THE COGNITIVE EFFECTS OF SOCIAL EXCLUSION IN SOCIAL ANXIETY

By

DANIELLE E. DEROS

Bachelor of Science in Biological Sciences

Bachelor of Science in Psychology

University of Maryland at College Park

College Park, MD

2016

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
December, 2021

THE COGNITIVE EFFECTS OF SOCIAL

EXCLUSION IN SOCIAL ANXIETY

Thesis Approved:

Dr. DeMond M. Grant, Ph.D.

Thesis Adviser

Dr. R. Matt Alderson, Ph.D.

Dr. Jennifer Byrd-Craven, Ph.D.

ACKNOWLEDGEMENTS

Thank you to my family, partner, friends, colleagues, advisors, and to my department for the overwhelming amount of assistance and encouragement I have been extended throughout the development of this work. Thank you especially to the Laboratory of Emotion and Psychophysiology for your unwavering support and guidance throughout all stages of my research process. I could not imagine having a better research family to grow with, let alone within the context of a global pandemic. I am looking forward to continuing to grow and develop within this field, as well as to the next part of my academic journey.

Name: DANIELLE E. DEROS

Date of Degree: DECEMBER, 2021

Title of Study: THE COGNITIVE EFFECTS OF SOCIAL EXCLUSION IN SOCIAL ANXIETY

Major Field: PSYCHOLOGY

Abstract: Social anxiety (SA) is characterized by persistent and intense fears of situations that provide the opportunity for social evaluation. Moreover, SA is often associated with core interpersonal (e.g., overt social skills, differential processing of socially-salient cues) and intrapersonal (e.g., biased attention and cognitions toward others and of oneself within social settings) impairments that present across a variety of social contexts. In particular, those with SA tend to demonstrate differences in attentional engagement and disengagement with socially-salient information such as negative facial expressions relative to those without SA. Moreover, social exclusion may serve as a social context in which such fears associated with core features of SA may be initiated and exacerbated. As a result, understanding sensitivity to different social contexts in which these fears and biases may present may clarify maintenance factors and adverse outcomes associated with SA. However, there currently exists a paucity of research regarding the nuanced impacts of different forms of social exclusion on impairments associated with SA. The present work aims to address these gaps at the intersections of attention, socio-emotional cue processing, and social exclusion in an effort to expand upon literature regarding mechanisms maintaining SA concerns. Using a mixed factorial 2 SA group (Low, High) by 2 Exclusion Type (Ostracism, Rejection) by 3 Time (Baseline, Post-Inclusion, Post-Exclusion) design, participants engaged online in a series of modified dot-probe tasks at baseline and following inclusion and exclusion versions of either Cyberball or an adapted written feedback-based rejection task. Primary results revealed a statistically significant main effect of time such that participants, on average, responded more slowly on trials within the modified dot probe task relative to those at the post-inclusion or post-exclusion versions of the same tasks. These findings may correspond to practice effects, and are inconsistent with broader literature. Implications, limitations, and future directions are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION[1]

Social Anxiety Disorder (SAD) is characterized by persistent and intense fears of situations in which an individual may be exposed to social evaluation (American Psychiatric Association [APA], 2013) Due to these significant apprehensions toward social contexts, SAD diagnoses are often associated with impairment and distress related to an array of intrapersonal (e.g., physiological stress, attentional deficits) and interpersonal factors (e.g., dissatisfying social relationships) (Lochner et al., 2003; Olatunji et al., 2007; Safren et al., 1997). Current models of SA posit that cognitive issues may result from hypervigilance toward and subsequent avoidance of social cues perceived as threatening (Amir et al., 1998), and that deficits regarding control over these attentional biases exist (Eysenck et al., 2007). Models also suggest that SA symptoms may impair perception of emotion, particularly regarding neutral and negative emotions during social interactions (Clark & Beck, 1988; Stopa & Clark, 2000). Accordingly, disruptions to appropriate attention allocation and accurate emotion detection relevant to social interactions may act as a pathway through which socially anxious symptomatology works.

Moreover, asymptomatic individuals often view those with SAD as being less intelligent, less attractive, and having poorer social skills (Alden & Taylor, 2004). This often results in exclusion and rejection from social relationships, thereby confirming apprehensions of social

[1] See Appendix A for relevant information regarding the introductory section of the thesis project originally proposed.

evaluation and exacerbating cognitive and emotion perception impairments, and emotional distress that individuals with SAD may possess (Baumeister et al., 2005; Washburn et al., 2016). However, individuals with SAD may report separate fears across diverse situations and when interacting with different individuals (APA, 2013; Cox et al., 2008; Stein & Deutsch, 2003). As a result, social anxiety may present under some evaluative situations but not in others. Yet, a paucity of research exists regarding the connections between social exclusion, attention toward emotions expressed in social situations, and accuracy of emotion detection under these contrasting circumstances. Thus, understanding the particular nature of social exclusion and differential contexts in which social exclusion can occur may provide additional insight regarding broadband interpersonal impairments associated with SAD. The current study seeks to investigate how different pathways of social exclusion influence the ability to accurately attend to and process emotionally-salient stimuli, which may serve as a maintaining factor for SAD.

Interpersonal models of SAD assert that social exclusion may relate to functional social impairment (see Alden & Taylor, 2004 for a review). Given that expectations of potential exclusion stemming from apprehensions of social evaluation are core features of SAD (APA, 2013), comprehensive understanding of sensitivity to such exclusion may clarify key maintenance factors and outcomes associated with the disorder. For example, those with SAD differ in self-regulation abilities relative to nonanxious controls and tend to report higher levels of distress and longer recovery times following social exclusion (Oaten et al., 2008). This suggests that the effects of rejection, exclusion, and ostracism manifest differently in individuals with SAD. Moreover, due to these differential effects and impairments to self-regulation and distress, exclusion also may influence how those with SAD may interpret and detect socially-salient threats. This is especially notable given predispositions to biased attention and processing of negative emotions in others as they relate to how those with SAD believe that others perceive them (e.g., Amir et al., 1998; Eysenck et al., 2007; Gilboa-Schechtman et al., 1999; see Heinrichs & Hofmann, 2001 for a review).

A robust literature exists that posits that those with SAD demonstrate difficulties with consciously shifting or focusing attention toward stimuli of interest and may exhibit initial hypervigilance toward threat-related stimuli over and above those without social fears (see Bar-Haim et al., 2007). More specifically, research suggests that those with SAD may have difficulty controlling attention to both external stimuli and internal experiences that correspond to social contexts that may evoke emotional responses to social threat (Clark & Wells, 1995; Mansell et al., 2003). This includes difficulties in focusing attention on general facial expressions as well as initial hypervigilance toward and subsequent difficulties disengaging with stimuli reflecting negative emotions (e.g., fear, anger; Bar-Haim et al., 2007; Horley et al., 2003). Similarly, a key characteristic of SAD potentially stemming from such attentional biases coincides with emotion dysregulation in response to evaluative social contexts (Clark & Wells, 1995; Hofmann, 2007; Kocovski & Endler, 2000).

One way that these attentional biases may be assessed that permits for subsequent repeated measurement of emotion dysregulation is through dot-probe paradigms. Rodgers and colleagues (2020) utilized an adapted dot-probe paradigm (Grafton & MacLeod, 2016; Rudaizky et al., 2014) that assesses attentional engagement and disengagement toward orientations of target probes presented on different locations on the screen in response to images of negative and neutral faces presented immediately prior to the target probes. Participants also must indicate if the orientation of the target probe matches the orientation of an anchor probe presented immediately prior to facial stimuli. Thus, both the type of facial image (i.e., negative or neutral) as well as the location of the target probe (i.e., in the same location as the anchor probe or on the opposite side of the screen) may impact how participants may be engaging with the task. Accuracy and reaction time bias indices may then be computed to provide metrics of how quickly individuals may shift their attention toward and away from such socially-relevant facial expressions to complete task demands (Rodgers et al., 2020).

However, more recent literature contends that those with SAD may not only possess impairments in processes related to attention toward emotions in others, but also difficulties in accurate perspective-taking and interpretation of how others perceive them in social contexts (Hezel & McNally, 2014; Sripada et al., 2009; Washburn et al., 2016), though some of this work has been mixed. For example, Hezel and McNally (2014) discovered that those who experience symptoms of SA perform worse on theory of mind tasks as indexed by making more errors when labelling others' emotions, particularly negative emotions, based on facial features (i.e., the Reading the Mind in the Eyes task), and also tend to engage in increased mind-reading when identifying emotional experiences of others (i.e., within the Movie for the Assessment of Social Cognition). However, not all work has found these impairments (e.g., Hirsch & Clark, 2004). Moreover, to present knowledge, attentional engagement and disengagement in SA in particular have not been assessed using aforementioned modified dot-probe paradigms. Thus, though impairments in abilities to shift focus on personal emotions and internal emotional experiences appear to be a core feature in SAD, the ability to accurately understand emotional expressions and exclusive behaviors in different exclusionary contexts also may act as a maintaining factor for social fears.

Accordingly, appropriate assessment of an individual's ability to skillfully attend to socially-relevant information in different contexts is critical to clarify factors that may support and cultivate characteristic socially-anxious fears. Specifically, cognitive and behavioral measures such as reaction time and performance on adapted dot-probe tasks may offer critical insight into investigation of underlying, covert responses that contribute to overt symptoms of psychopathology. To date, however, little research has been directly conducted regarding the connections between different forms of social exclusion and attention toward emotions expressed in social situations. The current study aims to address these gaps at the intersections of attention, emotion processing, and social exclusion in an effort to expand upon literature regarding the attentional mechanisms maintaining SAD.

To accomplish these goals, participants with high (HSA) and low (LSA) levels of SA were be recruited to engage in different behavioral manipulation tasks that elicit feelings of social exclusion that may arise in different contexts. More specifically, participants were assigned to either engage in a task that more passively and ambiguously provides cues regarding social exclusion through ostracism (i.e., the Cyberball Task; Williams & Jarvis, 2006) in which participants were progressively socially ignored during a virtual ball-tossing game, or to engage in a task that explicitly provides cues regarding social exclusion through feedback-based rejection (i.e., a neutral writing task in which participants receive pre-programmed positive and negative feedback on their written responses) in which participants were directly rejected and evaluated based on their performance. Outcomes will be assessed through an adapted dot-probe task to provide accuracy and attentional bias indices prior to engaging in their respective condition tasks, following an innocuous version of the task (i.e., either being included on all tosses in Cyberball or receiving positive feedback on their written responses), and following the exclusion version of the task (i.e., either being ignored and ostracized in Cyberball or receiving negative feedback on written responses).

Several hypotheses also are proposed based on existing literature. With regard to accuracy, given that literature largely indicates that performance on tasks is not impaired in those with SAD relative to non-anxious controls, no differences in accuracy of performance are expected between HSA and LSA groups. Additionally, it is not expected that ostracism or rejection would differentially impact accurate performance on this task. On the other hand, consistent with findings presented by Grafton and MacLeod (2016), it is expected that participants overall will demonstrate faster reaction times to identifying negative facial expressions relative to neutral, but this effect will be intensified for those with HSA relative to those with LSA. Moreover, those with HSA will demonstrate rapid engagement with facial expression stimuli relative to attentional disengagement (i.e., faster reaction times in initial attention to negative facial expressions and faster reaction times to shift away from negative facial expressions), and relative to those with LSA. Further, consistent with broader literature indicating that those with SAD tend to experience heightened attentional biases when presented with ambiguous socially-salient information, those with HSA who have been ostracized will demonstrate more rapid reaction times followed by those with HSA who have been explicitly rejected. Given literature suggesting that these biased responses in attention and interpretation do not vary between ostracism contexts and rejection contexts, no differences in reaction times between ostracized and rejected LSA participants are expected.

CHAPTER II

REVIEW OF THE LITERATURE[2]

Note: Due to the COVID-19 pandemic, the present document was not able to be fully completed as it was originally proposed. Below is the literature review chapter that corresponds to this work as it was defended.

Social Anxiety Disorder

Social Anxiety Disorder (SAD) is characterized by persistent and intense fears of situations in which an individual may be exposed to social evaluation (APA, 2013). Moreover, these fears may manifest in many contexts and among many types of individuals (e.g., peers, romantic others, strangers, etc.) (Beidel et al., 2010; De Los Reyes et al., 2013). Although SAD typically peaks during adolescence, adulthood presents a variety of situations that maintain and may even initiate underlying SAD symptoms (Alfano & Beidel, 2011). Similarly, SAD is associated with a variety of impairments across occupational, social, and academic domains. In fact, literature suggests that those with SAD experience greater relationship dissatisfaction (Alden & Taylor, 2004) and poorer quality of life (Olatunji et al., 2007; Wong et al., 2012). Further, those with whom SAD-diagnosed individuals interact also tend to perceive those with SAD to be less intelligent, less attractive, and as having poorer social skills (Alden & Taylor, 2004). Thus,

[2]Due to the COVID-19 pandemic, the present document was not able to be fully completed as it was originally proposed due to transition to entirely online methodologies. Accordingly, the information presented in this section contains new subsections that correspond to the work as it was defended that has been modified for online methodologies, in addition to subsections that correspond to the work as it was proposed, as applicable. Appendix B contains supplemental literature review sections that correspond to the work as it was originally proposed.

research regarding the processes maintaining and mechanisms contributing to SAD is warranted to better understand the underlying nature of social fears central to SAD.

Core features of SAD in adulthood involves anxious apprehension about being judged, often on social competence or on observable markers of anxiety, followed by subsequent avoidance of situations that have the potential to confirm such apprehensions (Alden & Taylor, 2004; Clark & Wells, 1995; Rapee & Heimberg, 1997; Taylor & Alden, 2010). However, motives for apprehension and avoidance may differ. For example, literature suggests that fears of both positive and negative social evaluation may appear across different presentations of SAD (Weeks et al., 2010). Further, avoidance of social contexts may present as a variety of safety behaviors (e.g., reassurance-seeking, self-soothing; Clark & Wells, 1995; Rapee & Heimberg, 1997). Consequently, the nature of social relationships and the contexts in which these relationships occur may create different symptoms profiles regarding socially-threatening stimuli in individuals with SAD. This is especially pertinent given the widespread and diverse cognitive- and emotional-processing biases experienced within SAD.

Cognitive Models of Social Anxiety

A number of cognitive models exist that elucidate potential mechanisms of biases central to SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997). Broadly, these models assert that such biases increase the frequency and intensity of aversive thoughts that consequently heighten arousal related to anxious symptomatology. Many posit that anxiety in SAD, specifically, is often associated with a predisposition to attend to socially-salient external and internal threat cues (Clark & Wells, 1995; Rapee & Heimberg, 1997). In social situations, for example, an individual with SAD may demonstrate increased attention toward what they may say in conversations with strangers, as well as toward their physical indicators of anxiety (e.g., perspiration or trembling) in an effort to appear socially-skilled. As a result, their skewed mental processes serve as responses to distorted beliefs of appearing inadequate or incompetent, thereby reinforcing subsequent behaviors (i.e., safety behaviors) aimed to reduce anxiety. Thus, models that integrate bidirectional relationships between internal cognitions and symptoms and external social context cues provide a comprehensive conceptualization of impairments associated with SAD.

Rapee and Heimberg's (1997) cognitive-behavioral framework contends that those with SAD assume others are likely to evaluate them negatively. They form mental representations of themselves within social contexts and subsequently become increasingly self-focused on their physical appearance and social abilities (Rapee & Heimberg, 1997). In this way, individuals tend to attribute their self-focus to external cues. Thus, Rapee and Heimberg (1997) posit that the underlying cognitive mechanisms contributing to SAD stem from increased and skewed focus on threatening stimuli (e.g., indicators of social evaluation by others) in social environments which trigger subsequent SAD symptoms.

On the other hand, Clark and Wells' (1995) cognitive framework of SAD asserts that anxiety within social interactions is maintained by cycles of increased attention, cognitive avoidance, and impaired social functioning. Those with SAD shift attention toward detailed monitoring of their actions and appearances, thereby interfering with information processing related to the environment and others' behaviors (Clark & Wells, 1995). Moreover, they engage in safety behaviors as strategies to reduce the likelihood that another may negatively evaluate them. These compensatory behaviors reinforce anxious cognitions, thereby maintaining SAD (Clark & Wells, 1995). This directly contrasts Rapee and Heimberg's (1997) model in that it posits that those with SAD focus attention inward to engage in self-monitoring behaviors as opposed to increased attention directed only toward external threat cues.

A robust empirical literature exists which supports translation of each of these prominent models within anxiety frameworks (see Cisler & Koster, 2010 for a review). This is primarily exemplified through research regarding selective attention to emotional stimuli given that those with SAD preferentially attend to context cues that threaten their social self-concept (e.g., negative evaluation, being viewed as incompetent) and subsequently engage in compensatory behaviors to reduce feelings of anxiety. Visual probe studies (MacLeod et al., 1986) suggest that those with SA concerns show an initial bias toward words indicative of negative affect associated with social behaviors, such as “stupid” or “inferior” (Amir et al., 1998; Vassilopoulos, 2005). For example, MacLeod and colleagues (1986) utilized a visual dot probe paradigm to assess attentional biases toward threat-related or neutral lexical stimuli. Dot-probe tasks facilitate indirect measurement of attention allocation by asking participants to press computer keys in response to simultaneous presentation of a dot with a target neutral or threat-related word (MacLeod et al., 1986). In this way, the amount of time required to detect and respond to the dot reflects visual attention allocation. For example, if a participant has a longer latency to detect the dot, then it may be that they were not directly attending to the spatial location of the dot, but rather toward other stimuli in the task from which they may require additional time to disengage (MacLeod et al., 1986). Similar patterns of attentional biases also are demonstrated with negative-affect facial stimuli (Gilboa-Schechtman, et al., 1999; Mogg et al., 2004). However, evidence also indicates that individuals who report higher levels of SA tend to avoid directed attention toward facial stimuli altogether, suggesting that facial stimuli in general may serve as threats in social contexts regardless of valence (Mansell et al., 1999; Chen et al., 2002). Moreover, neuroimaging and electrophysiological research posits that SAD participants may demonstrate early hypervigilance toward (McTeague et al., 2011) and heightened brain activation in response to faces (Cooney et al., 2006), and more specifically angry or harsh facial expressions (Mueller et al., 2009; Phan et al., 2006). Though a variety of literature utilizing cognitive attention-based tasks aligning with Clark and Wells’ (1995) and Rapee and Heimberg’s (1997) cognitive models of SAD exists, results appear to be mixed across types and contexts represented by stimuli. Thus, it may be that those with SAD automatically and differentially attend to aversive social cues, especially regarding detection of emotion in faces. This is particularly important given avoidance of contexts that have the potential to confirm apprehensions of any kind of evaluation characteristic of SAD (Weeks et al., 2010).

Evidence regarding cognitive aspects of SAD also extends beyond study of basic executive function mechanisms to potential applications within assessment and treatment. Indeed, a number of effective interventions for SAD traditionally assume that cognitive biases are direct antecedents to poor social functioning (e.g., cognitive-behavioral therapy; Singh & Hope, 2009). Cognitive bias modification and attentional training paradigms, therefore, were developed as methods to train individuals with related psychopathology to adjust cognitive processes to revise automatic attention toward and subsequent conscious processing of threatening stimuli (Beard, 2011; Koster et al., 2009). Induction of such cognitive biases has been shown to increase anxiety symptoms in both anxious and non-anxious controls (See Hallion & Ruscio, 2011 for a review; Mathews & Mackintosh, 2000; Mathews & MacLeod, 2002, 2005). Similarly, attention and cognitive bias interventions, in which participants are trained to direct attention away from aversive stimuli thereby capitalizing on automatic cognitive process impairments characteristic of anxiety, have shown reductions in symptoms reported by those with the disorder (see Hakamata et al., 2010 for a review). Collectively, as interventions that capitalize on automatic cognitive pathways are broadly successful in the short-term, it fits that differential cognitive functions are present in individuals who struggle with anxiety.

Several pharmacological interventions for disorders such as SAD also may influence cognitive pathways (Browning et al., 2010; Harmer, 2008). This is particularly notable given associations between disrupted serotonergic pathways, social cognition, attention, and symptoms of anxiety (Canli & Lesch, 2007). Browning and colleagues (2007) discovered that healthy individuals to whom selective serotonin reuptake inhibitors (SSRIs) were administered demonstrated an increased bias toward positive words in a visual-probe task, thereby indicating attentional and cognitive changes along with pharmacologic agents aimed at reducing mood-related symptoms. Additional research posits that SSRIs modulate attentional vigilance to threat short-term (Murphy et al., 2009). Together, these studies suggest that cognitive biases play a significant role in the maintenance of anxiety-related disorders such as SAD, even on a neurochemical level.

In sum, each of these models attributes cognitive mechanisms to physical and behavioral impairments in SAD. They support that individuals with SAD have skewed mental representations of themselves interacting across social contexts. Accordingly, such selective attention may stem from cognitive processes and information processing (e.g., self-focused physiological response, perceptions of social interactions and context) related to social judgment. Indeed, individuals with SAD may often misinterpret others' thoughts and emotions during social interactions (Hezel & McNally, 2014; Washburn et al., 2016). Accordingly, those with SAD may have additional difficulty diverting attention away from socially-salient threats (Buckner et al., 2010), may attribute more negative qualities to others across contexts (Stopa & Clark, 2000), and may internalize these concerns (Clark & Wells, 1995; Kashdan & Roberts, 2004; Spurr & Stopa, 2002). Moreover, recent literature regarding effective assessment and pharmacologic treatment for SAD posits that such interventions succeed through direct and indirect cognitive mechanisms coinciding with SAD (Browning et al., 2010; Hakamata et al., 2010; Harmer, 2008). Consequently, individuals with SAD may experience more interpersonal difficulties as a result of differential cognitive function.

Attentional Control Models of Social Anxiety

The Attentional Control Theory (ATC) expanded upon existing cognitive models of anxiety, better conceptualizing and defining mechanisms contributing to impairments associated with anxious symptomatology (Eysenck et al., 2007). Eysenck and colleagues (2007) developed the theory with a particular focus on abilities to direct attention when presented with a threat. Accordingly, individuals with anxiety often have difficulties with consciously shifting or focusing attention toward stimuli of interest (Eysenck et al., 2007). Moreover, individuals may simultaneously be hypervigilant toward threat-related stimuli (see Bar-Haim et al., 2007; Eysenck et al., 2007). Because of this, individuals who experience anxiety-related symptoms may sense and perceive their environments and internal physiological responses in different ways compared to those without the same concerns. Such attentional disparities may facilitate downstream processing deficits related to goal-directed or targeted task completion. Indeed, a key assumption in many of the models described above is that dysregulated cognition in anxiety disorders is often maintained by abnormal activation or suppression of attentional networks (Ghassemzadeh et al., 2019).

