Asian/Pacific Islander

_____Other _____

4) What is your highest level of education **completed**?

_____Less than high school _____High School/GED

_____Some College _____2-year degree

_____4-year degree _____Master's Degree

_____Doctoral Degree

5) When was the last time you have eaten a full meal?

_____Less than 4 hours _____Less than 8 hours

_____Less than 12 hours _____More than 12 hours

6) Have you exercised today?

_____Yes _____No

7) How often a week do you exercise?

_____0-1 times _____2-3 times

_____4-5 times _____6+ times per week

8) How much sleep did you receive the night before the study (in hours)?

_____0-2 hours _____2-3 hours

_____4-5 hours _____6+ hours

9) Have you consumed caffeinated food or drinks the day of the study?

_____Yes _____No

10) Do you smoke?

_____Yes _____No

11) Are you left-handed or right handed?

_____Left _____Right

Appendix H: State-Trait Anxiety Inventory

INSTRUCTIONS: A number of statements that people have used to describe themselves are given below. Read each statement and then write the number in the blank at the end of the statement that indicates ***how you feel right now,*** **that is,** ***at this moment.*** There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1 = not at all
2 = somewhat
3 = moderately so
4 = very much so

1. I feel calm ____
2. I feel secure ____
3. I am tense ____
4. I feel strained ____
5. I feel at ease ____
6. I feel upset ____
7. I am presently worrying over possible misfortunes _____
8. I feel satisfied ____
9. I feel frightened ____
10. I feel comfortable ____
11. I feel self-confident ____
12. I feel nervous ____
13. I am jittery ____
14. I feel indecisive ____
15. I am relaxed ____
16. I feel content ____
17. I am worried ____
18. I feel confused ____
19. I feel steady ____
20. I feel pleasant _____

Think about how you generally feel on a day-to-day basis over the last several months and indicate how each of the following statements best describe you.

1 = not at all 2 = somewhat 3 = moderately so 4 = very much so

1. I feel pleasant ____
2. I feel nervous and restless ____
3. I feel satisfied with myself ____
4. I wish I could be as happy as others seem to be ____
5. I feel like a failure ____
6. I feel rested ____
7. I am "calm, cool, and collected" ____
8. I feel that difficulties are piling up so that I cannot overcome them ____
9. I worry too much over something that really doesn't matter ____
10. I am happy ____
11. I have disturbing thoughts ____
12. I lack self-confidence ____
13. I feel secure ____
14. I make decisions easily ____
15. I feel inadequate _____
16. I am content ____
17. Some unimportant thought runs through my mind and bothers me ____
18. I take disappointments so keenly that I can't put them out of my mind ____
19. I am a steady person ____
20. I get in a state of tension or turmoil as I think over my recent concerns and interests ____