With specific regard to SAD profiles, research suggests that such individuals may have difficulty controlling attention to both external stimuli and internal experiences that correspond to emotionally-salient social threat (Clark & Wells, 1995; Mansell et al., 2003). For example, saccade experiments suggest that socially-anxious individuals often tend to have difficulty in focusing attention on facial expressions (Weiser et al., 2009). Saccade tasks were developed to assess facets of executive functions, including top-down processing abilities to direct and focus attention (Kowler et al., 1995; Munoz & Everling, 2004). These tasks involve fixation points centered on a screen, with random presentations of stimuli on the screen periphery. Participants are instructed to attend to fixated points and then either toward target peripheral cues or away from target peripheral cues (i.e., in the opposite direction on the screen). Thus, deficits in attentional control may be determined by abilities to accurately inhibit directing attention toward non-target cues and to consciously attend to target cues (Everling & Fischer, 1998; Crawford et al., 2002). Weiser and colleagues (2009) utilized a visual saccade task to assess for deficits in attentional control toward facial emotion in individuals with SAD. Their results indicated that socially-anxious individuals tended to take longer amounts of time to shift attention toward facial stimuli (Weiser et al., 2009). However, shorter shifting latencies were demonstrated when directing attention toward stimuli which displayed fearful emotions, and longer latencies were demonstrated when directing attention away from those same stimuli. In line with attentional control theory, these findings suggest that those with SAD may exhibit an initial hypervigilance toward facial expressions displaying negative emotions followed by subsequent difficulty disengaging with those same expressions (Bar-Haim et al., 2007; Eysenck et al., 2007). Thus, individuals with SAD may experience difficulties in both shifting (e.g., slowed shifting toward facial expression in general and a comparatively rapid shifting toward threatening facial stimuli) and focusing (e.g., impaired disengagement from threatening facial stimuli) attentional resources.

Similarly, these conclusions align closely with research suggesting that those with SAD demonstrate different patterns of eye movements when scanning faces relative to non-anxious controls (Horley et al., 2003). Horley and colleagues (2003) utilized a visual scanpath paradigm to assess how those with SAD detect and attend to interpersonal stimuli. Visual scanpaths involve tracking goal-directed gaze and fixation on target stimuli. They discovered that those with SAD tended to make fewer fixations on facial features of any emotion and that any fixations on features were of shorter duration compared to those made by individuals without SAD. Moreover, those in the SAD group demonstrated broader scanpaths across non-facial features (e.g., forehead, chin, ears). Together, these data suggest that SAD may encompass active avoidance of salient facial features relevant to social threat (Horley et al., 2003). These differential attentional processes also may serve potential markers for interpersonal deficits (e.g., low self-efficacy in social interactions and being viewed by others as having poor social skills) common in SAD.

Overall, initial automatic and subsequent conscious attentional control processes appear to play a significant role in the cognitive contributions to impairments associated with SAD. Consequently, individual attentional processes may work together as a network to control a number of functions. Collectively, such attentional networks have been implicated in groups of attentional abilities related to abilities to alert to, orient toward, and understand task-relevant stimuli across contexts, which may maintain anxiety concerns (Ghassemzadeh et al., 2019; Heeren et al., 2015; Pacheco-Unguetti et al., 2011). Attentional Network Tests (ANTs) have been used to measure differences in these collections of attentional network processes (Fan et al., 2002). ANTs require that participants determine direction of the middle arrow in a set of arrows within a flankers task (i.e., is the arrow pointing right > or left <). A target arrow or sets of arrows are presented above or below fixation points. Impairments to attentional networks, therefore, are measured through latencies and accuracy of target direction and spatial location detection when presented individually or in the context of other flankers (Fan et al., 2002). Heeren and colleagues (2015) utilized an ANT to measure deficits in these collections of attention processes in individuals with SAD and found that those with SAD were slower to respond to targets when they were presented with spatial cues (i.e., above or below fixation points) compared to non-anxious controls. Moreover, they demonstrated increased reaction time to attend to task-irrelevant stimuli (Heeren et al., 2015). As a result, those with socially-anxious concerns demonstrated dysfunctions in networks specifically involved with abilities to shift or orient attentional resources toward target and away from non-target stimuli. Thus, socially-anxious individuals may demonstrate abilities to attend to stimuli, yet experience difficulties in adapting and adjusting attention to stimuli that may pose realistic social threat.

Though attention and orientation to external socially-relevant stimuli may play roles in pathology and maintenance of SAD, a key characteristic of SAD also involves self-focused attention (for a review, see Spurr & Stopa, 2002). Indeed, symptoms may stem from hypervigilance to aversive internal physiological states and personal behaviors associated with fears in social contexts (Woody & Rodriguez, 2000; Bogels & Mansell, 2004). This is particularly notable given recent literature regarding attentional biases in anxious symptomatology such as bodily sensations (Judah et al., 2016a; Kanai et al., 2012) and self-focused fears of appearing incompetent in social contexts (Judah et al., 2016b). In fact, those with SAD tend to perform worse on cognitive tasks, and such poor performance is correlated with self-focus as indexed by self-report and measures of psychophysiology (Judah et al., 2016a; 2016b). Moreover, socially-anxious individuals also may demonstrate heightened attention toward commission of errors (Barker et al., 2015; Endrass et al., 2014; Kujawa at al., 2016). As a result, those who have concerns related to social anxiety may experience not only altered attentional processes in the context of external social threats, but also attentional biases toward internal physical states, thoughts, and emotions. These may ultimately facilitate downstream impairments in psychological and interpersonal functioning.

Emotion and Information Processing in Social Anxiety

Though a robust literature base exists regarding automatic attentional biases to internal and external socially-salient experiences in SAD, interpretation and processing of such biases play additional roles in the maintenance of this condition. More specifically, maintenance mechanisms may be associated with abnormal interpretative processes toward social contexts that may elicit aversive emotional states. For example, individuals with SAD tend to misinterpret ambiguously- or, in some cases, positively-valenced social stimuli as negative, thereby prompting a mental label of such stimuli as threatening or aversive and provoking self-focused negative emotional reactions (see Heinrichs & Hofmann, 2001 for a review). Consequently, a constellation of executive functions (e.g., self-regulation, cognitive flexibility, working memory) play a significant role in organizing and understanding socially-salient information. More specifically, accurate understanding of emotions in and evaluations by others in response to actions committed by the socially-anxious individual, over and above pure perception of emotions in others, may be a central task of executive functions (e.g., Pessoa, 2009; Liao et al., 2010).

Self-regulation is characterized by attempts to actively influence emotional expression and experience (Gross & Thompson, 2007). In SAD, such emotion regulation, and rather dysregulation, occurs in response to evaluative social contexts (Clark & Wells, 1995; Hofmann, 2007; Kocovski & Endler, 2000). For example, previous work has shown that individuals with SA tend to actively avoid engaging in situations that remind them of feared social situations in which they have previously participated (Werner et al., 2011), and that those with SAD who tend to engage in safety behaviors (e.g., not speaking, avoiding eye contact, wearing clothes to hide physical symptoms of anxiety) also tend to do so as a way to mediate negative affect (Moscovitch et al., 2013). Thus, such avoidance and engagement in safety behaviors assists individuals in regulating current and recalled emotions. Moreover, emotion regulation is often demonstrated through employment of safety behaviors (e.g., situational avoidance, reassurance-seeking) that aim to reduce anxiety symptoms (Wells et al., 1995; Barlow et al., 2004). Indeed, literature posits that safety behaviors may divert attention away from aversive external stimuli (e.g., negative emotions in others) or distract individuals from aversive internal emotional or physiological experiences (e.g., apprehension of social situations, increased somatization of apprehension) (Barlow et al., 2004; see Clark & McManus, 2002 for a review). Accordingly, emotion regulation requires an understanding and appropriate labeling of one's own emotional experiences. As a result, it appears that some presentations of SAD may involve core deficits in abilities to successfully manage aversive emotions in response to social situations in which they are evaluated.

At the same time, emotion regulation and management may additionally require skills in adaptive functioning, including cognitive flexibility. Cognitive flexibility refers to the extent to which an individual is able to transition from thinking about one concept to another (Juardo & Rosselli, 2007). Moreover, abilities to flexibly employ cognitive resources permit accurate top-down synthesis of new information from the environment with existing mental schemas (e.g., Eslinger & Grattan, 1993). Alternatively, cognitive rigidity often contributes to the etiology of psychopathology, particularly when individuals hold stable cognitions related to particular aversive emotions (e.g., major depressive disorder; Deveney & Deldin, 2006). In SAD, for example, afflicted individuals often experience stable and inflexible fears and cognitions regarding social evaluation (Arlt et al., 2016; Clark & Wells, 1995; Jazaieri et al., 2015; Levin et al., 2017), and such patterns of experiences may be difficult to break. As an example, Everaert and colleagues (2018) assessed cognitive inflexibility in relation to depression severity and social anxiety. More specifically, they discovered that severity of social anxiety symptoms were associated with more inflexible interpretations of fictitious, ambiguous social situations (e.g., situations that have negative outcomes vs. situations that have negative outcomes yet are disconfirmed by external, positive information) and individuals further demonstrated difficulties in abilities to revise negative interpretation biases (Everaert et al., 2018). Alternatively, literature also suggests that those with SAD may demonstrate impairments in emotion perspective-taking and comprehension of others' mental states (i.e., Theory of Mind, mentalizing; Hezel & McNally, 2014; Sripada et al., 2009; Washburn et al., 2016). Hezel & McNally (2014) discovered that those with non-comorbid SAD performed significantly worse on tasks that required mentalization compared to healthy controls. Moreover, SAD participants were more likely to attribute more intense emotions and exaggerated meanings regarding what evaluators were thinking and feeling (Hezel & McNally, 2014). Washburn and colleagues (2016) discovered similar patterns of interpreting exaggerated negative emotions in others, as well as a trend toward inaccurate labeling of any emotions in others. Studies using similar methodology have additionally found similar results regarding the associations between SAD symptom severity and abilities to accurately discriminate facial expressions (Battaglia et al., 2004; Buhlmann et al., 2015). Thus, though impairments in abilities to shift focus on personal emotions and internal emotional experiences appear to be a core feature in SAD, the ability to accurately understand emotions and thoughts of those considered to be evaluators also may act as a maintaining factor for social fears.

Over and above emotion regulation and cognitive flexibility, impairments in abilities to mentally hold external information may contribute to longer-term processing biases. Working memory involves a combination of storage and manipulation of information (Baddeley, 2012). Current views of working memory posit that it is a limited capacity system comprised of a central executive, phonological loop, and a visuospatial sketchpad (Baddeley, 2003, 2012). The phonological loop and visuospatial sketchpad serve to aid in information encoding and retrieval for auditory and visual cues, respectively. The central executive functions to control and "supervise" the resources allocated to the phonological loop and visuospatial sketchpad. Because of this, when the central executive achieves its capacity, due to an excess load of tasks that require memory usage for example, it becomes more difficult to orchestrate recall of phonological and visuospatial processes (Baddeley, 2012). As a result, when additional cognitive and executive processes are required to complete a number of tasks, such cognitive resources are split across these processes, thereby reducing resources allocated to working memory (Baddeley, 2003, 2012). The SAD literature has found that individuals tend to experience increased difficulty disengaging from stimuli portraying negative emotions (e.g., disgust, anger) when their central executive functions are highly loaded (Judah et al., 2013). Relatedly, those with SAD also tend to demonstrate more inhibited encoding of irrelevant positively-valenced stimuli in emotion recall tasks relative to healthy controls (Segal et al., 2015). As a whole, these results suggest that those with SAD may possess central executive and working memory biases for enhanced recall of negative emotions in others with simultaneous deficits in recall for positive emotions in others.

Various methodological paradigms have been implemented in the assessment of abnormalities in executive functions as they relate to emotion and social information processing. For example, reaction-time tasks provide information regarding the length of processing and predispositions toward labeling and organization of particular stimuli. These tasks show that those with SAD tend to be quicker to avoid situations that provide the potential for social threat relative to those without SAD (e.g., Heuer et al., 2007), and tend to detect negative, emotionally-evaluative facial expressions such as anger more quickly (e.g., Gilboa-Schechtman et al., 1999). Psychophysiological indices also demonstrate that those with SAD exhibit exaggerated neural activity in regions associated with emotion processing (e.g., amygdala, anterior cingulate cortex hippocampus) when encountering social interactions (e.g., Bruhl et al., 2010; Evans et al., 2008; Goldin et al., 2009; Kolassa, & Miltner, 2006). Collectively, these suggest that SAD may involve covert, higher-order cognitive processes required to consciously understand emotions in themselves and others over and above overt, automatic emotion detection.

Taken together, those with SAD may demonstrate dysregulated emotional processes, may experience impairments in emotional perspective-taking, and may have more difficulty in quickly and accurately identifying emotionally-salient information in social contexts. These executive function processes are central to understanding and effectively participating in situations in which the potential for evaluation may occur. Accordingly, these patterns of functional impairment may result from a combination of skewed automatic emotion detection (i.e., attention) processes and biased active, conscious emotion interpretation (i.e., social information processing). Moreover, it may be that such top-down processing capabilities reciprocally affect and are affected by automatic biases in what individuals with SAD actually initially attend to (Corbetta & Shulman, 2002). These connections within complex emotion systems and social function may influence social fears given that perceptions of meaning underlying social interactions are critical to success in social environments (e.g., Bar-On et al., 2004; Miller et al., 2005). Thus, emotion-processing deficits may have downstream effects on interpersonal skills displayed by those with SAD.

Social Exclusion

Humans strive to make social connections with others in order to enhance health, well-being, and overall quality of life (Steptoe et al., 2013; Umberson & Montez, 2010). Certainly, social bonding and acceptance have been posited as fundamental human needs from a number of perspectives (e.g., social bonding theory, human needs theory; Hirschi, 1969; Maslow, 1943). As a result, interruptions to interpersonal connections may have a significant negative influence on an individual's social functioning and development (Baumeister et al., 2002; Baumeister et al., 2005). Given that expectations of potential exclusion stemming from apprehensions of social evaluation are core features of SAD (APA, 2013), comprehensive understanding of sensitivity to and consequent longitudinal effects of such exclusion may elucidate key maintenance factors and outcomes associated with the disorder. Indeed, it may be that social exclusion confirms apprehensions of social evaluation, thereby reinforcing negative perceptions of interpersonal self-efficacy in social contexts. For example, anxiety symptoms in response to social situations may be viewed as automatic reactions to threats of evaluation which may culminate in breaks in social bonds (Baumeister & Tice, 1990; Buss, 1990). Further, hypervigilance toward and heightened sensitivity to such social exclusion also may predispose individuals to maladaptive patterns of social interaction and interpersonal perceptions (Downey et al., 1997; Levinson et al., 2013;

Romero-Canyas et al., 2010). Moreover, these reactions may closely align with cognitive, attentional, and emotional impairments characteristic of SAD.

Coinciding with cognitive and attentional control perspectives, research has shown that social exclusion and perceived isolation contribute to abilities to attend to and engage with social threats (Cacioppo & Hawkley, 2009). For example, ostracism tends to increase the likelihood that individuals interpret ambiguous actions of others as more threatening (Zadro et al., 2006). Such patterns have been replicated across behavioral (e.g., Bangee et al., 2014; Berenson et al., 2009) and neuroimaging designs (e.g., Gutz et al., 2015), though not all studies have found this (DeWall et al., 2009; Maner et al., 2003). Moreover, rejection sensitivity predicts attentional avoidance biases for socially-threatening stimuli (e.g., socially-salient words within emotional Stroop tasks; Berenson et al., 2009). Thus, it may follow that exclusion by others may act as a maintenance factor which may additionally exacerbate attentional biases characteristic of SAD. Together, social exclusion may further intensify executive function deficits that are characteristic of SAD. Additional work needs to be conducted regarding the intersecting effects of exclusion for those with SAD given such predispositions to detection biases in social contexts.

However, despite robust literature suggesting that exclusion may thwart adaptive and effective attention toward and processing of socially-relevant cues, particularly for those with SAD, much of this work has focused on the broad effects of exclusion. Indeed, relatively little research thus far has been conducted that directly compares and parses apart the effects of different types of social exclusion. For example, some work proposes that exclusion may operate in distinct ways via direct rejection and ignoring others (Freedman et al., 2016). Exclusion also varies across domains such as pathway (e.g., active vs. passive), intent (explicit vs. ambiguous), and medium (e.g., verbal or behaviors) (Riva & Eck, 2016). For instance, individuals may be directly and actively excluded through provision of feedback concerning their standing in social interactions, but also may be passively excluded by being ignored. Within community samples, Molden and colleagues (2009) discovered that, on average, individuals engage in different responses to social rejection (i.e., social withdrawal, rumination) relative to being ignored (i.e., increased social engagement, desire for acknowledgement of being ignored from excluders), which suggests that these distinctions might affect different interpersonal processes. Additionally, targets of exclusion may explicitly be able to acknowledge that they have been excluded, or there might be circumstances in which targets might not fully understand the intentions of excluders. Work indicates that when situations are ambiguous with regard to if exclusion has occurred, targets of exclusion may be more likely to have negative cognitive and behavioral biases toward socially-relevant stimuli (Jones & Barnett, 2020; Williams, 2009). Individuals also may be excluded or rejected by others by means of linguistic communication (e.g., negative verbal or written evaluations), but also may be rejected through behavior (e.g., not including all members in a collaboration; exclusive facial expressions or nonverbal cues). However, distinctions on such domains have not been extensively studied within SAD samples.

Social Exclusion Tasks

Ostracism-Based Tasks. A number of research paradigms have been utilized that directly manipulate social inclusion and exclusion defined within ostracism. Though these manipulations have been implemented in behavioral designs (e.g., face-to-face ball-tossing paradigms, self-report; Williams & Sommer, 1997), one of the most commonly-used ostracism manipulation tasks is a computer-based Cyberball task (Williams et al., 2000; Williams & Jarvis, 2006). Cyberball is a virtual ball-tossing game in which participants are informed that they are playing with two other individuals. However, these individuals are software-generated. Participants also are informed that the primary purpose of the game is to practice mentally visualizing a real-life ball-tossing game. The original task lasted for approximately five minutes and players are divided into either an inclusion or exclusion condition. Experimenters also may select the number of avatars for software-generated players, and may program path, speed, and length of ball tossing (Williams & Jarvis, 2006). Consequently, this task lends itself well to a number of modifications regarding ostracism.

Indeed, Cyberball has been implemented across paradigms that investigate a number of mechanisms underlying social behavior (e.g., psychophysiology; Gutz et al., 2015; Heeren et al., 2017) and has been shown to yield robust effects of ostracism despite its brevity and virtual nature (Kraines et al., 2019; Williams & Jarvis, 2006). For example, work has shown that the Cyberball task elicits activation of the insula and anterior cingulate, which are regions sensitive to social exclusion (Bolling et al., 2011; Kross et al., 2007; van der Muelen et al., 2016). Additionally, Cyberball also has been utilized as a method to study the effects of experimentally-manipulated ostracism in a number of disorders. Symptoms of such disorders, including depression, anxiety disorders, and borderline personality disorder, are often strongly influenced by dysfunctional interpersonal relationships (e.g., Heeren et al., 2017; Kraines et al., 2019; Renneberg et al., 2011; Zhang et al., 2017). Within SAD in particular, literature broadly indicates that those with SA concerns tend to demonstrate stronger responses on both neural and self-report metrics toward ostracism (e.g., Heeren et al., 2017; Nishiyama et al., 2015; van Noordt et al., 2015). As an illustrative example, Heeren and colleagues (2017) utilized a Cyberball paradigm to assess neural differences in responses to ostracism between those with SAD and nonanxious controls. Toward this end, the researchers found that not only did self-reported measures of social exclusion correlate significantly with exclusion conditions, but these reports were higher in those with SAD (Heeren et al., 2017). Moreover, those with SAD demonstrated increased activation in those neural regions associated with exclusion relative to nonanxious controls (Heeren et al., 2017). Thus, the Cyberball task appears to effectively induce experimentally-manipulated exclusion on behavioral self-report and physiological domains.

Rejection-Based Tasks. On the other hand, rejection-based social interaction tasks are distinct from ostracism-based tasks in the methods by which exclusion occurs. Traditionally, such tasks have paralleled social stressor-based tasks that provide the opportunity for direct performance-based social evaluation. One example of such a task is an impromptu speech task in which participants are asked to perform an unexpected speech in front of confederates that the participant presumes to be others engaged in the study (e.g., Beidel et al., 1989). Importantly, research utilizing such tasks suggest that impromptu speeches elicit internal arousal and stress responses in individuals with SA and in community samples, as well as across developmental periods (e.g., Beidel et al., 1989; De Los Reyes et al., 2013; Lipton et al., 2020). Such tasks also have been shown to elicit similar responses in vivo and in virtual environments (Owens & Beidel, 2015). However, this work largely has not included any exclusion-based elements which capitalize on those fears central to SA despite that those with SA also may be fearful of settings in which socially-evaluative performance may occur. To address this gap, more recent work has developed the Fears of Evaluation About Performance (FEAP) task in which participants give a 5-minute impromptu speech and receive in-the-moment counterbalanced positive and negative feedback, presumably from other research participants, on their speech performance (Lipton et al., 2020). Lipton and colleagues (2020) found that those with fears of positive evaluation demonstrated internal arousal toward receiving positive feedback, and that those with fears of negative evaluation demonstrated internal arousal in response to receiving negative feedback. Moreover, data demonstrated order effects such that initial receipt of positive feedback may reduce the adverse impacts of latter negative feedback (i.e., internal arousal) whereas initial receipt of negative feedback increased responses to latter positive feedback (Lipton et al., 2020). Thus, fears of valenced evaluation may correspond to self-reported internalized behavioral responses to valenced feedback, and the extent to which individuals are impacted by this feedback may depend on the timing of feedback, within health adult samples. Yet, the use of direct feedback as a method of explicit rejection in SA samples has been less frequently used, and the broader impact of feedback on a variety of objective domains (e.g., cognitive, executive functioning, and attention) has been less well understood.

Attention and Emotion Processing Tasks

Impairments in attention toward and avoidance of social cues perceived as threatening, as well as subsequent processing of emotionally-salient information within these cues, are characteristic of SAD (Amir et al., 1998; Clark & Beck, 1988; Eysenck et al., 2007; Stopa & Clark, 2000). To assess such difficulties, a diverse array of tasks exists to assess attentional abilities to focus on, direct toward, engage with, and disengage with key component s within the social environment. Reaction time tasks, for example, have been implemented in a number of research designs as a way to assess temporal processing of stimuli. In this way, reaction-time tasks provide metrics regarding how long an individual may take to cognitively process stimuli within particular task parameters. Moreover, such tasks also may yield information about individual predispositions toward labeling and organizing visual task items. Within the context of SAD and attention to emotion, studies have found that those with SAD tend to demonstrate shorter reaction times to avoid social threats (e.g., Heuer et al., 2007) as well as faster times to detect negative, emotionally-evaluative facial expressions (e.g., Gilboa-Schechtman et al., 1999) relative to nonanxious individuals. Thus, those with SAD may demonstrate a quantitative predisposition toward rapid automatic detection of socially-threatening emotions in others as well as a tendency to quickly disengage from similar stimuli when presented with the opportunity to avoid them. This aligns with literature suggesting that those with anxiety and, in particular, those with SA concerns may experience difficulties in both shifting (e.g., slowed shifting toward facial expression in general and a comparatively rapid shifting toward threatening facial stimuli) and focusing (e.g., impaired disengagement from threatening facial stimuli) attentional resources (e.g., Eysenck et al., 2007; Taylor et al., 2016; Wieser et al., 2009). Similarly, when social threat is ambiguous, those with SAD may rapidly detect such stimuli and broadly interpret such stimuli as more threatening and aversive (e.g., Beard & Amir, 2010; Kanai et al., 2010; Yoon & Zinbarg, 2007). However, utilization of reaction time as the sole metric of attentional biases precludes direct investigation of efficiency and accuracy of identifying to what an individual may really be attending, as well as what factors contribute to the extent to which individuals engage and disengage from stimuli. Additionally, reaction time may not necessarily indicate underlying attentional network dysfunction and may not implicate a specific facet of attention or executive function processing in impairments in and of themselves.

As previously noted, a number of visual attention and Attentional Network Tests (ANTs) have been used to measure collections of attentional network processes that can be quantified by latency (i.e., time spent attending to a cue) and accuracy of target cue identification (i.e., correct selection of cues; Fan et al., 2002). Visual dot-probe paradigms in particular have largely shown to be useful tasks to indirectly capture visual attentional biases toward both neutral and valenced stimuli through reaction time (e.g., MacLeod et al., 1986). In the context of fears associated with SAD, traditional visual dot-probe tasks utilize images of two faces portraying neutral, positive, or negative opposing pairs of facial expressions. Participants are then instructed to respond to either the direction or location of a target shape (e.g., a line or a cross) that is presented on the screen following the images. Importantly, this target is presented in the same location as one of the valenced pictures in the expression pair (e.g., behind either the negative facial expression or behind the neutral facial expression in a negative-neutral pair). Reaction times to response toward the target are recorded as outcomes. Those with SAD and other anxiety-related disorders tend to respond more quickly toward the targets that are presented alongside threatening facial stimuli relative to those that are presented alongside neutral stimuli (Bar-Haim et al., 2007). These findings are in line with work suggesting that those with SAD demonstrate rapid attentional biases toward threatening social information in that participants may be able to respond more quickly to those targets since their attention is already engaged and drawn toward that facial expression. Yet, these traditional dot-probe paradigms preclude understanding of the underlying comprehensive attentional networks contributing to attentional biases as they only measure reaction times in response to stimuli that compete for general attentional resources rather than explicitly manipulating where attention is focused and shifted on the screen. Moreover, some electrophysiological work suggests that traditional dot-probe paradigms demonstrate poor validity in measuring nondirected attention (Thigpen et al., 2018). Rudaizky and colleagues (2014), as well as Grafton and MacLeod (2016), subsequently developed a modified dot-probe task that manipulated participants' location of attention on screen in samples of anxious and socially-anxious samples, respectively. Within this modified dot-probe task, anchor stimuli are presented prior to facial expression pairs and participants are instructed to respond to if a target stimuli presented after a period of time matches the orientation of the anchor. Targets are then intentionally presented either behind negative facial expressions or neutral facial expressions to represent attentional engagement and disengagement from task demands (i.e., the facial stimuli may capture attentional resources away from determining if the target is presented in the same orientation as the anchor). Such work using this paradigm has suggested that those with anxiety demonstrate faster reaction times to discerning targets when presented behind negative stimuli, as well as faster reaction times to disengage from the threatening facial expressions (Grafton & MacLeod, 2016; Rodgers et al., 2020; Rudaizky et al., 2014). As a result, modified dot-probes may be an advantageous method by which to assess different features of attentional control.

The "Reading the Mind in the Eyes" Test (RMET) was developed by Baron-Cohen and colleagues (1997, 2001) as a way to assess abilities to accurately perceive and identify facial expressions (i.e., "mentalization") in adults with Autism Spectrum Disorders. The theoretical basis underlying the RMET suggests that the task capitalizes on mental state attribution frameworks as well as emotion recognition and face perception processes in the absence of attentional control (Baron-Cohen et al., 1997, 2001; Numenmaa, 1964). The RMET is comprised of black-and-white photographs of human emotions as they are expressed through the eyes and eyebrow regions (Baron-Cohen et al., 1997). Out of 25 such stimuli, photographs are displayed for approximately 3 seconds and participants are instructed to select from a set of options the appropriate emotion conveyed by the eyes in the photograph. The original RMET task included dichotomous, semantically-opposite response selections (e.g., Concerned vs. Unconcerned; Baron-Cohen et al., 1997). However, revised versions of the test have incorporated forced response of four choices including the correct emotion label as well as three distractor descriptors to address chance performance on trials (i.e., p = .50; Baron-Cohen et al., 2001). Moreover, this task distinguishes between general and clinical, neurodevelopmental populations (Baron-Cohen et al., 1997, 2001; Holt et al., 2014; Moor et al., 2012). However, the RMET, as well as other metrics of emotion processing, has been less frequently used in populations with mood and anxiety disorders. Washburn and colleagues (2016) aimed to examine differences in abilities to decode the mental states of others in individuals with SAD, major depressive disorder (MDD), and comorbid SAD and MDD. They found that those with pure SAD and comorbid SAD/MDD performed significantly less accurately on the RMET, thereby suggesting that those with SAD may show impairment in interpreting the general mental states and emotions of others (Washburn et al., 2016). Thus, it may be that the RMET taps into underlying emotion processing deficits and biased attention to socially-salient emotions. However, given that task responses are presented simultaneously with facial stimuli, RMET tends captures recognition of salient emotional cues as opposed processed recall of such potentially socially-threatening facial cues.

Current Study and Hypotheses

Taken together, current cognitive models of SAD and the broader literature suggest that individuals with SA demonstrate attentional and emotion processing biases toward presentations of negative or threatening affect in others relative to those without SAD (e.g., Amir et al., 1998; Gilboa-Schechtman et al., 1999; Stopa & Clark, 2000; Mogg et al., 2004). Similarly, such biases may be influenced by events that confirm fears characteristic of SAD that are directly associated with social evaluation (e.g., social rejection; Baumeister & Tice, 1990; Berenson et al., 2009; Zadro et al., 2006), and may have downstream effects on social self-efficacy and interpersonal perceptions (Downey et al., 1997; Baumeister et al., 2005; Romero-Canyas et al., 2010; Levinson et al., 2013). However, the SA literature has not widely nor directly compared the effects of different formats of social exclusion across different contexts and domains. Importantly, it is critical to discern differences in cognitive responses to explicit, active rejection and more ambiguous ostracism. This may account for not only some inconsistencies in findings across the literature, but also for clarifying how different types of exclusion may differentially elicit varied evaluative concerns and attentional deficits in those with SAD.

The current study proposes a number of hypotheses regarding these modulated mechanisms in those who report either high or low levels of SA symptoms (HSA or LSA, respectively), who are excluded or included, and who are explicitly rejected or passively ostracized. Notably, these mechanisms will be assessed through modifications of behavioral (i.e., accuracy, reaction time) factors within a modified dot-probe task.

Accuracy. Given that literature largely indicates that performance on tasks is not impaired in those with SAD relative to non-anxious controls, it is expected that those in the HSA group will not demonstrate any significant differences in accuracy of performance on a dot-probe task relative to those in the LSA group. Additionally, it is not expected that ostracism or rejection would differentially impact accurate performance on this task.

Reaction Time. Consistent with findings presented by Grafton and MacLeod (2016), it is expected that those with participants overall will demonstrate faster reaction times to identifying negative facial expressions relative to neutral, but this effect will be intensified for those with HSA relative to those with LSA. Moreover, those with HSA will demonstrate rapid engagement with facial expression stimuli relative to attentional disengagement (i.e., faster reaction times in initial attention to negative facial expressions and faster reaction times to shift away from negative facial expressions), and relative to those with LSA. Further, consistent with broader literature indicating that those with SAD tend to experience heightened attentional biases when presented with ambiguous socially-salient information, those with HSA who have been ostracized will demonstrate more rapid reaction times followed by those with HSA who have been explicitly rejected. Given literature suggesting that these biased responses in attention and interpretation do not vary between ostracism contexts and rejection contexts, it is expected that there will be no differences in reaction times between ostracized and rejected LSA participants.

CHAPTER III

METHODOLOGY[3]

Participants

The sample for the present study was recruited from the undergraduate student population at Oklahoma Statue University via an online recruitment system (SONA) in which students received course credit for research participation.[4] Participants were given a short form of the Social Interaction Anxiety Scale (SIAS-6; Mattick & Clarke, 1998; Peters et al., 2012) as a pre-screener via the online recruitment system to create groups comprised of individuals who meet for high and low levels of SA concerns. Those who scored in the extremes of SA concerns (i.e., one standard deviation above or below the standardized mean of SA concerns on the SIAS-6) were recruited into study groups. Those who scored in the upper extreme of scores were recruited into the study within the high SA (HSA) group. Those who scored in the lower extreme of scores were recruited into the low SA (LSA) group. These recruitment procedures align with those previously conducted utilizing high and low SA groups (e.g., Judah et al., 2016a). Moreover, participants were recruited to participate either within an ostracism group, within which they completed the Cyberball task, or a rejection group, within which they completed an online writing

[3] See the Appendix C for relevant information regarding the methodologies of the thesis project originally proposed.
[4] Due to complications in online recruitment during the COVID-19 pandemic resulting in difficulties collecting the originally-proposed a priori sample size, recruitment was expanded to include any individual over the age of 18 within the United States who responded to online research advertisements through email and on social media. These participants were given the option to voluntarily enter into a drawing to receive one of ten $20 Amazon gift cards as compensation for participation.

task and received explicit positive or negative feedback on their written responses.

An a priori power analysis (Cohen, 1988) was performed using G*Power version 3.1.9.4 to determine sample size that would result in adequate analytic power. Calculations were computed based on repeated measures, within-between interaction ANOVA statistical *F* tests using 4 between-subject groups (i.e., HSA/Rejection, HSA/Ostracism, LSA/Rejection, and LSA/Ostracism) and 3 within-subject groups (i.e., Baseline, Post-Inclusion, Post-Exclusion). Effect sizes found in previous studies ($\eta^2 = .16$, Heeren et al., 2012; $d = .18$-.69, Heeren et al., 2012) suggested a total of 16 – 284 individuals would be needed to achieve adequate power (i.e., $\beta = .80$, $\alpha = .05$). Based on this analysis as well as on previous work that assessed similar constructs through similar study designs (e.g., $N = 26$, Buckner et al., 2010; $N = 56$, Zadro et al., 2006), a conservative approach was used and data from 150 participants were proposed to be collected. More specifically, it was initially expected that would be approximately 37-38 participants recruited for each between-subject group (i.e., HSA vs. LSA; ostracism vs. rejection). However, due to significant difficulties in participant recruitment and data cleaning and rejection procedures, a final analytic sample size of 45 was collected. Moreover, only 14 participants out of 45 were categorized as LSA and HSA using an extreme-groups approach based on responses on the SIAS. To address this, SA scores were analyzed continuously. Participant subsample sizes and demographic information are presented in Table 1.

Table 1. *Descriptive Statistics for Demographics Across Experimental Groups*

	Ostracism Group		Rejection Group		Total	
SIAS, Mean (SD), Range	34.24 (15.47)	3-65	45.06 (12.41)	21-67	38.09 (15.24)	3-67
Age, Mean (SD), Range	22.03 (5.19)	18-38	21.50 (5.35)	18-39	21.84 (5.20)	18-39

	Ostracism Group	Rejection Group	Total
Gender, N(%)			
Male	4 (13.8%)	4 (25.0%)	8 (17.8%)
Female	24 (82.8%)	12 (75.0%)	36 (80.0%)
Other	1 (3.4%)	0 (0.0%)	1 (2.2%)
Race, N(%)			
Caucasian	24 (82.8%)	12 (75.0%)	36 (80.0%)
Black/African-American	2 (6.9%)	0 (0.0%)	2 (4.4%)
American Indian or Alaska Native	2 (6.9%)	1 (6.3%)	3 (6.7%)
Asian	0 (0.0%)	1 (6.3%)	1 (2.2%)
Multiracial	1 (3.4%)	2 (12.5%)	3 (6.7%)
Ethnicity, N(%)			
No Latin or Hispanic Origin	25 (86.2%)	15 (93.8%)	40 (88.9%)
Latino/a	3 (10.3%)	1 (6.3%)	4 (8.9%)
Chicano/a	1 (3.4%)	0 (0.0%)	1 (2.2%)

Note. SIAS = Social Interaction Anxiety Scale. M = Mean. SD = Standard Deviation. Additional independent samples *t*-test analyses revealed no significant differences between group based on age, and a significant difference between groups based on SA, $t(43)=-2.40$, $p<.05$. Chi-square analyses for additional demographic variables were invalid due to inadequate cell sizes.

Materials

Measures.

Demographics. Participants completed a demographics questionnaire assessing a variety of different items, including age, gender, race, and ethnicity.

Social Interaction Anxiety Scale – 6-Item (SIAS-6; Peters et al., 2012). The SIAS-6 is a 6-item measure that was developed as a brief version of the SIAS (see below), which assesses the extent to which individuals experience anxiety within social interactions. Items are rated on a 5-point Likert scale ranging from 0 (i.e., “not at all characteristic or true of me”) to 4 (i.e., “extremely true of me”). Total scores range from 0 to 24, with higher scores reflecting higher levels of social interaction anxiety. The SIAS-6 also has been shown to correlate with the full version of the SIAS as well as other measures of SA, in addition to demonstrating abilities to discriminate between clinical SA and community samples (Peters et al., 2012). This measure was used as an initial screening tool for the SONA sample to better recruit participants demonstrating high and low levels of SA.

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998). The SIAS is a 20-item measure of the extent to which an individual may experience fear during participation in broader social interactions (e.g., direct social engagement with another individual). This questionnaire was used to confirm baseline levels of SA concerns in order to facilitate group placement into high and low SA groups. Each item in the measure is rated on a Likert scale ranging from 0 (i.e., "not at all characteristic or true of me") to 4 (i.e., "extremely characteristic or true of me"). Total scores range from 0 to 80, with higher scores reflecting higher levels of SA. The SIAS also has shown adequate levels of internal consistency in groups with social phobia (Cronbach's $\alpha = 0.93$; Mattick & Clarke, 1998) and in undergraduate samples (Cronbach's $\alpha = 0.88$; Mattick & Clarke, 1998). Within the present work, the SIAS revealed an excellent internal consistency estimate (Cronbach's $\alpha = 0.91$).

Social Phobia Scale (SPS; Mattick & Clarke, 1998). The SPS is a 20-item measure of the extent to which an individual may experience fear as a result of social evaluation during routine activities. This questionnaire was used to assess baseline levels of SA concerns in order to facilitate group placement into high and low SA groups. Each item in the measure is rated on a Likert scale ranging from 0 (i.e., "not at all characteristic or true of me) to 4 (i.e., "extremely characteristic or true of me"). Total scores range from 0 to 80, with higher scores reflecting higher levels of SA. The SPS also has shown adequate levels of internal consistency in samples with social phobia (Cronbach's $\alpha = 0.89$; Mattick & Clarke, 1998) and in undergraduate samples (Cronbach's $\alpha = 0.90$; Mattick & Clarke, 1998). Within the present work, responses on the SPS from 2 participants were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure. Out of valid responses, the SPS revealed an excellent internal consistency estimate (Cronbach's α = 0.94).

Fear of Positive Evaluation Scale (FPES; Weeks, Heimberg, & Rodebaugh, 2008). The FPES is a 10-item measure of the extent to which individuals with SAD may experience fear when in social situations that provide potential for positive evaluation (e.g., compliments, praise). This questionnaire was used as an adjunct measure to the BFNE (see below). Each item in the measure is rated on a Likert scale ranging from 0 (i.e., "not at all true") to 9 (i.e., "very true"). Total scores range from 0 to 72, with higher scores reflecting greater fears of positive evaluation. Two reverse-scored items are not included in total score calculation, but instead are used for the purposes of detecting response biases. The FPES also has shown adequate levels of internal consistency in samples with SAD (Cronbach's α = .80; Weeks et al., 2008). Within the present work, responses on the FPES from 1 participant were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure. Out of valid responses, the FPES revealed a good internal consistency estimate (Cronbach's α = 0.87).

Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983). The BFNE is a 12-item measure of the extent to which an individual may fear situations in which he/she may be negatively evaluated by others (Leary, 1983). This questionnaire was used to assess the relationship between apprehension toward negative aspects of social interactions and confirmation of such negative evaluation as demonstrated through social exclusion. Each item in the measure is rated on a Likert scale ranging from 1 (i.e., "not at all characteristic of me") to 5 (i.e., "extremely characteristic of me"). Four of the items are reverse scored. Total scores range from 12 to 60, with higher scores reflecting increased apprehension toward situations in which negative evaluation may occur. The overall BFNE also has shown adequate levels of internal consistency in undergraduate samples (Cronbach's α = 0.90; Leary, 1983) and in samples with SAD (Cronbach's α = .89; Weeks et al., 2005). Within the present work, the BFNE revealed an excellent internal consistency estimate (Cronbach's α = 0.91).

Adult Rejection Sensitivity Questionnaire (RSQ; Berenson et al., 2009). The RSQ is a 9-item measure that assesses individual concerns when making requests of others. Each item assesses the extent to which an individual is concerned or anxious about the outcome of making a particular social request as well as how likely in individual believes that someone would fulfill their request. Each item is rated on a scale of 1 (i.e., "very unconcerned" or "very unlikely") to 6 (i.e., "very concerned" or "very likely"). Individual item scores are calculated by multiplying the level of rejection concern by a score comprised of the reverse-scored likelihood of request fulfillment items. Total scores are then calculated from the average of the individual item scores, with higher scores reflecting greater rejection sensitivity. The RSQ has been shown to demonstrate adequate internal consistency ($\alpha = 0.70$), converges with similar measures (e.g., attachment, social distress), and can discriminate between groups of individuals with psychopathology concerns related to rejection (e.g., personality disorders) (Downey et al., 1997). Within the present work, responses on the RSQ from 5 participants were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure. Out of valid responses, the RSQ revealed a good internal consistency estimate (Cronbach's $\alpha = 0.90$).

Social Thoughts and Beliefs Scale (STABS; Turner et al., 2003). The STABS is a 21-item measure of cognitions associated with actual and perceived behaviors and reactions within social contexts. Each item is rated on a Likert scale ranging from 1 (i.e., "Never characteristic) to 5 (i.e., "Always characteristic). Items load onto two subscales relating to Social Comparison and Social Ineptness. The STABS also has demonstrated acceptable internal consistency ($\alpha = 0.93$-0.96) and abilities to distinguish individuals with SAD from those with other types of anxiety-related disorders and those without psychopathology (Turner et al., 2003). Within the present work, responses on the STBS from 24 participants were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure.

Out of valid responses, the STBS revealed a good internal consistency estimate (Cronbach's α = 0.87).

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). The PSWQ is a 16-item measure of trait worry that assesses the extent to which individuals engage in repetitive, negative anxious thought styles. Items are rated on a Likert scale ranging from 1 (i.e., "not at all typical of me") to 5 (i.e., "very typical of me"). Items 1, 3, 8, 10, and 11 are reverse-scored to account for valence of item wording. Total scores range from 16 to 80, with higher scores reflecting greater trait worry. The PSWQ has demonstrated adequate levels of internal consistency (α = 0.93-0.95), is able to distinguish clinical populations, and has been validated for use in college samples (Meyer et al., 1990). Within the present work, responses on the PSWQ from 1 participant were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure. Out of valid responses, the PSWQ revealed an excellent internal consistency estimate (Cronbach's α = 0.94).

Attentional Control Scale (ACS; Derryberry & Reed, 2002). The ACS is a 20-item measure of attentional control that assesses individual differences in abilities to focus and shift attention. This questionnaire was used as a self-report indicator of attention to compare with performance on behavioral indicators of attention on outcome measures. Items are rated on a Likert scale ranging from 1 (i.e., "almost never") to 4 (i.e., "always"). Total scores range from 20 to 80, with higher scores reflecting enhanced abilities to effortfully control attention. The ACS has demonstrated good internal consistency (α = .88) and is predictive of behavioral indicators of attention (Derryberry & Reed, 2002; Judah et al., 2016a). Within the present work, the ACS revealed a good internal consistency estimate (Cronbach's α = 0.83).

Patient Health Questionnaire – 9 Item (PHQ-9; Kroenke et al., 2001). The PHQ-9 is a 9-item screening measure of the frequency of symptoms corresponding to DSM criteria related to Major Depressive Disorder. Items are rated on a 4-point Likert scale ranging from 0 (i.e., "not at all") to 3 (i.e., "nearly every day"). Total scores on the PHQ-9 range from 0 to 27, with higher scores reflecting increased frequency of depressive symptoms. The PHQ-9 has demonstrated acceptable internal consistency (α = .86 - .89) and sensitivity to distinguish major depression (Kroenke et al., 2001). Within the present work, responses on the PHQ-9 from 1 participant were excluded due to provision of "Prefer not to answer" or missing responses resulting in inability to compute a total score for the measure. Out of valid responses, the PHQ-9 revealed an excellent internal consistency estimate (Cronbach's α = 0.91).

Cognitive Tasks.

Reading the Mind in the Eyes Task (RMET; Baron-Cohen et al., 1997, 2001). The RMET is a measure that presents a series of 36 black-and-white photographs of portions of the face including and immediately surrounding the eyes and eyebrow regions. This task was used to assess participants' abilities to accurately perceive and identify facial expressions in the absence of attentional control processes (Baron-Cohen et al., 1997, 2001; Numenmaa, 1964). Participants are instructed to select from a set of 4 options (i.e., 1 correct option and 3 distractor options) the appropriate emotion conveyed by the eyes in the photograph (i.e., "For each set of eyes, choose and circle which word best describes what the person in the picture is thinking or feeling"). Participants also are provided with a glossary which contains definitions of response options. Total scores range from 0 to 36, with higher scores reflecting more accurate identification of facial expressions. Emotional valence subscores also may be calculated to provide an index of abilities to accurately identify faces presenting with positive (items 1, 6, 16, 20, 21, 25, 30, 31), negative (items 2, 5, 11, 14, 17, 23, 27, 34, 35, 36), and neutral (items 3, 4, 7, 8, 9, 10, 12, 13, 15, 18, 19, 24, 28, 29, 32, 33) emotions (Harkness et al., 2005). The RMET has been used to distinguish general and clinical, neurodevelopmental populations (Baron-Cohen et al., 1997, 2001; Holt et al., 2014; Moor et al., 2012) and more recently has been used to assess emotion processing deficits in populations with mood and anxiety disorders (Washburn et al., 2016). Although the RMET was originally developed for in-person administration by trained study personal, the RMET was administered online in the current study due to inabilities to administer study materials in-person during the COVID-19 pandemic.

Emotion Processing Tasks.

Modified Dot-Probe Task (MDP; adapted from Grafton & MacLeod, 2016; Rodgers et al., 2020; Rudaisky et al., 2014; See Figures 1 and 2). A modified version of a traditional dot-probe paradigm (MDP) was used to assess the extent to which participants demonstrate biases in how they engage and disengage with stimuli that reflect emotionally-salient facial expressions. Facial stimuli were selected from black-and-white versions of stimuli in the Radboud Faces Database (Lagner et al., 2010). The Radboud Faces Database is comprised of a set of 67 models each displaying 8 different emotional expressions. For the present study, a set of 32 Caucasian adult male and female pairs of angry and neutral facial stimuli were randomly selected from the database for use in the MDP. All images were scaled to a size of 6cm by 8cm for use within the task. The MDP was programmed using PsychoPy3 version 2020.2.10 and was administered online using the PsychoPy Pavlovia online research task platform. Participants completed this task on their personal computers via an online browser and provided their responses via personal computer keyboards.

Participants were instructed to respond as fast as they could to stimuli that appeared on the screen using the ‘f’ and ‘j’ keys on their keyboards. Participants were first presented with two white outlines of vertical 6cm by 8cm rectangles on the right and left side of their computer screen against a black background that were positioned 16cm apart from the middle of the rectangles. These rectangles also contained a small red square (1.5cm by 1.5cm) that appeared in the middle of one of the rectangles. The rectangle (i.e., right or left) within which the square appeared was programmed to be random. After the rectangles and red square appeared on the screen for a period of 1000ms, a 0.5cm red line (i.e., anchor) appeared within the red square. Participants were instructed to focus their attention on and remember the orientation (i.e., either horizontal or vertical) of the anchor, which also was programmed to be random. The anchor remained on the screen for 150ms. After the anchor disappeared, images of two faces appeared within each of the white rectangles. These faces were comprised of pairs of neutral and angry facial expressions displayed by the same model. The faces remained on the screen for an additional 500ms and then were replaced by a second red line (i.e., target) that appeared either within either the right or left rectangle on the screen. When this target line appeared, participants were instructed to indicate using their keyboard whether the orientation of the line was identical to or different from the original anchor. Participants selected the 'f' key to indicate if the orientation of the lines were a match, and the 'j' key to indicate if the orientation of the lines were a mismatch. Each trial was separated by a 1000ms interstimulus interval. All participants completed a block of 16 practice trials after reading task instructions. During the practice block, participants were provided with accuracy feedback. Following the practice block, participants completed 4 blocks of 32 trials for a total of 128 trials.

Notably, this task aims to assess whether angry facial stimuli utilize attentional resources that compete with attention on task demands. Trials in which the anchor probe appeared in the same location as an angry facial image assess attentional disengagement. Trials in which the anchor probe appeared in the same location as a neutral facial image assess attentional engagement. Moreover, metrics of attentional re-allocation also were provided within reaction times to shift and sustain focus in the areas of angry and neutral facial images based on the location of the target probe. More specifically, within disengagement trials, attentional shifting was represented through target probes presented in the same location as the neutral facial images and sustaining attentional focus was represented through target probes presented in the same location as the angry facial images. Within engagement trials, attentional shifting was represented through target probes presented in the same location as the angry facial images whereas sustaining attentional focus was represented through target probes presented in the same location as the neutral facial images.

Figure 1
Sample Presentation Sequences for Attentional Engagement Match Trials in Modified Dot-Probe Task

Note. The top sequence provides an example of an engagement trial in which participants shift attention from anchor probe and neutral facial expression to negative facial expression to identify target. The bottom sequence provides an example of an engagement trial in which participants sustain focus on anchor probe and neutral facial expression to identify target.

Figure 2
Sample Presentation Sequences for Attentional Disengagement Match Trials in Modified Dot-Probe Task

Note. The top sequence provides an example of a disengagement trial in which participants sustain focus on anchor probe and angry facial expressions to identify target. The bottom sequence provides an example of a disengagement trial in which participants shift attention from anchor probe and angry facial expression to neutral facial expression to identify target.

Social Exclusion Tasks.

Cyberball (Williams et al., 2000; Williams & Jarvis, 2006). Cyberball is a computer-based behavioral task designed to simulate the effects of social ostracism. In Cyberball, participants are informed that they will play an online ball-tossing game with two other individuals. Participants also are told that the purpose of the task is to practice mental visualization of physically tossing a ball to other players in real life. Within the game, however, the other individuals are computer-generated players with pre-programmed ball-tossing patterns. The Cyberball display includes 2 avatars representing the participant and two additional players to whom the participant can virtually toss the ball. Cyberball includes two conditions that are dependent upon different ball-tossing patterns. The inclusion condition is programmed such that each individual (the participant and two computer-generated avatars) is thrown the ball an equal number of times for the duration of the game (i.e., approximately 30 tosses or 5 minutes). The exclusion condition is programmed such that the two computer-generated avatars toss the ball to the participant a single time each and spend the remainder of the game tossing the ball to each other. For the present study, 29 participants completed the Cyberball task. Each of these participants completed a counterbalanced order of the inclusion and exclusion versions of Cyberball followed by the MDP.

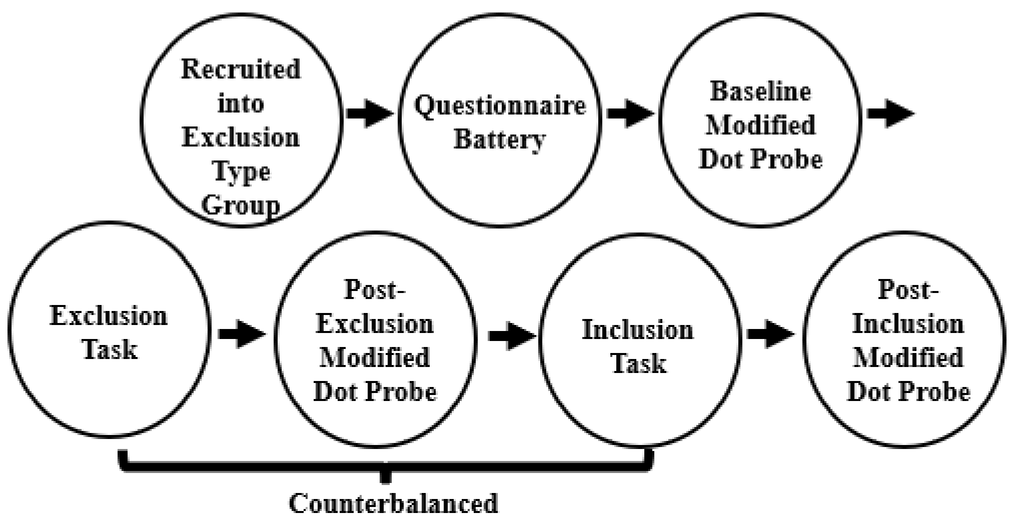
In accordance with the validated Cyberball paradigm procedures, participants answered a series of questions related to the Cyberball task immediately following completion of each Cyberball task. Aligning with checks utilized previously within the Cyberball task (e.g., Williams et al., 2002), these statements included: 1) I was ignored; 2) I was excluded; and 3) Assuming that 33% of the time you would receive the ball if everyone received it equally, what percent of throws did you receive? The first two items were rated on a Likert scale ranging from 1 (i.e., "strongly disagree") to 5 (i.e., "strongly agree"). The final item was an open-text response for participants to enter their subjective percentage ratings from 0% to 100%. Participants also completed the Need Threat Scale (NTS; Jamieson et al., 2010; Williams, 2009) and the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The NTS is a 20-item questionnaire that evaluates different factors associated with social dynamics and the need to belong, and was designed as a manipulation check to assess feelings of ostracism within Cyberball. Thus, this questionnaire was completed immediately following the Cyberball task. Items are rated on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*extremely*). Items 1, 2, 3, 9, 11, 12, 13, 19, and 20 are reverse scored. All items are divided across 4 subscales of Belonging, Self-Esteem, Meaningful Existence, and Control, with higher scores reflective of greater levels of the construct for which the scale was named. The PANAS is a 20-item scale that assess the extent to which respondents experience positive and negative state emotions with varying intensities. Items are rated on a 5-point Likert scale ranging from "Very slightly or not at all" to "Extremely."

Written Feedback Task (adapted from Lipton et al., 2020; Thomas et al., 2017). The WFT is a writing-based task that was adapted for the present study to simulate the effects of explicit rejection in an online setting. Lipton and colleagues (2020) designed a similar performance-based task in which participants were instructed to give a 5-minute impromptu speech on topics that were not personally-focused, such as "What are the qualities of a good United States President?" Moreover, participants were falsely informed that others would be watching their speech through a camera and subsequently received pre-programmed positive and negative feedback regarding their performance on their speech (Lipton et al., 2020). They found that such a task elicits self-reported arousal as well as distinct fears of evaluation (Lipton et al., 2020). In the present study, participants were asked to complete a writing task in which they are presented with neutral prompt and given a period of 5 minutes to complete a written response to the prompt. Neutral prompts that were personally-focused were utilized to highlight centrality of the rejection-based feedback directly to the participant's intrinsic desires as well as written performance. Following completion of the prompts, participants are presented with a waiting screen for a period of 30 seconds in which they were told that they would receive feedback on their response from other participants. However, all feedback was pre-programmed to be consistent across all participants. Different versions of the WFT were programmed based on writing prompt and the type of pre-programmed feedback that was presented to participants. Neutral writing prompts that were presented to participants included "For 5 minutes, please write a detailed description of your dream vacation" and "For 5 minutes, please write a detailed description of your dream job." Feedback that was presented to participants was either positive (i.e., "Your response was well-prepared!" and "That sounds like an interesting dream!") or negative (i.e., "Your response was not well-written" and "That description was not understandable"). These sets of positive and negative feedback were intended to represent explicit social inclusion and social exclusion, respectively, and participants received both types of feedback from presumably two other participants, similar to the Cyberball group. For the present study, 16 participants completed this task. Each of these participants completed a counterbalanced order of the writing prompt (i.e., dream vacation vs. dream job) and feedback type (i.e., positive vs. negative) followed by the MDP.

Procedure (see Figure 3)

All procedures were approved by the Institutional Review Board at Oklahoma State University. During the first phase of recruitment, undergraduate participants responded to SONA advertisements for participation in either the ostracism or rejection conditions. They were then presented with a link to their respective survey programmed within the Qualtrics platform. All questionnaires and study tasks were completed online. Following informed consent, participants completed a series of baseline questionnaires described above (i.e., demographics, SIAS, SPS, FPES, BFNE, RSQ, STBS, PSWQ, ACS, PHQ-9) as well as a computerized version of the RMET as an index of their baseline abilities to accurately identify a range of emotional expressions. Following completion of these tasks, participants then were directed to the Pavlovia platform to complete a baseline version of the MDP. Participants then returned to the Qualtrics platform to engage in the social exclusion task corresponding to their experimental grouping. Those who engaged in the ostracism condition completed both the inclusive and exclusive version of the Cyberball task using separate links to the Empirisoft Cyberball host platform outside of Qualtrics, and the order of the Cyberball versions was be counterbalanced across participants. Immediately after responding to manipulation checks associated with the Cyberball task, participants completed a second and third MDP. Those who engaged in the rejection condition competed both the inclusive and exclusive versions of the WFT within Qualtrics. The order of the writing prompt (i.e., dream vacation vs. dream job) and response feedback (i.e., positive vs. negative) was be counterbalanced. Immediately after receiving feedback, participants completed a second and third MDP. After completion of all tasks, participants were be debriefed and compensated with either SONA credit (for those recruited from OSU through the SONA system) or provided with links to voluntarily enter in a drawing to receive one of ten, $20 Amazon gift cards (for those recruited outside of the OSU SONA system). Gift card compensation was provided following the data collection period.

Figure 3
Study Procedures and Design Flow



Data Preparation Procedures

Data were used from participants who provided valid responses to survey measures and MDP tasks. Data were prepared for analysis according to procedures delineated by Rodgers and colleagues (2020). Specifically, trials across the four blocks within each dot-probe task (i.e., at Baseline, Post-Inclusion, Post-Exclusion) were removed prior to analysis if the corresponded to: (1) inaccurate responding (e.g., the participant incorrectly selected a “match” response for a “mismatch” trial); (2) reaction times that were faster than 250ms, which is a conservative cut-off which suggests that participants responded more quickly than is able for purposeful and intentional responding; and (3) outlier reaction times that fell outside of 1.96 standard deviations from the participant's average reaction times for engagement and disengagement trials. Participants also were excluded from analyses if their total accuracy scores across trials within each dot-probe task was less than 85% accurate. Prior to preparation procedures, data from 128 trials across 57 participants each for Baseline, Post-Inclusion, and Post-Exclusion were collected (i.e., 3,648 respective engagement and disengagement trials out of a total of 7,296 trials). For engagement trials, 6.8% of total engagement trials were excluded from analyses at Baseline (120 trials were inaccurate, 0 trials reflected reaction times <250 ms, and 128 trials reflected outlier reaction times), 6.0% of total engagement trials were excluded at Post-Inclusion (93 trials were inaccurate, 0 trials reflected reaction times <250 ms, and 127 trials reflected outlier reaction times), and 6.6% of engagement total trials were excluded at Post-Exclusion (107 were inaccurate, 0 trials reflected reaction times <250 ms, and 134 trials reflected outlier reaction times). For disengagement trials, 6.6% of total disengagement trials were excluded from analyses at Baseline (126 trials were inaccurate, 1 trial reflected a reaction time <250 ms, and 114 trials reflected outlier reaction times), 6.5% of total disengagement trials were excluded at Post-Inclusion (111 trials were inaccurate, 0 trials reflected reaction times <250 ms, and 127 trials reflected outlier reaction times), and 6.5% of total disengagement trials were excluded at Post-Exclusion (111 were inaccurate, 0 trials reflected reaction times <250 ms, and 126 trials reflected outlier reaction times). Taken together, 5,871 trials (i.e., 2939 engagement trials and 2932 disengagement trials) from 45 participants comprised the final analytic sample.

Analytic Strategy

The present study utilized a mixed factorial design with between-subject factors of SA (Low SA concerns, High SA concerns) and Exclusion Type (Ostracism, Rejection), and a within-subject factor of Time (Baseline, Post-Inclusion, Post-Exclusion). As a result, these factors were assessed on multiple behavioral outcomes, including accuracy, reaction time, and attention bias indices on the MDP, using a series of mixed-model ANOVAs. Additional descriptive analyses (e.g., frequencies, bivariate correlations, *t*-Tests, ANOVAs) were conducted to assess differences in demographics and facets of SA (e.g., social interactions, social performance, safety behaviors, etc.), as well as psychopathology and symptomatology that are comorbid with SA (e.g., depression, worry, attentional deficits) between groups. In line with Field (2009), data were assessed for assumptions of normality, homogeneity of variance, and sphericity. Normality was assessed through skewness and kurtosis metrics. Homogeneity of variance across groups was assessed using an F_{max} test. Sphericity was assessed using Mauchly's test and Hyunh-Feldt or Greenhouse-Geisser corrections were used accordingly (Field, 2009; Girden, 1992). Significant interaction effects were probed using post-hoc dependent samples *t*-tests using Bonferroni corrected α criteria to assess for differences between model factors.

CHAPTER IV

FINDINGS

Manipulation Checks

Manipulation checks were completed within the Ostracism group consistent with Cyberball administration procedures (e.g., Williams et al., 2009). More specifically, responses on the three manipulation check items following completion of each version of the Cyberball task (i.e., agreement regarding the extent to which participants felt ignored, felt excluded, and the percentage of throws on which they received the ball), as well as responses on the NTS and PANAS were analyzed (see Table 2). Following the completion of the inclusion version of Cyberball, the majority of participants (i.e., 72.4% and 78.3%, respectively) within the Ostracism group responded that they "Disagreed" or "Strongly Disagreed" that they were ignored and excluded, and 37.9% responded that they received the ball at least 33% of the time during the task. Following completion of the exclusion version of Cyberball, the majority of participants (i.e., 89.7% and 93.1%, respectively) within the Ostracism group responded that they "Agreed" or "Strongly Agreed" that they were ignored and excluded, and 86.2% responded that they received the ball less than 33% of the time during the task. Moreover, paired-samples *t*-tests indicated that participants responded with significantly higher average scores on the NTS ($t(27)=6.91$, $p<.001$) and the positive subscale of the PANAS ($t(28)=4.59$, $p<.001$), as well as significantly lower average scores on the negative subscale of the PANAS ($t(28)=-3.27$, $p<.01$) following the inclusion version of Cyberball relative to the exclusion version.

No additional manipulation checks were administered for those within the Rejection group over and above a series of response validity questions administered at the end of the study due to lack of established manipulation check measures.

Table 2. *Descriptive Statistics for Manipulation Checks Presented within the Ostracism Group*

	Post-Inclusion		Post-Exclusion	
	N	%	N	%
"I was ignored"				
Strongly Agree	1	3.40%	19	65.50%
Agree	4	13.80%	7	24.10%
Neither Agree nor Disagree	3	10.30%	1	3.40%
Disagree	14	48.30%	0	0.00%
Strongly Disagree	7	24.10%	2	6.90%
"I was excluded"				
Strongly Agree	1	3.40%	20	69.00%
Agree	4	13.80%	7	24.10%
Neither Agree nor Disagree	1	3.40%	0	0.00%
Disagree	15	51.70%	0	0.00%
Strongly Disagree	8	27.60%	2	6.90%
"What percent of throws did you receive?				
≥33% of throws	11	37.93%	4	13.79%
<33% of throws	18	62.07%	25	86.21%
	M(SD)	Range	*M(SD)*	Range
NTS	16.79 (5.19)	5.00-24.50	9.37 (3.98)	5.00-18.25
PANAS – Positive	23.28 (11.04)	10.00-50.00	15.03 (6.66)	10.00-38.00
PANAS - Negative	14.97 (6.41)	10.00-36.00	18.45 (8.82)	10.00-46.00

Note. NTS = Need Threat Scale; PANAS = Positive and Negative Affect Schedule.

Descriptive Analyses

Bivariate correlational analyses were conducted to assess relationships between facets of SA (e.g., social interactions, social performance, safety behaviors, etc.), as well as psychopathology and symptomatology that are comorbid with SA (e.g., depression, worry, attentional deficits). More specifically, associations between total scores on the SIAS, SPS, STBS, BFNE, FPES, RSQ, PHQ-9, PSWQ, ACS, and RMET were computed and demonstrated to largely have low-to-moderate strength associations (see Table 3).

Table 3. *Bivariate Correlations Between Facets of Social Anxiety and Comorbid Psychopathology*

Variables	SIAS	SPS	STBS	BFNE	FPES	RSQ	PHQ-9	PSWQ	ACS	RMET
Mean	38.09	28.84	27.14	43.51	35.63	10.22	8.09	62.34	50.16	28.95
SD	15.24	6.55	9.99	10.27	17.81	4.25	17.81	65.50	8.23	3.10
SIAS	--									
SPS	.78***	--								
STBS	.67**	.62**	--							
BFNE	.47**	.66***	.50*	--						
FPES	.61***	.59***	.08	.22	--					
RSQ	.53***	.50**	.46*	.48**	.41**	--				
PHQ-9	.60***	.77***	.28	.56***	.42**	.55***	--			
PSWQ	.57***	.54***	.60**	.63***	.26	.54***	.54***	--		
ACS	-.52***	-.44**	-.51*	-.42**	-.35*	-.42**	-.36*	-.51***	--	
RMET	-.14	-.17	.06	-.06	-.08	.07	-.29	.23	.10	--

Note. $^{*}p<.05$. $^{**}p<.01$. $^{***}p<.001$. SIAS = Social Interaction Anxiety Scale. SPS = Social Phobia Scale. STBS = Social Thoughts and Behaviors Scale. BFNE = Brief Fear of Negative Evaluation Scale. FPES = Fear of Positive Evaluation Scale. RSQ = Rejection Sensitivity Questionnaire. PHQ-9 = Patient Health Questionnaire – 9 Item. PSWQ = Penn State Worry Questionnaire. ACS = Attentional Control Scale. RMET = Reading the Mind in the Eyes Task.

A series of independent samples *t*-tests also were performed to identify differences in the above characteristics between experimental manipulation groups. However, results revealed that there were no significant differences in these variables between the Ostracism and Rejection groups when using Bonferroni alpha corrections for multiple comparisons (i.e., .05/9 tests = .006).

Primary Aims and Behavioral Data

Accuracy

To assess the extent to which experimentally-manipulated exclusion conditions impacted abilities to correctly respond to MDP task demands (i.e., indicating a match or a mismatch between the orientation of the anchor probe and the target probe), a 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) mixed-model ANOVA was computed. SA was included as a continuous covariate using SIAS scores within this analysis to address low subsample size for participants providing responses for high and low levels of SA using an extreme groups approach, as stated above.

Assumptions of normality, as well as homogeneity of variance and sphericity were assessed. Accuracy data across all time points were revealed to be within appropriate ranges for skewness (i.e., -1.65, -1.56, and -1.42 for Baseline, Post-Inclusion, and Post-Inclusion, respectively) based on established thresholds (i.e., less than the absolute value of 2; Tabachnick & Fidell, 2007). However, accuracy data at Baseline and Post-Exclusion only were revealed to be within appropriate ranges for kurtosis (i.e., 3.73 and 1.71, respectively) whereas accuracy data at Post-Inclusion were revealed to be outside of appropriate ranges (i.e., 4.49) of less than the absolute value of 4 (Tabachnick & Fidell, 2007). Levene's Test of Equality of Error Variances indicated that there were significant differences in error variances only in post-inclusion accuracy data. Mauchly's Test of Sphericity was not significant, suggesting that this assumption was not violated.

No significant main effects or interactions were observed across any factors with respect to accuracy information. Results from statistical analyses are provided in Table 4.

Table 4. *Mixed-Model ANOVA Effects of Social Anxiety, Exclusion Type, and Time on Accuracy*

	F	*df*	*p*	Partial Eta Squared
SA	1.81	1	.186	.008
Exclusion Type	0.32	1	.576	.042
Time	0.05	2	.955	.001
Time * SA	0.27	2	.763	.007
Time*Exclusion Type	1.02	2	.364	.024
SA*Exclusion Type	0.03	1	.872	.001
SA*Exclusion Type*Time	1.09	2	.342	.026

Note. SA = Social Anxiety.

Reaction Times

To assess the extent to which experimentally-manipulated exclusion conditions impacted the rate at which participants responded to MDP task demands (i.e., indicating a match or mismatch between the orientation of the anchor probe and the target probe), a 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 4 (Attentional Bias: Disengagement Shifting, Disengagement Focusing, Engagement Shifting, Engagement Focusing) mixed-model ANOVA was computed. Like accuracy analyses, SA was included as a continuous covariate using SIAS scores.

Assumptions of normality, as well as homogeneity of variance and sphericity were assessed. Reaction time data for each level of Time and Attentional Bias were revealed to be within appropriate ranges for skewness based on established thresholds (i.e., less than the absolute value of 2; Tabachnick & Fidell, 2007). All reaction time data for each level of Time and Attentional Bias also were within acceptable ranges for kurtosis (i.e., less than the absolute value of 4; Tabachnick & Fidell, 2007) with the exceptions of post-inclusion disengagement shifting trials (i.e., kurtosis of 4.21) and post-inclusion engagement shifting trials (i.e., kurtosis of 4.62). Levene's Test for Equality of Error Variances indicated that there were significant differences in error variances for all levels of Attentional Bias at Baseline and at Post-Exclusion. Mauchly's Test of Sphericity was non-significant for the factor of Time. However, Mauchly's Test of Sphericity was significant ($p<.001$) for both the factor of Attentional Bias (ϵ = .37) and interaction of Time and Attentional Bias (ϵ = .23). Thus, the Greenhouse-Geisser correction was used to assess for effects on these factors (Girden, 1992).

A significant main effect of Time was observed such that reaction times at Baseline (M = 0.730) were significantly slower than reaction times at either Post-Inclusion (M = 0.660) or Post-Exclusion (M = 0.658), $F(2,84) = 5.36$, $p < .01$, $\eta_p^2 = .113$. No other significant main effects or interactions were observed. Results from statistical analyses are provided in Table 5.

Table 5. *Mixed-Model ANOVA Effects of Social Anxiety, Exclusion Type, Time, and Attentional Bias on Reaction Times*

	F	*df*	*p*	Partial Eta Squared
SA	0.06	1	.813	.001
Exclusion Type	0.01	1	.911	.000
Time	5.36	2	.006	.113
Attentional Bias*	1.12	1.81	.327	.026
SA x Time	0.24	2	.787	.006
SA x Attentional Bias*	0.20	1.81	.798	.005
Exclusion Type x Time	1.46	2	.238	.034
Exclusion Type x Attentional Bias*	1.09	1.81	.337	.025
Time x Attentional Bias*	0.27	3.91	.893	.006
SA x Time x Attentional Bias*	0.51	3.91	.726	.012
Exclusion Type x Time x Attentional Bias*	0.67	3.91	.610	.016

Note. SA = Social Anxiety. *Greenhouse-Geyser corrections applied.

Exploratory Analyses and Behavioral Data

Several exploratory analyses were conducted to parse apart potential mechanisms underlying the lack of proposed effects between experimental groups over time.

Accuracy

Log-Transformed Accuracy Indices. A log-transformation was applied to the total accuracy scores of each participant at Baseline, Post-Inclusion, and Post-Exclusion to correct for non-normally-distributed scores within the sample. After logarithmic corrections, a 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) mixed-model ANOVA using SA as a continuous covariate was re-analyzed. However, no significant main effects or interactions emerged.

Median-Split SA Symptoms. Groups of “High” and “Low” levels of SA were created based on median-split procedures (See DeCoster et al., 2011; Iacobucci et al., 2015). A median-split (Median = 41.00) of total SIAS scores was used to form high (*N* = 23; 51.1%) and low (*N* = 22; 48.9%) SA groups. Although this procedure may have resulted in a loss of statistical power due to categorization of a continuous measurement, a median-split procedure was selected in order to create equal groups of SA symptoms given that levels of SA differed between the groups of experimental manipulations. A 2 (SA Group: HSA, LSA) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) mixed-model ANOVA was computed for a. total accuracy scores. No significant main effects or interactions were revealed.

Elevated vs. Subthreshold SA Symptoms. Separate groups of “Elevated” and “Subthreshold” levels of SA were created based on average scores reported within the clinical sample collected during the development of the SIAS measure (Mattick & Clarke, 1998). More specifically, “Elevated” SA scores are reflected by total scores greater than or equal to 34.6 (N = 27, 60.0%), and “Subthreshold” SA scores are reflected by total scores less than 34.6 (N = 18, 40.0%). A 2 (SA Group: Elevated, Subthreshold) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) mixed-model ANOVA was computed for total accuracy scores. No significant main effects or interactions were revealed.

Removal of SA Symptoms. To clarify the role that reported SA symptoms may play in obscuring potential differences in accuracy measures dependent upon the manipulation, a separate 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) mixed-model ANOVA was computed for total accuracy scores. However, no significant main effects or interactions emerged.

Reaction Times

Log-Transformed Attentional Bias Indices. A log-transformation was applied to the mean reaction times for each set of attentional engagement and disengagement trials of each participant at Baseline, Post-Inclusion, and Post-Exclusion to correct for non-normally-distributed scores within the sample. After logarithmic corrections, a 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 4 (Attentional Bias: Disengagement Shifting, Disengagement Focusing, Engagement Shifting, Engagement Focusing) mixed-model ANOVA using continuous SA scores as a covariate was re-analyzed. A main effect of time remained such that log-transformed reaction times at Baseline (M = -0.143) were significantly less negative than log-transformed reaction times at either Post-Inclusion (M = -

0.187) or Post-Exclusion (*M* = -0.188), $F(2,84) = 5.75$, $p < .01$, $\eta_p^2 = .120$. However, no additional significant main effects or interactions emerged.

Median-Split SA Symptoms. Using the same procedures as stated above, HSA and LSA groups were created based on a median-split procedure using total SIAS scores (See DeCoster et al., 2011; Iacobucci et al., 2015). A 2 (SA Group: HSA, LSA) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 4 (Attentional Bias: Disengagement Shifting, Disengagement Focusing, Engagement Shifting, Engagement Focusing) mixed-model ANOVA on reaction times was analyzed. Greenhouse-Geyser corrections were used for the Attentional Bias factor. Results revealed a main effect of Time such that reaction times at Baseline (*M* = 0.728) were significantly slower than at either Post-Inclusion (*M* = 0.658) or Post-Exclusion (*M* = 0.653), $F(2,82) = 28.67$, $p < .001$, $\eta_p^2 = .412$. Moreover, a main effect of Attentional Bias emerged such that reaction times toward Engagement Shifting trials (*M* = 0.663) were faster than Disengagement Shifting trials (*M* = 0.676), Disengagement Focusing trials (*M* = 0.692), and Engagement Focusing trials (*M* = 0.690), $F(1.81, 74.34) = 9.85$, $p < .001$, $\eta_p^2 = .194$. No additional significant main effects or interactions were demonstrated.

Elevated vs. Subthreshold SA Symptoms. Using the same procedures as listed above, Elevated and Subthreshold SA groups were created based on average scores reported by the clinical sample recruited during the development of the SIAS (Mattick & Clarke, 1998). A 2 (SA Group: Elevated, Subthreshold) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 4 (Attentional Bias: Disengagement Shifting, Disengagement Focusing, Engagement Shifting, Engagement Focusing) mixed-model ANOVA on reaction times was analyzed. Greenhouse-Geyser corrections were used for the Attentional Bias factor. Results revealed a main effect of Time such that reaction times at Baseline (*M* = 0.742) were significantly slower than at either Post-Inclusion (*M* = 0.671) or Post-Exclusion (*M* = 0.658), $F(2,82) = 23.43$, $p < .001$, $\eta_p^2 = .364$. Moreover, a main effect of Attentional Bias emerged such that reaction times toward Engagement Shifting trials (*M* = 0.670) were faster than

Disengagement Shifting trials (M = 0.687), Disengagement Focusing trials (M = 0.704), and Engagement Focusing trials (M = 0.699), $F(1.79, 73.47) = 9.85$, $p < .01$, $\eta_p^2 = .169$. No additional significant main effects or interactions were demonstrated.

Removal of SA Symptoms. To clarify the role that reported SA symptoms may play in obscuring potential differences in reaction times dependent upon the manipulation, a separate 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 4 (Attentional Bias: Disengagement Shifting, Disengagement Focusing, Engagement Shifting, Engagement Focusing) mixed-model ANOVA was computed for average reaction times. Greenhouse-Geyser corrections were applied for the Attentional Bias factor. Like previous exploratory analyses, main effects of Time and Attentional Bias were demonstrated. With respect to Time, reaction times at Baseline (M = 0.729) were significantly slower than reaction times at Post-Inclusion (M = 0.660) and Post-Exclusion (M = .658), $F(2,86) = 34.58$, $p<.001$, $\eta_p^2 = .446$. With respect to Attentional Bias, reaction times to respond on Engagement Shifting trials (M = 0.666) were significantly faster than Engagement Focusing trials (M = 0.693) and Disengagement Focusing trials (M = 0.693), $F(1.82, 74.14) = 10.87$, $p < .001$, $\eta_p^2 = .202$.

Collapsing Attentional Bias Indices. In accordance with Grafton and Macleod (2016), attentional bias indices were calculated to determine if differences in reaction times were dependent on attentional engagement and disengagement broadly. An Attentional Engagement Bias Index (AEBI) was calculated such that, for attentional engagement trials (i.e., those in which the anchor probe initially directed attention to the location of neutral facial stimuli), a difference score was attained by subtracting average reaction times for trials in which the target probe was in the location of the angry facial stimuli (i.e., Engagement Shifting trials) from those in which the target probe was in the location of the neutral facial stimuli (i.e., Engagement Focusing trials). An Attentional Disengagement Index (ADBI) was calculated such that, for attentional disengagement trials (i.e., those in which the anchor probe initially directed attention to the location of the angry facial stimuli), a difference score was attained by subtracting average reaction times for trials in which the target probe was in the location of the angry facial stimuli (i.e., Disengagement Focusing trials) from those in which the target probe was in the location of the neutral facial stimuli (i.e., Disengagement Shifting trials). These attentional bias index reaction times were then subjected to separate mixed-model ANOVAs based on the above analyses (i.e., continuous SA scores, median-split, elevated-subthreshold SA concerns, and removal of SA concerns).

A 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 2 (Bias Index: AEBI, ADBI) mixed-model ANOVA with total SA scores as a continuous covariate was performed. No main significant effects or interactions emerged.

A 2 (SA Group: HSA, LSA) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 2 (Bias Index: AEBI, ADBI) mixed-model ANOVA was performed using median SIAS scores to create SA Groups. Greenhouse-Geyser corrections were applied. A main effect of Bias Index, as well as a Time by Bias Index interaction were observed. With respect to Bias Index, index values were greater for the AEBI (M = 0.02) relative to the ADBI (M = -0.02), $F(1,41) = 9.94$, $p < .01$, $\eta_p^2 = .195$. With respect to Time by Bias Index, for AEBI trials, there were greater index values between Baseline (M = 0.04) and Post-Inclusion (M = 0.018) as well as Post-Exclusion (M = 0.018), $F(1.51, 62.02) = 4.92$, $p < .05$, $\eta_p^2 = .107$.

A 2 (SA Group: Elevated, Subthreshold) by 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 2 (Bias Index: AEBI, ADBI) mixed-model ANOVA was performed using clinical thresholds on the SIAS to create SA Groups. A main effect of Bias Index was revealed such that there were greater index values on average for the AEBI (M = 0.023) relative to the ADBI (M = -0.017), $F(1,41) = 6.79$, $p < .05$, $\eta_p^2 = .142$.

Finally, a 2 (Exclusion Type: Ostracism, Rejection) by 3 (Time: Baseline, Post-Inclusion, Post-Exclusion) by 2 (Bias Index: AEBI, ADBI) mixed-model ANOVA was performed without the inclusion of SA symptoms. Greenhouse-Geyser corrections were applied. A main effect of Bias Index was demonstrated such that there were greater index values for the AEBI (M = .024) relative to the ADBI (M = -0.015), $F(1, 43) = 11.99$, $p = .001$, $\eta_p^2 = .218$. Moreover, a Time by

Bias Index interaction emerged such that, for the ADBI, index values were greater at Post-Exclusion (*M* = -0.009) relative to Baseline (*M* = -0.023) and, for the AEBI, index values were greater at Baseline (*M* = 0.035) relative to Post-Inclusion (*M* = 0.019) and Post-Exclusion (*M* = 0.019), $F(1.52, 65.52) = 5.20$, $p < .05$, $\eta_p^2 = .108$.

CHAPTER V

CONCLUSION

Main Findings

The goal of this study was to investigate the differential impacts of varied forms of social exclusion (i.e., Ostracism and Rejection) on behavioral indicators of attention (i.e., accuracy and reaction time) toward emotionally-salient social cues (i.e., angry and neutral facial expressions) in individuals with and without social anxiety (SA) concerns. More broadly, this work aimed to expand upon existing literature regarding interpersonal factors and attentional mechanisms maintaining SA. To achieve these ends, participants were recruited to engage in either an Ostracism-based interaction task (i.e., Cyberball; Williams & Jarvis, 2009) or a Rejection-based interaction task (i.e., Written Feedback Task; adapted from Lipton et al., 2020). As well as to complete a series of pre- and post-interaction task modified dot-probe paradigms. Outcomes from these modified dot-probe paradigms provided information regarding the extent to which participants accurately and quickly responded to task demands when attention was either sustained or shifted to different locations on the screen following influence of seeing angry or neutral facial expressions. Based on previous research, it was hypothesized that (1) no differences would be expected in accuracy of performance between levels of SA, (2) no differences would be expected in accuracy of performance between different forms of social exclusion, (3) overall participants would demonstrate faster reaction times to identify targets following angry relative to neutral facial expressions, though this effect would be intensified for those with higher levels of

SA relative to those with lower levels, (4) those with higher levels of SA would demonstrate rapid engagement and disengagement with angry facial expressions, and (5) those with higher levels of SA who have been ostracized will demonstrate more rapid reaction times relative to those who have been rejected.

Results of the manipulation and validity checks indicated that individuals largely engaged with the tasks and, for those who participated in Cyberball, broadly felt more ignored and excluded following the Exclusion version of the task relative to the Inclusion version. Results from descriptive analyses revealed that participants on average may experience a variety of symptoms related to differing levels of SA (e.g., general SA, interaction-specific SA, social thoughts, specific evaluative fears, etc.) as well as comorbid psychopathology (e.g., depression). Importantly, there were no differences in these factors between experimental manipulation groups, suggesting that the individuals in each group may be influenced by psychopathology and general attentional factors, which may have downstream impacts on responses to social exclusion and engagement with attention-based tasks, to similar extents.

With regard to primary aims, several hypotheses were supported by obtained results. Statistical analyses regarding accuracy scores discerned no significant differences with regard to level of SA, Exclusion Type or Time. This is consistent with existing literature suggesting that these factors may not have an influence on overt effectiveness of completion of task demands (e.g., Grafton & Macleod, 2016). However, some hypotheses also were not supported by collected data. Notably, main effects largely only emerged for the factor of Time across proposed analyses, though some exploratory analyses suggested that main effects of Attentional Bias also existed. More specifically, analyses revealed that reaction times to all types of attentional trials were slower during the Baseline dot-probe relative to both the Post-Inclusion and Post-Exclusion dot-probes. Further, there were no significant differences in reaction times between the Post-Inclusion and Post-Exclusion dot-probes. These are inconsistent with existing work suggesting that SA concerns and socially-salient cues may interact to impact the efficiency with which individuals may complete task demands (e.g., Beard & Amir, 2010; Gilboa-Schechtman et al., 1999; Heuer et al., 2007). As a result, a likely explanation underlying the results of the present study may involve practice effects in completion of the task across the different time points.

With regard to exploratory main effects of Attentional Bias, results broadly suggested that participants responded more quickly on Engagement Shifting Trials relative to the other forms of Attentional Bias Trials (i.e., Engagement Focusing, Disengagement Shifting, and Disengagement Focusing). Given that Engagement Shifting trials assessed reaction time to respond to target probes that were presented on the side of the screen pertaining to an image of an angry facial expression following an anchor probe that was presented on the side of the screen pertaining to an image of a neutral facial expression, this may indicate that participants broadly were demonstrating rapid initial biases toward negative or threatening socially-salient stimuli. Some literature suggests that individuals with SA concerns demonstrate shorter attentional latencies toward negatively-valenced facial stimuli as well as subsequent prolonged latencies when shifting attention away from those stimuli (e.g., Bar-Haim et al., 2007; Eysenck et al., 2007; Grafton & Macleod, 2016; Weiser et al., 2009). Although there were no main effects of SA within the present analyses, these results may indicate that those with and without SA concerns in the present sample may demonstrate similar initial attentional biases toward negative facial stimuli. However, these results also may in part be due to the fact that the majority of the sample could be characterized as having “elevated” SA concerns based on total scores reported on the SIAS, and that those who reported “subthreshold” levels of SA may not necessarily be representative of community samples without such concerns. Similarly, computer and internet characteristics (e.g., keyboard press latency, internet browser, internet connection) were unable to be controlled, which also may culminate in errors in reaction time data collection, thereby influencing analyzed effects (Plant, 2016). Importantly, the electronic hardware utilized by participants may not have high enough temporal resolution to capture all attentional effects across time.

Similarly, some exploratory analyses utilizing collapsed Shifting and Focusing trials into broader Attentional Disengagement and Engagement Bias Indices (see Grafton & Macleod, 2016) suggested interaction effects between Time and Bias Index such that there were greater Engagement Bias indices relative to Disengagement Bias indices at Baseline relative to other time points. However, these results only were present when SA was included in the model. When SA concerns were omitted from the model, an interaction emerged such that Disengagement Bias indices were greater at Post-Exclusion relative to Baseline, as well as that Engagement Bias indices remained greater at Baseline relative to other time points. This may indicate that participants demonstrated faster responses to target probes in the same location of the negative facial images relative to those in the location of the neutral facial images on Disengagement trials presented following the Exclusion phase of the tasks relative to the baseline phase, and that they demonstrated faster responses to target probes presented in the same location of the negative facial images on Engagement trials presented at Baseline. In line with previous discussion, this also may further highlight that SA symptoms may obscure differences in attentional engagement and disengagement over time.

Interestingly, no main effects or interactions emerged with regard to manipulation group (i.e., Ostracism or Rejection). Previous research suggests that situations that are ambiguous as to if social exclusion has occurred tend to elicit negative cognitive and behavioral biases toward socially-relevant stimuli (e.g., Jones & Barnett, 2020; Williams, 2009). Previous work also suggests that rejection may impact attentional and perceptual biases (e.g., Berenson et al., 2009). Moreover, individuals may engage in different responses to social rejection relative to being ignored, which may suggest that distinctions between rejection and ostracism may tap into different interpersonal and cognitive processes (Freedman et al., 2016; Molden et al., 2009). Despite this, the present findings may indicate that, at least with respect to behavioral indicators of attention such as accuracy and reaction time, ostracism and rejection may culminate in the same effects on attention. However, additional research is needed to distinguish these impacts on additional facets of attention as well as other executive functions (e.g., memory for social interactions, self-imagery).

Taken together, the findings of this work may point toward that the specific operationalizations of ostracism and rejection utilized within the present methodologies may not differentially impact overt behavioral indicators of attention across differing levels of SA. However, future work should expand upon these results through the use of more robust social manipulations, examination of additional overt and covert indices of attention, and utilization of different tasks that elicit responses to socially-salient cues.

Limitations

Several study limitations warrant comment. First, data from a large number of participants were excluded both prior to and following data cleaning as responses were only included if they indicated that they provided valid responses on survey measures and the MDP as well as if they correctly responded on at least 85% of the MDP trials at each of the time points. Notably, additional descriptive analyses demonstrated that out of 332 participants who consented to participation and provided a response on at least one survey item, 258 participants completed the entire study and 68 provided complete MDP data at all three time points (i.e., at Baseline, Post-Inclusion, and Post-Exclusion). Moreover, out of these 68 participants, 11 indicated on a series of validity checks that they either did not read the instructions carefully prior to completing relevant items, that they did not answer all items honestly and accurately, that they answered items randomly without reading the items, that their responses are not an accurate reflection of their views, or that they did not believe the manipulation was genuine (e.g., “I don't know if this is a reason not to use my data, but I didn't think that anyone was actually reading and giving feedback on my responses to the writing prompts” and “If there were any reason it would be that the ‘other participants’ reading my answers were so obviously a lie to me that the ‘responses’ probably had no bearing on my cognition”). Data from 12 additional participants also were rejected through the data cleaning process (i.e., they responded with less than 85% accuracy on trials). As a result, the data provided here may not be an accurate reflection or representation of attentional biases in response to different facets of social exclusion as they occur within SA or general samples, thereby hindering generalizability. It is speculated that this may be due to a variety of reasons, such as that the study was conducted online such that research personnel could not control distractions in participants’ environments. Similarly, study materials took approximately 1 hour to complete and there were several repeated measures that some participants noted made it difficult for them to remain attentive throughout the course of the study. Recruitment and study procedures also were conducted during the COVID-19 pandemic from approximately March 2021 through early October 2021 following periods of reduced social activity whereby inclusion and exclusion may play a role, as well as potentially reduced distress and impairment stemming from anxiety within social contexts. Some recent research suggests that although young individuals (e.g., adolescents and young adults) may experience elevated anxiety concerns overall, individuals who report concerns related to home confinement and isolation also report decreased SA symptoms (e.g., Hawes et al., 2021). On the other hand, other work suggests that social distancing practices may maintain and potentially maintain or increase SA symptoms (e.g., Arad et al., 2021), which also may impact how individuals are responding to socially exclusive contexts. However, additional research is required to empirically document the stability and robustness of such speculations and effects.

Second, rejection and data processing procedures resulted in uneven data loss and subsample sizes between the Ostracism and Rejection groups. The final analytic sample for the Ostracism Group reflected data from 29 participants whereas the Rejection Group reflected data from only 16 participants. Accordingly, outcome measures within the Rejection Group may not be sufficiently powered to obtain valid results.

Third, the online manipulations that were utilized during the study may have been neither ecologically valid nor robust enough to attain hypothesized effects. For example, though existing research and the present work indicate that participants reported differences in feelings of being ignored, excluded, threatened by ostracism, and positive and negative affect, since the game was conducted online on participants' personal computers, it may not have been realistic to assume that they believed they were playing with other participants in real time. Moreover, given that there were no established manipulation checks suitable for online administration for the WFT, it is unclear if the participants truly felt included following receipt of positive feedback or rejected following receipt of negative feedback, or if they spent the full time engaging with the written prompts. Thus, it was difficult to control for if participants truly engaged in the manipulations in the way that they were intended.

Finally, the final analytic sample does not accurately reflect the full scope of individuals who experience SA concerns, which hinders generalizability of findings. The sample collected was overwhelmingly female and non-Hispanic White. Moreover, the average level of SA reported within the sample was indicative of potentially clinically-elevated levels based on scores on the SIAS reported by clinical samples (i.e., >34.6 points; Mattick & Clarke, 1998). Although prevalence rates of SAD are higher in individuals who identify as female, that the present sample was overwhelmingly female may have obscured the influence of SA symptoms and responses to exclusion that may be present in individuals who identify as male or who identify as non-binary or other gender identities. Similarly, the present data does not provide information regarding the SA-related concerns that individuals who have other marginalized backgrounds, who are from other global geographic regions, or who have different income statuses also may experience, which some literature suggests may differ from unmarginalized groups within the United States (e.g., Stein et al., 2017). Thus, the present results should only be applied on average to groups of individuals who have similar characteristics to the analytic sample.

Future Directions and Concluding Comments

The work presented here encourages future research to assess nuances in factors related to contexts of social exclusion to better understand the full scope of impairments that individuals with concerns pertaining to rejection and evaluation may experience. Although the current findings may suggest that, within the present sample, individuals may not demonstrate biases in efficient responding in the context of attentional engagement and disengagement toward angry and neutral facial stimuli depending on specific forms of exclusion or inclusion and SA symptoms, they may indicate broadly that behavioral indicators of attention are impacted by social interaction. Future studies may consider utilizing additional methodologies to further study these nuances, particularly those that may get at more covert, rapid responses to social exclusion (e.g., electroencephalography and event-related potential methodologies). Further, future work might aim to address other characteristics of social interactions that may impact evaluative concerns characteristic of SA, such as the degree of familiarity of an excluder to an individual (e.g., strangers vs. someone with whom an individual is already familiar) or utilizing in-vivo manipulations (e.g., ostracism-based conversation tasks, speech and feedback-based tasks, etc.). The present work extends previous literature regarding the settings in which SA concerns may impact responses to socially-salient interaction cues such as ostracism and rejection, and may be important for understanding cross-contextual impairments in SA that may serve as potential targets for research and treatment.

REFERENCES

Albright, L., & Malloy, T.E. (1999). Self-observation of social behavior and metaperception. *Journal of Personality and Social Psychology, 77*(4), 726-734. doi: 10.1037/0022-3514.77.4.726

Alden, L.E., & Taylor, C.T. (2004). Interpersonal processes in social phobia. *Clinical Psychology Review, 24*, 857-882. doi: 10.1016/j.cpr.2004.07.006

Alden, L.E., & Taylor, C.T. (2010). Interpersonal processes in social anxiety disorder. In J.G. Beck (Ed.), *Interpersonal Processes in the Anxiety Disorders: Implications for Understanding Psychopathology and Treatment* (125-152). Washington, DC: American Psychological Association.

Alfano, C.A., & Beidel, D.C. (2011). *Social anxiety in adolescents and young adults: Translating developmental science into practice.* Washington, DC: American Psychological Association.

Allen, J.J.B., Chambers, A.S., & Towers, D.N. (2007). The many metrics of cardiac chronotropy: A pragmatic primer and a brief comparison of metrics. *Biological Psychology, 75,* 243-262. doi: 10.1016/j.biopsycho.2006.08.005

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Amir, N., Foa, E.B., & Coles, M.E. (1998). Automatic activation and strategic avoidance of threat-relevant information in social phobia. *Journal of Abnormal Psychology*, *107*(2), 285-290.

Andreassi, J.L. (2007). Psychophysiology: Human behavior and physiological response. Mahwah, NJ: Lawrence Erlbaum Associates.

Arad, G., Shamai-Leshem, D., & Bar-Haim, Y. (2021). Social distancing during a COVID-19 lockdown contributes to the maintenance of social anxiety: A natural experiment. *Cognitive Therapy and Research, 45,* 708-714. doi: 10.1007/s10608-021-10231-7

Arlt, J., Yiu, A., Eneva, K., Dryman, M.T., Heimberg, R.G., & Chen, E.Y. (2016). Contributions of cognitive inflexibility to eating disorder and social anxiety symptoms. *Eating Behavior, 21*, 30-32. doi: 10.1016/j.eatbeh.2015.12.008

Baddeley, A. (2003). Working memory: Looking back and looking forward. *Nature Reviews Neuroscience, 4*, 829-839.

Baddeley, A. (2012). Working memory: Theories, models, and controversies. *Annual Review of Psychology, 63,* 1-29. doi: 10.1146/annurev-psych-120710-100422

Baker, C.A., Peterson, E., Pulos, S., & Kirkland, R.A. (2014). Eyes and IQ: A meta-analysis of the relationship between intelligence and "reading the mind in the eyes." *Intelligence, 44*, 78-92. doi: 10.1016/j.intell.2014.03.001

Bangee, M., Harris, R.A., Bridges, N., Roenberg, K.J. & Qualter, P. (2014). Loneliness and attention to social threat in young adults: Findings from an eye tracker study. *Personality and Individual Differences, 63*, 16-23. doi: 10.1016/j.paid.2014.01.039

Bar-Haim, Y., Lamy, D., Pergamin, L., Bakermans-Kranenburg, M.J., & van Ijzendoorn, M.H. (2007). Threat-related attentional bias in anxious and nonanxious individuals: A meta-analytic study. *Psychological Bulleting, 133,* 1-24.

Barlow, D.H., Allen, L.B., & Choate, M.L. (2004). Toward a unified treatment for emotional disorders. *Behavior Therapy, 35,* 205-230.

Barker, T.V., Troller-Renfree, S., Pine, D.S., & Fox, N.A. (2015). Individual differences in social anxiety affect the salience of errors in social contexts. *Cognitive and Affective Behavioral Neuroscience, 15,* 723-735. doi: 10.3758/s13415-015-0360-9

Baron-Cohen, S., Jolliffe, T., Mortimore, C., & Robertson, M. (1997). Another advanced test of theory of mind: Evidence from Very High Functioning Adults with Autism or Asperger Syndrome. *Journal of Child Psychology and Psychiatry, 38*(7), 813-822.

Baron-Cohen, S. Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The “reading the mind in the eyes” test revised version: A study with normal adults, and adults with asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry, 42*(2), 241-251.

Bar-On, R., Tranel, D., Denburg, N.L., & Bechara, A. (2004). Exploring the neurological substrate of emotional and social intelligence. In J.T. Cacioppo & G.G. Berntson (Eds.), *Social Neuroscience: Key Readings* (223-237). New York, NY: Psychology Press.

Battaglia, M., Ogliari, A., Zanoni, A., Villa, F., Citterio, A.,…& Maffei, C. (2004). Children’s discrimination of expressions of emotions: Relationship with indices of social anxiety and shyness. *Journal of the American Academy of Child and Adolescent Psychiatry, 43*(3), 358-365. doi: 10.1097/01.chi.0000103177.91435.1b

Baumeister, R.F., DeWall, C.N., Ciarocco, N.J., & Twenge, J.M. (2005). Social exclusion impairs self-regulation. *Attitudes and Social Cognition, 88*(4), 589-604. doi: 10.1037/0022-3514.88.4.589

Baumeister, R.F., & Tice, D.M. (1990). Anxiety and social exclusion. *Journal of Social and Clinical Psychology, 9*(2), 165-195.

Baumeister, R.F., Twenge, J.M., & Nuss, C.K. (2002). Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought. *Journal of Personality and Social Psychology, 83*(4), 817-827. doi: 10.1037.0022-3514.83.4.817

Beard, C. (2011). Cognitive bias modification (CBM) for anxiety: Current evidence and future directions. *Expert Review of Neurotherapeutics, 11*(2), 299-311. doi: 10.1586/ern.10.194

Beard, C., & Amir, N. (2010). Negative interpretation bias mediates the effect of social anxiety on state anxiety. *Cognitive Therapy and Research, 34,* 292-296. doi: 10.1007/s10608-009-9258-6

Becker, M.W., & Detweiler-Bedell, B. (2009). Short article: Early detection and avoidance of threatening faces during passive viewing. *Quarterly Journal of Experimental Psychology, 67*(7), 1257-1264. doi: 10.1080/17470210902725753

Beidel, D.C., Rao, P.A., Scharfstein, L., Wong, N., & Alfano, C.A. (2010). Social skills and social phobia: An investigation of DSM-IV subtypes. *Behaviour Research and Therapy, 48,* 992-1001. doi: 10.1016/j.brat.2010.06.005

Beidel, D.C., Turner, S.M., Jacob, R.G., & Cooley, M.R. (1989). Assessment of social phobia: Reliability of an impromptu speech task. *Journal of Anxiety Disorders, 3*(3), 149-158. doi: 10.1016/0887-6185(89)90009-1

Berenson, K.R., Gyurak, A., Ayduck, O., Downey, G., Garner, M.J., … & Pine, D.S. (2009). Rejection sensitivity and disruption of attention by social threat cues. *Journal of Research in Personality, 43*(6), 1064-1072. doi: 10.1016/j.jrp.2009.07.007

Bogels, S.M., & Mansell, W. (2004). Attention processes in the maintenance and treatment of social phobia: Hypervigilance, avoidance, and self-focused attention. *Clinical Psychology Review, 24,* 827-856. doi: 10.1016/j.cpr.2004.06.005

Bolling, D.Z., Pitskel, N.B., Deen, B., Crowley, M.J., McPartland, J.C., Mayes, L.C., & Pelphrey, K.A. (2011). Dissociable brain mechanisms for processing social exclusion and rule violation. *Neuroimage, 54*(3), 2462-2471. doi: 10.1016/j.neuroimage.2010.10.049

Boyce, P., & Parker, G. (1989). Development of a scale to measure interpersonal sensitivity. *Australian and New Zealand Journal of Psychiatry, 23*(3), 341-351.

Browning, M., Holmes, E.A., & Harmer, C.J. (2010). The modification of attentional bias to emotional information: A review of the techniques, mechanisms, and relevance to emotional disorders. *Cognitive, Affective, & Behavioral Neuroscience, 10*(1), 8-20. doi: 10.3758/CABN.10.1.8

Bruhl, A.B., Rufer, M., Delsignore, A., Kaffenberger, T., Jancke, L., & Herwig, U. (2010). Neural correlates of altered general emotion processing in social anxiety disorder. *Brain Research, 1378*, 72-83. doi: 10.1016/j.brainres.2010.12.084

Bublatzky, F. Gerdes, A.B.M., White, A.J., Riemer, M., & Alpers, G.W. (2014). Social and emotional relevance in face processing: Happy faces of future interaction partners enhance the late positive potential. *Frontiers in Human Neuroscience, 8*(493), 1-10. doi: 10.3389/fnhum.2014.00493

Buckner, J.D., DeWall, C.N., Schmidt, N.B., & Maner, J.K. (2010). A tale of two threats: Social anxiety and attention to social threat as a function of social exclusion and non-exclusion threats. *Cognitive Therapy and Research, 34,* 449-455. doi: 10.1007/s10608-009-9254-x

Buckner, J.D., Maner, J.K., & Schmidt, N.B. (2010). Difficulty disengaging attention from social threat in social anxiety. *Cognitive Therapy and Research, 34,* 99-105. doi: 10.1007/s10608-008-9205-y

Buhlmann, U., Wacker, R., & Dziobek, I. (2015). Inferring other people's states of mind: Comparison across social anxiety, body dysmorphic, and obsessive-compulsive disorders. *Journal of Anxiety Disorders, 34,* 107-113. doi: 10.106/j.anxdis.2015.06.003

Buss, D.M. (1990). The evolution of anxiety and social exclusion. *Journal of Social and Clinical Psychology, 9*(2), 196-201.

Cacioppo, J.T., & Hawkley, L.C. (2009). Perceived social isolation and cognition. *Trends in Cognitive Science, 13*(10), 447-454. doi: 10.1016/j.tics.2009.06.005

Canli, T., & Lesch, K. (2007). Long story short: The serotonin transporter in emotion regulation and social cognition. *Nature Neuroscience, 10,* 1103-1109.

Chen, S., Yao, N., Qian, M., & Lin, M. (2016). Attentional biases in high social anxiety using a flanker task. *Journal of Behavior Therapy and Experimental Psychiatry, 51,* 27-34. doi: 10.1016/j.btep.2015.12.002

Chen, Y.P., Ehlers, A., Clark, D.M., & Mansell, W. (2002). Patients with social phobia direct their attention away from faces. *Behaviour Research and Therapy, 40*(6), 677-687. doi: 10.1016/S0005-7967(01)00086-9

Christensen, P.N., Stein, M.B., & Means-Christensen, A. (2003). Social anxiety and interpersonal perception: A social relations model analysis. *Behaviour Research and Therapy, 41,* 1355-1371. doi: 10.1016/S0005-7967(03)00064-0

Cisler, J.M., & Koster, E.H.W. (2010). Mechanisms of attentional biases toward threat in anxiety disorders: An integrative review. *Clinical Psychology Review, 30*(2), 203-216. doi: 10.1016/j.cpr.2009.11.003

Clark, D.M., & Beck, A.T. (1988). Cognitive approaches. In C.G. Last, & M. Hersen, *Handbook of anxiety disorders* (pp. 362-385). New York: Pergamon.

Clark, D.M., & McManus, F. (2002). Information processing in social phobia. *Biological Psychiatry, 51*(1), 92-100. doi: 10.1016/S0006-3223(01)01296-3

Clark D.M., & Wells, A. (1995). A cognitive model of social phobia. In R.G. Heimberg, M.R. Liebowitz, D.A. Hope, & F.R. Schneider (Eds.). *Social phobia: Diagnosis, assessment, and treatment* (pp. 69-93). New York: Guilford Press.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). Mahwah, NJ: Lawrence Erlbaum Associates.

Cooney, R.E., Atlas, L.Y., Joormann, J., Eugene, F., & Gotlib, I.H. (2006). Amygdala activation in the processing of neutral faces in social anxiety disorder: Is neutral really neutral? *Psychiatry Research: Neuroimaging, 148*, 55-59.

Corbetta, M., & Shulman, G.L. (2002). Control of goal-directed and stimulus-driven attention in the brain. *Nature Reviews Neuroscience, 3*, 201-215. doi: 10.1038.nrn755

Cox, B.J., Clara, I.P., Sareen, J., & Stein, M.B. (2008). The structure of feared social situations among individuals with a lifetime diagnosis of social anxiety disorder in two independent nationally representative mental health surveys. *Behaviour Research and Therapy, 46*(4), 477-486. doi: 10.1016/j.brat.2008.01.011

Crawford, T.J., Bennett, D., Lekuwa, G., Shaunak, S., Deakin, J.F. (2002). Cognition and the inhibitory control of saccades in schizophrenia and Parkinson's disease. *Progress in Brain Research, 140,* 449-466. doi: 10.1016/S0079-6123(02)40068-4

Crowley, M.J., Wu, J., McCarty, E.R., David, D.H., Bailey, C.A., & Mayes, L.C. (2009). Exclusion and micro-rejection: Event-related potential response predicts mitigated distress. *Neuroreport, 20*(17), 1518-1522. doi: 10.1097/WNR.0b013e328330377a

Crowley, M.J., Wu, J., Molfese, P.J., & Mayes, L.C. (2010). Social exclusion in middle childhood: Rejection events, slow-wave neural activity and ostracism distress. *Society for Neuroscience, 5*(5-6), 483-495. doi: 10.1080/17470919.2010.500169

Cuthbert, B.N., Schupp, H.T., Bradley, M.M., Birbaumer, N., & Lang, P.J. (2000). Brain potentials in affective picture processing: Covariation with autonomic arousal and affective report. *Biological Psychology, 52,* 91-111.

Davila, J., & Beck, J.G. (2002). Is social anxiety associated with impairment in close relationships? A preliminary investigation. *Behavior Therapy, 33,* 427-446.

DeCoster, J., Gallucci, M., & Iselin, A.R. (2011). Best practices for using median splits, artificial categorization, and their continuous alternatives. *Journal of Experimental Psychopathology, 2*(2), 197-209. doi: 10.5127/jep.008310

Delorme, A. & Makeig, S. (2004). EEGLAB: An open source toolbox for analysis of single-trial EEG dynamics including independent component analysis. *Journal of Neuroscience Methods, 134,* 9-21.

De Los Reyes, A., Bunnell, B.E., & Beidel, D.C. (2013). Informant discrepancies in adult social anxiety disorder assessments: Links with contextual variations in observed behavior. *Journal of Abnormal Psychology, 122*(2), 376-386. doi: 10.1037/a0031150

Deros, D.E., Racz, S.J., Lipton, M.F., Augenstein, T.M. Karp, J.N., Keeley, L.M.,… & De Los Reyes, A. (2018). Multi-informant assessments of adolescent social anxiety: Adding clarity by leveraging reports from unfamiliar peer confederates. *Behavior Therapy, 49*(1), 84-98. doi: 10.1016/j.beth.2017.05.001

Derryberry, D., & Reed, M.A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111*(2), 225-236. doi: 10.1037/0021-843X.111.2.225

Deveney, C.M., & Deldin, P.J. (2006). A preliminary investigation of cognitive flexibility for emotional information in major depressive disorder and non-psychiatric controls. *Emotion, 6*(3), 429-437. doi: 10.1037/1528-3542.6.3.429

DeWall, C.N., Maner, J.K., & Rouby, D.A. (2009). Social exclusion and early-stage interpersonal perception: Selective attention to signs of acceptance. *Journal of Personality and Social Psychology, 96*(4), 729-741. doi: 10.1037/a0014634

Downey, G., Khouri, H., & Feldman, S.I. (1997). Early interpersonal trauma and later adjustment: The mediational role of rejection sensitivity. In D. Cicchetti & S.L. Toth (Eds.), *Rochester symposium on developmental psychology, Vol. 8. Developmental perspectives on trauma: Theory, research, and intervention* (pp. 85-114). Rochester, NY, US: University of Rochester Press.

Endrass, T., Riesel, A., Kathmann, N., & Buhlmann, U. (2014). Performance monitoring in obsessive-compulsive disorder and social anxiety disorder. *Journal of Abnormal Psychology, 123*(4), 705-714. doi: 10.1037/abn0000012

Eriksen, B.A., & Eriksen, C.W. (1974). Effects of noise letters upon the identification of a target letter in a nonsearch task. *Perception & Psychophysica, 16*, 143-149.

Eslinger, P.J., & Grattan, L.M. (1993). Frontal lobe and frontal-striatal substrates for different forms of human cognitive flexibility. *Neuropsychologia, 31*(1), 17-28.

Evans, K.C., Wright, C.I., Wedig, M.M., Gold, A.L., Pollack, M.H., & Rauch, S.L. (2008). A functional MRI study of amygdala responses to angry schematic faces in social anxiety disorder. *Depression and Anxiety, 25,* 496-505. doi: 10.1002/da.20347

Everaert, J., Bronstein, M.V., Cannon, T.D., & Joorman, J. (2018). Looking through tinted glasses: Depression and social anxiety are related to both interpretation biases and inflexible negative interpretations. *Clinical Psychological Science*. doi: 10.1177/2167702617747968

Everling, S., & Fischer, B. (1998). The antisaccade: A review of basic research and clinical studies. *Neuropsychologia, 36*(9), 885-899.

Eysenck, M.W., Derakshan, N., Santos, R., & Calvo, M.G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion*, *7*(2), 336-353. doi: 10.1037/1528-3542.7.2.336

Fan, J., McCandliss, B.D., Sommer, T., Raz, A., & Posner, M.I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience*, *14*(3), 340-347.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage Publications Ltd.

Freedman, G., Williams, K.D., & Beer, J.S. (2016). Softening the blow of social exclusion: The responsive theory of social exclusion. *Frontiers in Psychology, 7(*1570), 1-17. doi: 10.3389/fpsyg.2016.01570

Friedman, B.H. (2007). An autonomic flexibility-neurovisceral integration model of anxiety and cardiac vagal tone. *Biological Psychology*, *74*, 185-199. doi: 10.1016/S0301-0511(97)00027-6

Friedman, D., Cycowicz, Y.M., & Gaeta, H. (2001). The novelty P3: An event-related brain potential (ERP) sign of the brain's evaluation of novelty. *Neuroscience and Biobehavioral Reviews, 25,* 355-373.

Ghassemzadeh, H., Rothbart, M.K., & Posner, M.I. (2019). Anxiety and brain networks of attentional control. *Cognitive and Behavioral Neurology, 32*(1), 54-62. doi: 10.1097/WNN.0000000000000181

Gilboa-Schechtman, E., Foa, E.B., & Amir, N. (1999). Attentional biases for facial expressions in social phobia: The face-in-the-crowd paradigm. *Cognition and Emotion, 13*(3), 305-318. doi: 10.1080/026999399379294

Girden, E. R. (1992). *ANOVA: repeated measures*. Sage university paper series on quantitative applications in the social sciences, 7-84. Newbury Park, CA: Sage.

Glenn, L.E., Keeley, L.M., Szollos, S., Okuno, H., Wang, X., Rausch, E.,…& De Los Reyes, A. (2019). Trained observers' ratings of adolescents' social anxiety and social skills within controlled, cross-contextual social interactions with unfamiliar peer confederates. *Journal of Psychopathology and Behavioral Assessment*, *41,* 1-15. doi: 10.1007/s10862-018-9676-4

Goldin, P.R., Manber, T., Hakimi, S., Canli, T., & Gross, J.J. (2009). Neural bases of social anxiety disorder: Emotional reactivity and cognitive regulation during social and physical threat. *Archives of General Psychiatry, 66*(2), 170-180. doi: 10.1001/archgenpsychiatry.2008.525

Grafton, B., & MacLeod, C. (2016). Engaging with the wrong people: The basis of selective attention to negative faces in social anxiety. *Clinical Psychological Science*, *4*(5), 793-804. doi: 10.1177/2167702615616344

Gross, J.J., & Thompson, R.A. (2007). Emotion regulation: Conceptual foundations. In J.J. Gross (Ed.), *Handbook of emotion regulation* (pp. 3-24). New York, NY: Guilford Press.

Gutz, L., Renneberg, B., Roepke, S., & Niedeggen, M. (2015). Neural processing of social participation in borderline personality disorder and social anxiety disorder. *Journal of Abnormal Psychology*, *124*(2), 421-431. doi: 10.1037/a0038614

Hajcak, G., MacNamara, A., Foti, D., Ferri, J., & Keil, A. (2013). The dynamic allocation of attention to emotion: Simultaneous and independent evidence from the late positive potential and steady state visual evoked potentials. Biological Psychology, 92, 447-455. doi: 10.1016/j.biopsycho.2011.11.012

Hajcak, G., MacNamara, A., & Olvet, D.M. (2010). Event-related potentials, emotion, and emotion regulation: An integrative review. *Developmental Neuropsychology*, *35*(2), 129-155. doi: 10.1080/87565640903526504

Hajcak, G., Weinberg, A., MacNamara, A., & Foti, D. (2012). ERPs and the study of emotion. In S.J. Luck and E.S. Kappenman (Eds.), *The Oxford Handbook of Event-Related Potential Components* (pp. 441-472). Oxford University Press: New York.

Hakamata, Y., Lissek, S., Bar-Haim, Y., Britton, J.C., Fox, N.A., Leibenluft, E., Ernst, M., & Pine, D. S. (2010). Attention bias modification treatment: A meta-analysis toward the establishment of novel treatment for anxiety. *Biological Psychiatry*, *68*(11), 982-990. doi: 10.1016/j.biopsych.2010.07.021

Halgren, E., Marinkovic, K., & Chauvel, P. (1998). Generators of the late cognitive potentials in auditory and visual oddball tasks. *Electroencephalography and Clinical Neurophysiology, 106,* 156-164.

Hallion, L.S., & Ruscio, A.M. (2011). A meta-analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin, 137*(6), 940-958. doi: 10.1037/a0024355

Harb, G.C., Heimberg, R.G., Fresco, D.M., Schneier, F.R., & Liebowitz, M.R. (2002). The psychometric properties of the Interpersonal Sensitivity Measure in social anxiety disorder. *Behaviour Research and Therapy, 40*(8), 961-979. doi: 10.1016/S0005-7967(01)00125-5

Harkness, K., Sabbagh, M., Jacobson, J., Chowdrey, N., & Chen, T. (2005). Enhanced accuracy of mental state decoding in dysphoric college students. *Cognition & Emotion, 19*(7), 999-1025. doi: 10.1080/02699930541000110

Harmer, C.J. (2008). Serotonin and emotional processing: Does it help explain antidepressant drug action? *Neuropharmacology, 55*(6), 1023-1028. doi: 10.1016/j.neuropharm.2008.06.036

Hawes, M.T., Szenczy, A.K., Klein, D.N., Hajcak, G., & Nelson, B.D. (2021). Increases in depression and anxiety symptoms in adolescents and young adults during the COVID-19 pandemic. *Psychological Medicine*, 1-9. doi: 10.1017/S0033291720005358

Heeren, A., Dricot, L., Billieux, J., Philippot, P., Grynberg, D., de Timary, P., & Maurage, P. (2017). Correlates of social exclusion in social anxiety disorder: An fMRI study. *Nature: Scientific Reports, 7*(260), 1-10. doi: 10.1038/s41598-017-00310-9

Heeren, A., Maurage, P., & Philippot, P. (2015). Revisiting attentional processing of non-emotional cues in social anxiety: A specific impairment for the orienting network of attention. *Psychiatry Research, 228*, 136-142. doi: 10.1016/j.psychres.2015.04.030

Heeren, A., Peschard, V., & Phillippot, P. (2012). The causal role of attentional bias for threat cues in social anxiety: A test on a cyber-ostracism task. *Cognitive Therapy and Research, 36*, 512-521. doi: 10.1007/s10608-011-9394-7

Heerey, E. A., & Kring, A. M. (2007). Interpersonal consequences of social anxiety. *Journal of Abnormal Psychology, 116*(1), 125-134.

Heinrichs, N., & Hofmann, S.G. (2001). Information processing in social phobia: A critical review. *Clinical Psychology Review, 21*(5), 751-770.

Heuer, K., Rinck, M., & Becker, E.S. (2007). Avoidance of emotional facial expressions in social anxiety: The approach-avoidance task. *Behaviour Research and Therapy, 45*, 2990-3001. doi: 10.1016/j.brat.2007.08.010

Hezel, D.M., & McNally, R.J. (2014). Theory of mind impairments in social anxiety disorder. *Behavior Therapy, 45*, 530-540.

Hirsch, C.R., & Clark, D.M. (2004). Information-processing bias in social phobia. *Clinical Psychology Review, 24*(7), 799-825. doi: 10.1016/j.cpr.2004.07.005

Hirschi, T. (1969). *Causes of delinquency.* Berkeley: University of California Press.

Hofmann, S.G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy, 36*(4), 193-209. doi: 10.1080/16506070701421313

Holt, R.J., Chura, L.R., Lai, M.C., Suckling, J., von dem Hagen, E.,…& Spencer, M.D. (2014). ‘Reading the mind in the eyes’: An fMRI study of adolescents with autism and their siblings. *Psychological Medicine, 44*(15), 3215-3227. doi: 10.1017/S0033291714000233

Horley, K., Williams, L.M., Gonsalvez, C., & Gordon, E. (2003). Social phobics do not see eye o eye: A visual scanpath study of emotional expression processing. *Journal of Anxiety Disorders, 17,* 33-44.

Hruby, T., & Marsalek, P. (2003). Event-related potentials – the P3 wave. *Acta Neurobiologiae Experimentalis, 63,* 55-63.

Iacobucci, D., Posavac, S.S., Kardes, F.R., Schneider, M.J., & Popovich, D.L. (2015). The median split: Robust, refined, and revived. *Journal of Consumer Psychology, 25*(4), 690-704. doi: 10.1016/j.jcps.2015.06.014

Jamieson, J.P., Harkins, S.G., & Williams, K.D. (2010). Need threat can motivate performance after ostracism. *Personality and Social Psychology Bulletin, 36*(5), 690-702. doi: 10.1177/0146167209358882

Jazaieri, H., Morrison, A.S., Goldin, P.R., & Gross, J.J. (2015). The role of emotion and emotion regulation in social anxiety disorder. *Current Psychiatry Reports, 17*, 531.

Jones, T.L., & Barnett, M.A. (2020). Anticipated emotional and behavioral responses to ambiguous rejection by a significant other, friend, or acquaintance. *The Journal of General Psychology,* 1-15. doi: 10.1080/00221309.2020.1798864

Juardo, M.B., & Rosselli, M. (2007). The elusive nature of executive functions: A review of current understanding. *Neuropsychology Review, 17*(3), 213-233. doi: 10.1007/s11065-007-9040

Judah, M.R., Grant, D.M., & Carlisle, N.B. (2016a). The effects of self-focus on attentional biases in social anxiety: An ERP study. *Cognitive, Affective, and Behavioral Neuroscience, 16*, 393-405. doi: 10.3758/s13415-015-0398-8

Judah, M.R., Grant, D.M., Frosio, K.E., White, E.J., Taylor, D.L., & Mills, A.C. (2016b). Electrocortical evidence of enhanced performance monitoring in social anxiety. *Behavior Therapy, 47*, 274-285.

Judah, M.R., Grant, D.M., Lechner, W.V., & Mills, A.C. (2013). Working memory load moderates late attentional bias in social anxiety. *Cognition and Emotion, 27*(3), 502-511. doi: 10.1080/02699931.2012.719490

Kashdan, T.B., & Roberts, J.E. (2004). Social anxiety's impact on affect, curiosity, and social-self-efficacy during a high self-focus social threat situation. *Cognitive Therapy and Research, 28*(1), 119-141.

Kanai, Y., Nittono, H., Kubo, K., Sasaki-Aoki, S., & Iwanaga, M. (2012). Early somatosensory event-related potentials reveal attentional bias for internal stimuli in social anxiety. *Biological Psychology, 89*(3), 591-597. doi: 10.1016/j.biopsycho.2012.01.005

Kenny, D.A., & La Vole, L. (1984). The social relations model. *Advances in Experimental Social Psychology, 18*, 141-182. doi: 10.1016/S0065-2601(08)60144-6

Kocovski, N.L., & Endler, N.S. (2000). Social anxiety, self-regulation, and fear of negative evaluation. *European Journal of Personality, 14*(4), 347-358. doi: 10.1002/1099-0984(200007/08)14

Kok, A. (2001). On the utility of P3 amplitude as a measure of processing capacity. *Psychophysiology, 38*, 557-577.

Kolassa, I., & Miltner, W.H.R. (2006). Psychophysiological correlates of face processing in social phobia. *Brain Research, 1118*(1), 130-141. doi: 10.1016/j.brainres.2006.08.019

Koster, E.H.W., Fox, E., MacLeod, C. (2009). Introduction to the special selection on cognitive bias modification in emotional disorders. *Journal of Abnormal Psychology, 118*(1), 1-4. doi: 10.1037/a0014379

Kowler, E., Anderson, E., Dosher, B., & Blaser, E. (1995). The role of attention in the programming of saccades. *Vision Research, 35*(13), 1897-1916.

Kraines, M.A., White, E.J., Grant, D.M., & Wells, T.T. (2019). Social anxiety as a precursor for depression: Influence of interpersonal rejection and attention to emotional stimuli. *Psychiatry Research, 275*, 296-303. doi: 10.1016/j.psychres.2019.04.001

Kroenke, K., Spitzer, R.L., & Williams, J.B.W. (2001). The PHQ-9: Validity of a brief depression severity questionnaire. *Journal of General Internal Medicine, 16*(9), 606-613. doi: 10.1046/j.1525-1497.2001.016009606.x

Krompinger, J.W., Moser, J.S., & Simons, R.F. (2008). Modulations of the electrophysiological response to pleasant stimuli by cognitive reappraisal. *Emotion, 8*(1), 132-137. doi: 10.1037/1528-3542.8.1.132

Kross, E., Egner, T., Ochsner, K., Hirsch, J., & Downey, G. (2007). Neural dynamics of rejection sensitivity. *Journal of Cognitive Neuroscience, 19*(6), 945-956.

Kujawa, A., Weinberg, A., Bunford, N., Fitzgerald, K.D., Hanna, G.L., Monk, C.S., … & Phan, K.L. (2016). Error-related brain activity in youth and young adults before and after treatment for generalized or social anxiety disorder. *Progress in Neuropsychopharmacology and Biological Psychiatry, 71*, 162-168. doi: 10.1016/j.pnpbp.2016.07.010

Lagner, O., Dotsch, R., Bijlstra, G., Widboldus, D.H.J., Hawk, S.T., & van Kippenberg, A. (2010). Presentation and validation of the Radboud Faces Database. *Cognition and Emotion, 24,* 1377-1388. doi: 10.1080/02699930903485076

Leary, M.R. (1983). A brief version of the Fear of Negative Evaluation Scale. *Personality and Social Psychology Bulletin, 9,* 371-375

Leary, M.R., & Kowalski, R.M. (1995). *Social Anxiety*. New York, NY: The Guilford Press.

Leng, Y., Zhu, Y., Ge, S., Qian, X., & Zhang, J. (2018). Neural temporal dynamics of social exclusion elicited by averted gaze: An event-related potentials study. Frontiers in Behavioral Neuroscience, 12(21), 1-9. doi: 10.3389/fnbeh.2018.00021

Levin, M.E., MacLane, C., Daflos, S., Seeley, J., Hayes, S.C.,…& Pistorello, J. (2017). Examining psychological inflexibility as a transdiagnostic process across psychological disorders. *Journal of Contextual Behavioral Science, 3*(3), 155-163. doi: 10.1016/j.jcbs.2014.06.003

Levinson, C.A., Langer, J.K., & Rodebaugh, T.L. (2013). Reactivity to exclusion prospectively predicts social anxiety symptoms in young adults. *Behavior Therapy, 44*(3), 470-478. doi: 10.1016/j.beth.2013.04.007

Liao, W., Chen, H., Feng, Y., Mantini, D., Gentili, C.,…& Zhang, W. (2010). Selective aberrant functional connectivity of resting state networks in social anxiety disorder. NeuroImage, 52(4), 1549-1558. doi: 10.1016/j.neuroimage.2010.05.01

Lipton, M.F., Qasmieh, N., Racz, S.J., Weeks, J.W., & De Los Reyes, A. (2020). The fears of evaluation about performance (FEAP) task: Inducing anxiety-related responses to direct exposure to negative and positive evaluations. *Behavior Therapy, 51*(6), 843-855. doi: 10.1016/j.beth.2020.01.004

Lochner, C., Mogotsi, M., du Toit, P.L., Kaminer, D., Niehaus, D.J., & Stein, D.J. (2003). Quality of life in anxiety disorders: A comparison of obsessive-compulsive disorder, social anxiety disorder, and panic disorder. Psychopathology, 36, 255-262. doi: 10.1159/000073451

Lopez-Calderon, J., & Luck, S.J. (2014). ERPLAB: An open-source toolbox for the analysis of event-related potentials. *Frontiers in Human Neuroscience*, 8(213), 1-14. doi: 10.3389/fnhum.2014.00213

Luck, S.J. (2014). *An introduction to the event-related potential technique* (2nd ed.). Cambridge, MA: MIT Press.

MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*, 15-20.

Maner, J.K., DeWall, C.N., Baumeister, R.F., & Schaller, M. (2003). Does social exclusion motivate interpersonal reconnection? Resolving the "porcupine problem." *Journal of Personality and Social Psychology, 92*(1), 42-55. doi: 10.1037/0022-3514.92.1.42

Mansell, W., & Clark, D.M. (1999). How do I appear to others? Social anxiety and processing of the observable self. *Behaviour Research and Therapy, 37*(5), 419-434. doi: 10.1016/S0005-7967(98)00148-X

Mansell, W., Clark, D.M., & Ehlers, A. (2003). Internal versus external attention in social anxiety: An investigation using a novel paradigm. *Behaviour Research and Therapy, 41*, 555-572. doi: 10.1016/S0005-7967(02)00029-3

Maslow, A.H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370-396. doi: 10.1037/h0054346

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109*, 602-615. doi: 10.1037/0021-843X.109.4.602

Mathews, A., & MacLeod, C. (2002). Induced processing biases have causal effects on anxiety. *Cognition and Emotion, 16*(3), 331-354. doi: 10.1080/02699930143000518

Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology, 1*, 167-195. doi: 0.1146/annurev.clinpsy.1.102803.14396

Mattick, R.P., & Clarke, J.C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy, 36*(4), 455-470. doi: 10.1016/S0005-967(97)10031-6

McTeague, L.M., Shumen, J.R., Wieser, M.J., Lang, P.J., & Keil, A. (2011). Social vision: Sustained perceptual enhancement of affective facial cues in social anxiety. *NeuroImage, 54*(2), 1615-1624. doi: 10.1016/j.neuroimage.2010.08.080

Meinhardt, J., & Pekrun, R. (2003). Attentional resource allocation to emotional events: An ERP study. *Cognition and Emotion, 17*(3), 477-500. doi: 10.1080/02699930244000039

Meyer, T.J., Miller, M.L., Metzger, R.L., & Borkovec, T.D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28*(6), 487-495. doi: 10.1016/0005-7967(90)90135-6

Miller, A.L., Gouley, K.K., Seifer, R., Zakriski, A., Eguia, M., & Vergnani, M. (2005). Emotion knowledge skills in low-income elementary school children: Associations with social status and peer experiences. *Social Development, 14*(4), 637-651. doi: 10.1111/j.1467-9507.2005.00321.x

Mogg, K., Bradley, B.P., & Philippot, P. (2004). Selective attention to angry faces in clinical social phobia. *Journal of Abnormal Psychology, 113*(1), 160-163. doi: 10.1037/0021-843X.113.1.160

Molden, D.C., Lucas, G.M., Gardner, W.L., Dean, K., & Knowles, M.L. (2009). Motivations for prevention or promotion following social exclusion: Being rejected versus being ignored. *Journal of Personality and Social Psychology, 96*(2), 415-431. doi: 10.1037/a0012958

Moor, B.G., Op de Macks, Z.A., Guroglu, B., Rombouts, S.A.R.B., Van der Molen, M.W., & Crone, E.A. (2012). Neurodevelopmental changes of reading the mind in the eyes. *Social Cognitive and Affective Neuroscience, 7*(1), 44-52. doi: 10.1093/scan/nsr020

Moran, T.P., Jendrusina, A.A., & Moser, J.S. (2013). The psychometric properties of the late positive potential during emotion processing and regulation. Brain Research, 1516, 66-75. doi: 10.1016/j.brainres.2013.04.018

Moser, J.S., Huppert, J.D., Duval, E., & Simons, R.F. (2008). Face processing biases in social anxiety: An electrophysiological study. *Biological Psychology, 78*(1), 93-103.

Moscovitch, D.A., Rowa, K., Paulitzki, J.R., Lerullo, M.D., Chiang, B., Antony, M.M., & McCabe, R.E. (2013). Self-portrayal concerns and their relation to safety behaviors and negative affect in social anxiety disorder. *Behaviour Research and Therapy, 51*(8), 476-486. doi: 10.1016/j.brat.2013.05.002

Mueller, E.M., Hogmann, S.G., Santesso, D.L., Meuret, A.E., Bitran, S., & Pizzagalli, D.A. (2009). Electrophysiological evidence of attentional biases in social anxiety disorder. *Physiological Medicine, 39,* 1141-1152.

Muhlberger, A., Wieser, M.J., Herrmann, M.J., Weyers, P., Troger, C., & Pauli, P. (2009). Early cortical processing of natrual and artificial emotional faces differs between lower and higher socially anxious persons. Journal of Neural Transmission, 116, 735-746. doi: 10.1007/s00702-008-0108-6

Munoz, D.P., & Everling, S. (2004). Look away: The anti-saccade task and the voluntary control of eye movement. *Nature Reviews: Neuroscience, 5*, 218-228.

Murphy, S.E., Yiend, J., Lester, K.J., Cowen, P.J., & Harmer, C.J. (2009). Short-term serotonergic but not adrenergic antidepressant administration reduces attentional vigilance to threat in healthy volunteers. *Neuropsychopharmacology, 12*(2), 169-179. doi: 10.1017/S1461145708009164

Nishiyama, Y., Okamoto, Y., Kunisato, Y., Okada, G., Yoshimura, S.,…& Yamawaki, S. (2015). fMRI study of social anxiety during social ostracism with and without emotional support. *PLoS ONE, 10*(5), e0127426. doi: 10.1371/journal.pone.012742

Numenmaa, T. (1964). The language of the face. *Jyvaskyla Studies in Education, Psychology, and Social Research.* Jyvaskyla, Finland: University of Jyvaskyla.

Oaten, M., Williams, K.D., Jones, A., & Zadro, L. (2008). The effects of ostracism on self-regulation in the socially anxious. *Journal of Social and Clinical Psychology, 27*(5), 471-504. doi: 10.1521/jscp.2008.27.5.471

Olatunji, B.O., Cisler, J.M., & Tolin, D.F. (2007). Quality of life in the anxiety disorders: A meta-analytic review. *Clinical Psychology Review, 27*, 572-581. doi: 10.1016/j.cpr.2007.01.015

Owens, M.E., & Beidel, D.C. (2015). Can virtual reality effectively elicit distress associated with social anxiety disorder. *Journal of Psychopathology and Behavioral Assessment*, *37,* 296-305. doi: 10.1007/s10862-014-9454-x

Pacheco-Unguetti, A.P., Acosta, A., Marques, E., & Lupianez, J. (2011). Alterations of the attentional networks in patients with anxiety disorders. *Journal of Anxiety Disorders, 25*(7), 888-895. doi: 10.1016/j.janxdis.2011.04.010

Paulhaus, D.L., & Morgan, K.L. (1997). Perceptions of intelligence in leaderless groups: The dynamic effects of shyness and acquaintance. *Journal of Personality and Social Psychology,* 72, 581-591.

Pessoa, L. (2009). How do emotion and motivation direct executive control? *Trends in Cognitive Science*, *13*(4), 160-166. doi: 10.1016/j.tics.2009.01.006

Peters, L., Sunderland, M., Andrews, G., Rapee, R.M., & Mattick, R.P. (2012). Development of a short form Social Interaction Anxiety (SIAS) and Social Phobia Scale (SPS) using nonparametric item response theory: The SIAS-6 and the SPS-6. *Psychological Assessment*, *24*(1), 66-76. doi: 10.1037/a0024544

Phan, K.L., Fitzgerald, D.A., Nathan, P.J., & Tancer, M.E. (2006). Association between amygdala hyperactivity to harsh faces and severity of social anxiety in generalized social phobia. *Biological Psychiatry*, *59*(5), 424-429. doi: 10.1016/j.biopsych.2005.08.012

Plant, R.R. (2016). A reminder on millisecond timing accuracy and potential replication failure in computer-based psychology experiments: An open letter. *Behavior Research Methods, 48*, 408-411. doi: 10.3758/s13428-015-0577-0

Rapee, R.M., & Heimberg, R.G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *41*, 1043-1054.

Renneberg, B., Herm, K., Hahn, A., Staebler, K., Lammers, C., & Roepke, S. (2011). Perception of social participation in borderline personality disorder. *Clinical Psychology & Psychotherapy, 19*(6), 473-480.

Riva, P., & Eck, J. (2016). The many faces of social exclusion. In Paolo Riva & Jennifer Eck (Eds.) *Social Exclusion: Psychological Approaches to Understanding and Reducing Its Impact.* Switzerland: Springer

Rodgers, N., Lau, J.Y.F., & Zebrowski, P.M. (2020). Attentional bias among adolescents who stutter: Evidence for a vigilance-avoidance effect. *Journal of Speech, Language, and Hearing Research, 63,* 3349-3363. doi: 10.1044/2020_JSLHR-20-00090

Romero-Canyas, R., Downey, G., Berenson, K., Ayduck, O., & Kang, N.J. (2010). Rejection sensitivity and the rejection-hostility link in romantic relationships. *Journal of Personality, 78*(1), 119-148. doi: 10.111/j.1467-6494.2009.00611.x

Rossignol, M., Phillipot, P., Bissot, C., Rigoulot, S., & Campanella, S. (2012). Electrophysiological correlates of enhanced perceptual processes and attentional capture by emotional faces in social anxiety. *Brain Research, 1460,* 50-62. doi: 10.1016/j.brainres.2012.04.034

Rudaizky, D., Basanovic, J., & MacLeod, C. (2014). Biased attentional engagement with, and disengagement from, negative information: Independent cognitive pathways to anxiety vulnerability? *Cognition & Emotion, 28*(2), 245-259. doi: 10.1080/02699931.2013.815154

Safren, S. A., Heimberg, R.G., Brown, E.J., & Holle, C. (1997). Quality of life in social phobia. *Depression and Anxiety, 4,* 126-133.

Sattler, J.M., & Ryan, J.J. (2009). *Assessment with the WAIS-IV*. La Mesa, CA: Jerome M. Sattler, Publisher, Inc.

Schmitz, J., Scheel, C.N., Rigon, A., Gross, J.J., & Blechert, J. (2012). You don't like me, do you? Enhanced ERP responses to averted eye gaze in social anxiety. *Biological Psychology, 91*, 263-269. doi: 10.1016/j.biopsycho.2012.07.004

Schupp, H.T., Cuthbert, B.N., Bradley, M.M., Cacioppo, J.T., Ito, T., & Lang, P.J. (2000). Affective picture processing: The late positive potential is modulated by motivational relevance. *Psychophysiology, 37*, 257-261.

Segal, A., Kessler, Y., & Anholt, G.E. (2015). Updating the emotional content of working memory in social anxiety. *Journal of Behavior Therapy and Experimental Psychiatry, 48*, 110-117. doi: 10.1016/j.btep.2015.02.012

Singh, J.S. & Hope, D.A. (2009). Cognitive-behavioral approaches to the treatment of social anxiety disorder. *Israel Journal of Psychiatry and Related Sciences, 46*(1), 62-69.

Spurr, J.M. & Stopa, L. (2002). Self-focused attention in social phobia and social anxiety. *Clinical Psychology Review, 22*(7), 947-975. doi: 10.1016/S0272-7358(02)00107-1

Sripada, C.S., Angstadt, M., Banks, S., Nathan, P.J., Liberzon, I., & Phan, K.L. (2009). Functional neuroimaging of mentalizing during the trust game in social anxiety disorder. *NeuroReport, 20*(11), 984-989. doi: 10.1097/WNR.0b013e32832d0a67

Stein, D.J., Lim, C.C.W., Roest, A.M., de Jonge, P., Auilar-Gaxiola, S., …& WHO World Mental Health Survey Collaborators. (2017). The cross-national epidemiology of social anxiety disorder: Data from the World Mental Health Survey Initiative. *BMC Medicine, 15*(143), 1-21. doi: 10.1186/s12916-017-0889-2

Stein, M.B., & Deutsch, R. (2003). In search of social phobia subtypes: Similarity of feared social situations. *Depression & Anxiety, 17*(2), 94-97. doi: 10.1002/da.10093

Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences of the United States of America, 110*(15), 5797-5801. doi: 10.1073/pnas.1219686110

Stopa, L., & Clark, D.M. (2000). Social phobia and interpretation of social events. *Behaviour Research and Therapy, 38*(3), 273-283. doi: 10.1016/S0005-7967(99)00043-1

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Pearson.

Taylor, C.T., & Alden, L.E. (2010). Safety behaviors and judgmental biases in social anxiety disorder. *Behaviour Research and Therapy, 48*, 226-237. doi: 10.1016/j.brat.2009.11.005

Taylor, C.T., Cross, K., & Amir, N. (2016). Attentional Control moderates the relationship between social anxiety symptoms and attentional disengagement from threatening information. *Journal of Behavior Therapy and Experimental Psychiatry, 50*, 68-76. doi: 10.1016/j.jbtep.2015.05.008

Thigpen, N.N., Gruss, L.F., Garcia, S., Herring, D.R., & Keil, A. (2018). What does the dot-probe task measure? A reverse correlation analysis of electrocortical activity. *Psychophysiology*, *55*(6), e13058. doi: 10.1111/psyp.13058

Thomas, S.A., Wilson, T.W., Jain, A., Deros, D.E., Um, M., Hurwitz, J., …, & De Los Reyes, A. (2017). Toward developing laboratory-based parent-adolescent conflict discussion tasks that consistently elicit adolescent conflict-related stress responses: Support from physiology & observed behavior. *Journal of Child and Family Studies, 26,* 3288-3302. doi: 10.1007/s10826-017-0844-z

Turner, S.M., Johnson, M.R., Beidel, D.C., Heiser, N.A., & Lydiard, R.B. (2003). The Social Thoughts and Beliefs Scale: A new inventory for assessing cognitions in social phobia. *Psychological Assessment, 15*(3), 384-391. doi: 10.1037/1040-3590.15.3.384

Umberson, D., & Montez, J.K. (2010). Social relationships and health: A flashpoint for health policy. *Journal of Health and Social Behavior, 51*(1), S54-S66. doi: 10.1177/0022146510383501

van der Meulen, M., van Ijzendoorn, M.H., & Crone, E.A. (2016). Neural correlates of prosocial behavior: Compensating social exclusion in a four-player cyberball game. *PLOS ONE.* doi: 10.1371/journal.pone.0159045

van Noordt, S.J.R., White, L.O., Wu, J., Mayes, L.C., & Crowley, M.J. (2015). Social exclusion modulates event-related frontal theta and tracks ostracism distress in children. *Neuroimage, 118*, 248-255. doi: 10.1016/j.neuroimage.2015.05.085

Varlet, M., Marin, L., Capdevielle, D., Del-Monte, J., Schmidt, R.C., Salesse, R.N., … & Raffard, S. (2014). Difficulty leading interpersonal coordination: Towards an embodied signature of social anxiety disorder. *Frontiers in Behavioral Neuroscience*. doi: 10.3389/fnbeh.2014.00029

Vassilopoulos, S.P. (2005). Social anxiety and the vigilance-avoidance pattern of attentional processing. *Beavioural and Cognitive Psychotherapy, 33,* 13-24. doi: 10.1017/S1352480400130

Washburn, D., Wilson, G., Roes, M., Rnic, K., & Harkness, K.L. (2016). Theory of mind in social anxiety disorder, depression, and comorbid conditions. *Journal of Anxiety Disorders, 37,* 71-77. doi: 10.1016/j.janxdis.2015.11.004

Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. doi: 10.1037/0022-3514.54.6.1063

Wechsler, D. (2008a). *WAIS-IV: Administration and scoring manual.* San Antonio: Pearson.

Wechsler, D. (2008b). *WAIS-IV: Technical and interpretive manual.* San Antonio: Pearson.

Weeks, J.W., Heimberg, R.G., Fresco, D.M., Hart, T.A., & Turk, C.L. (2005). Empirical validation and psychometric evaluation of the Brief Fear of Negative Evaluation Scale in patients with social anxiety disorder. *Psychological Assessment, 17*(2), 179-190. doi: 10.1037/1040-3590.17.2.179

Weeks, J.W., Heimberg, R.G., & Rodebaugh, T.L. (2008). The Fear of Positive Evaluation Scale: Assessing a proposed cognitive component of social anxiety disorder. *Journal of Anxiety Disorders, 22*, 386-400. doi: 10.1016/j.janxdis.2007.04.009

Weeks, J.W., Jakatdar, T.A., & Heimberg, R.G. (2010). Comparing and contrasting fears of positive and negative evaluation as facets of social anxiety. *Journal of Social and Clinical Psychology*, *29*(1), 68-94.

Weiser, M.J., Pauli, P., & Muhlberger, A. (2009). Probing the attentional control theory in social anxiety: An emotional saccade task. *Cognitive, Affective, & Behavioral Neuroscience, 9*(3), 314-322. doi: 10.3758/CABN.9.3.314

Wells, A., Clark, D.M., & Ahmad, S. (1998). How do I look with my minds eye: Perspective taking in social phobic imagery. *Behaviour Research and Therapy, 36,* 631-634.

Wells, A., Clark, D.M., Salkovskis, P., Ludgate, J., Hackmann, A., & Gelder, M. (1995). Social phobia: The role of in-situation safety behaviors in maintaining anxiety and negative beliefs. *Behavior Therapy, 26,* 153-161. doi: 10.1016/S0005-7894(05)80088-7

Werner, K., Goldin, P.R., Ball, T.M., Heimberg, R.G., & Gross, J.J. (2011). Assessing emotion regulation in social anxiety disorder: The emotion regulation interview. Journal of Psychopathology and Behavior Assessment, 33(3), 346-354. doi: 10.1007/s10862-011-9225-x

Weiser, M.J., Pauli, P., & Muhlberger, A. (2009). Probing the attentional control theory in social anxiety: An emotional saccade task. *Cognitive, Affective, & Behavioral Neuroscience, 9*(3), 314-322. doi: 10.3758/CABN.9.3.314

Williams, K.D. (2009). Ostracism: Effects of being ignored and excluded. In M. Zanna (Ed.), *Advances in experimental social psychology*. (Volume 41, pp. 279-314). New York, NY: Academic Press.

Williams, K.D., Cheung, C.K.T., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality & Social Psychology, 79,* 748-762

Williams, K.D., Govan, C.L., Croker, V., Tynan, D., Cruickshank, M., & Lam, A. (2002). Investigations into differences between social- and cyberostracism. *Group Dynamics: Theory, Research, and Practice*, *6*(1), 65-77. doi: 10.1037/1089-2699.6.1.65

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.

Williams, K.D., & Sommer, K.L. (1997). Social ostracism by coworkers: Does rejection lead to loafing or compensation? *Personality & Social Psychology Bulletin, 23,* 693-706.

Wong, N., Sarver, D.E., & Beidel, D.C. (2012). Quality of life impairments among adults with social phobia: The impact of subtype. *Journal of Anxiety Disorders, 26,* 50-57. doi: 10.1016/j.anxdis.2011.08.012

Woody, S.R., & Rodriguez, B.F. (2000). Self-focused attention and social anxiety in social phobics and normal controls. *Cognitive Therapy and Research, 24*(4), 473-488.

Yoon, K.L., & Zinbarg, R.E. (2007). Threat is in the eye of the beholder: Social anxiety and the interpretation of ambiguous facial expressions. *Behaviour Research and Therapy, 45*(4), 839-847.

Yuan, L., Zhou, R., & Hu, S. (2014). Cognitive reappraisal of facial expressions: Electrophysiological evidence of social anxiety. *Neuroscience Letters*, *577*, 45-50. doi: 10.1016/j.neulet.2014.06.006

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*(5), 692-697.

Zhang, Q., Li X., Wang, K., Zhou, X., Dong, Y., … & Yu, F. (2017). Dull to social acceptance rather than sensitivity to social ostracism in interpersonal interaction for depression: Behavioral and electrophysiological evidence from cyberball tasks. *Frontiers in Human Neuroscience*.

APPENDICES

APPENDIX A

Note: Due to the COVID-19 pandemic, the present document was not able to be fully completed as it was originally proposed. Below is the introduction chapter that corresponded to this work as it was originally proposed.

Social Anxiety Disorder (SAD) is characterized by persistent and intense fears of situations in which an individual may be exposed to social evaluation (American Psychiatric Association [APA], 2013). Due to these significant apprehensions toward social contexts, SAD diagnoses are often associated with impairment and distress related to an array of intrapersonal (e.g., physiological stress, attentional deficits) and interpersonal factors (e.g., dissatisfying social relationships) (Safren et al., 1997; Lochner et al., 2003; Olatunji et al., 2007). Current models of social anxiety posit that cognitive issues may result from hypervigilance toward and subsequent avoidance of social cues perceived as threatening (Amir et al., 1998), and that deficits regarding control over these attentional biases exist (Eysenck et al., 2007). Models also suggest that social anxiety symptoms may impair perception of emotion, particularly regarding neutral and negative emotions, during social interactions (Clark & Beck, 1998; Stopa & Clark, 2000). Accordingly, disruptions to appropriate attention allocation and accurate emotion detection relevant to social interactions may act as a pathway through which socially anxious symptomatology works.

Moreover, asymptomatic individuals often view those with SAD as being less intelligent, less attractive, and having poorer social skills (Alden & Taylor, 2004). This often results in exclusion and rejection from social relationships, thereby confirming apprehensions of social evaluation and exacerbating cognitive and emotion perception impairments, and emotional distress that individuals with SAD may possess (Baumeister et al., 2005; Washburn et al., 2016). However, individuals with SAD may report separate fears across diverse situations and when interacting with different individuals (APA, 2013; Cox et al., 2008; Stein & Deutsch, 2003). As a result, social anxiety may present under some evaluative situations but not in others. Yet, a paucity of research exists regarding the connections between social exclusion, attention toward emotions expressed in social situations, and accuracy of emotion detection under these contrasting circumstances. Thus, understanding the particular nature of social exclusion and differential contexts in which social exclusion may occur may provide additional insight regarding broadband interpersonal impairments associated with SAD. The current study seeks to investigate how different pathways of social exclusion influence the ability to accurately attend to and process emotionally-salient stimuli, which may serve as a maintaining factor for SAD.

Interpersonal models of SAD assert that social exclusion may relate to functional social impairment (see Alden & Taylor, 2004 for a review). Given that expectations of potential rejection stemming from apprehensions of social evaluation are core features of SAD (APA, 2013), comprehensive understanding of sensitivity to such rejection may clarify key maintenance factors and outcomes associated with the disorder. For example, those with SAD differ in self-regulation abilities relative to nonanxious controls and tend to report higher levels of distress and longer recovery times following social exclusion (Oaten et al., 2008). This suggests that the effects of rejection, exclusion, and ostracism manifest differently in individuals with SAD. Moreover, due to these differential effects and impairments to self-regulation and distress, exclusion also may influence how those with SAD may interpret and detect socially-salient threats. This is especially notable given predispositions to biased attention and processing of negative emotions in others as they relate to how those with SAD believe that others perceive them (e.g., Amir et al., 1998; Eysenck et al., 2007; Gilboa-Schechtman et al., 1999; see Heinrichs & Hofmann, 2001 for a review).

A robust literature exists that posits that those with SAD demonstrate difficulties with consciously shifting or focusing attention toward stimuli of interest and may exhibit initial hypervigilance toward threat-related stimuli over and above those without social fears (see Bar-Haim et al., 2007). More specifically, research suggests that those with SAD may have difficulty controlling attention to both external stimuli and internal experiences that correspond to social contexts that may evoke emotional responses to social threat (Clark & Wells, 1995; Mansell et al., 2003). This includes difficulties in focusing attention on general facial expressions as well as initial hypervigilance toward and subsequent difficulties disengaging with stimuli reflecting negative emotions (e.g., fear, anger; Bar-Haim et al., 2007; Horley et al., 2003). Similarly, a key characteristic of SAD potentially stemming from such attentional biases coincides with emotion dysregulation in response to evaluative social contexts (Clark & Wells, 1995; Hofmann, 2007; Kocovski & Endler, 2000). However, more recent literature contends that those with SAD may not only possess impairments in processes related to attention toward emotions in others, but also accurate perspective-taking and interpretation of how others perceive them in social contexts (Hezel & McNally, 2014; Sripada et al., 2009; Washburn et al., 2016). Thus, though impairments in abilities to shift focus on personal emotions and internal emotional experiences appear to be a core feature in SAD, the ability to accurately understand emotions and thoughts of those who may be evaluators also may act as a maintaining factor for social fears.

Accordingly, appropriate assessment of an individual's ability to skillfully take emotional perspectives of others is critical to clarify factors that may support and cultivate characteristic socially-anxious fears. Specifically, psychophysiological measures such as electroencephalography (EEG) may offer critical insight into investigation of underlying, covert mechanisms of executive functioning and cognitive processing that contribute to overt symptoms of psychopathology (Luck, 2014). In particular, neural resources that are allocated toward emotionally-salient tasks can be directly measured through use of event-related potentials (ERPs; Luck, 2014) that occur in response to specific stimuli presentations within cognitive tasks. Two key ERPs that may be important to assess in the context of exclusion given their associations with attentional resource allocation and emotion processing are the P3 (Gutz et al., 2015; Luck, 2014; Meinhardt & Pekrun, 2003) and the late positive potential (LPP; Moran et al., 2013). For example, Gutz and colleagues (2015) suggest that when individuals are engaged in contexts in which a socially-threatening event may occur (e.g., exclusion), P3 amplitudes increase which may signify that exclusion increases the amount of neural resources required to attend to a task. Similarly, Schmitz and colleagues (2012) discovered that those with higher levels of SA concerns exhibit enhanced LPP amplitudes when viewing facial expressions that may convey information about potential rejection and evaluation (e.g., averted eye gaze). Moreover, Moser and colleagues (2008) demonstrated that those who endorsed higher levels of SA display stronger P3 and LPP amplitudes toward expressions that symbolize social threat (e.g., anger, disgust). Indeed, such components have been shown to be elicited by tasks that highlight contexts relevant for social interactions (e.g., rejection and exclusion; Gutz et al., 2015; Williams & Jarvis, 2006), as well as those that contrast neutral and threatening facial expressions (e.g., Moser et al., 2008). However, fewer psychophysiological research methodologies have examined these components within paradigms that combine assessment of samples of socially-anxious individuals and exclusionary contexts.

As a whole, individuals with SAD demonstrate attentional and emotion-processing biases toward presentations of negative or threatening affect in others relative to those without SAD. Relatedly, these biases may be influenced by events such as social exclusion that may be direct manifestations of core fears characteristic of the disorder (e.g., Baumeister et al., 2005; Cacioppo & Hawkley, 2009; Zadro et al., 2006). These may be key maintaining factors of SAD. However, little research has been conducted regarding the connections between social exclusion, attention toward emotions expressed in social situations, and accurate detection and interpretation of emotion within these different contexts. More notably, such research has failed to extensively examine psychophysiological mechanisms underscoring these links. The current study aims to address these gaps at the intersections of attention, emotion processing, and social rejection in an effort to expand upon literature regarding the psychophysiological mechanisms maintaining SAD. In line with extant research, it is hypothesized that a number of behavioral and electrocortical indicators of modulated attention and information processing will be affected. Namely, (1) those with high social anxiety (HSA), particularly when excluded, will demonstrate shorter reaction times when responding to negative facial expression target stimuli and longer reaction times when responding to positive facial expression target stimuli; (2) those with HSA will exhibit reduced P3 amplitude and enhanced LPP amplitude relative to those with low social anxiety (LSA); (3) those with HSA will display enhanced P3 amplitudes and LPP amplitudes when excluded relative to when included, though not over and above those demonstrated by those with LSA; and (4) those with LSA who interact with strangers will demonstrate enhanced P3 amplitudes and enhanced LPP amplitudes relative to those who interact with close-others when excluded as compared as compared to those with HSA who may display blunted P3 amplitudes and enhanced LPP amplitudes under the same conditions.

APPENDIX B

Note: Due to the COVID-19 pandemic, the present document was not able to be fully completed as it was originally proposed. Below are selected literature review sections that pertain to the work as it was originally proposed.

Interpersonal Models of Social Anxiety

Although SAD is associated with a number of intrapersonal functional impairments and deficits (i.e., differential attention, emotion interpretation), this disorder also may coincide with a number of dysfunctional interpersonal processes (Alden & Taylor, 2010; Leary & Kowalski, 1995). Interpersonal perspectives assert that positive social interactions and social skills play a central role in maintaining psychological health (See Alden & Taylor, 2010 for a review). Similarly, these perspectives also posit that psychopathology may arise due to poor social skills that contribute to maladaptive social interactions (see Alden & Taylor, 2004 for a review). Moreover, these perspectives may be dependent on context and type of a relationship which may contribute to how aforementioned cognitive factors are manifested in actuality.

One prominent interpersonal framework that may lend well to incorporating cognitive perceptions of social interactions within SAD is the social relations model (Christensen et al., 2003; Kenny & La Vole, 1984). The social relations model is used to examine dyadic relationships and contends that perceptions of sociability are determined both by individual behavior and how others perceive social interactions in general (Kenny & La Vole, 1984). When applied to SAD, this may provide insight into how those with SAD perceive themselves, as well as how social partners perceive socially-anxious individuals, within social contexts. Thus, these comprehensive models provide information regarding how individuals see themselves, how they see others, how they are seen by others, and how they believe they are seen by others (i.e., metaperceptions; Kenny & La Vole, 1984). This framework dovetails with attentional and emotion processing models of SAD, positing that such cognitive and interpretation processes influence top-down processing of socially-salient behaviors.

From this perspective, research has found that individuals with SAD tend to view themselves negatively within social interactions (e.g., having poor social skills) and believe that others also view them negatively (e.g., appearing more nervous, negative judgments), thereby suggesting that those with SAD may endorse biased judgments regarding how others perceive them (Christensen et al., 2003; Kenny & La Vole, 1984). For example, individuals with SAD tend to rate their own social interactions with asymptomatic individuals as less cohesive, smooth, and coordinated (Heerey & Kring, 2007). Those with SAD also tend to overestimate the degree to which larger groups may consistently view them, such as the degree to which every person in a group views them negatively or as being anxious (Mansell & Clark, 1999). Alternatively, Albright and Malloy (1999) discovered that when given the opportunity to observe oneself within social interactions, individuals tend to become more accurate in understanding how others may judge their social skills. This may indicate that individuals possess automatic deficits in determining how others view them within the immediate context of social interactions. Yet, when given the opportunity for reflection outside of social situations, they may be better able to understand their actual social functioning (Albright & Malloy, 1999; Wells et al., 1998). As a result, literature may suggest that a key factor of SAD within interpersonal frameworks is related to personal impairments in their own social self-concepts.

However, some work also has asserted that those with SAD are viewed differently by those with whom they interact, which may act as a maintaining factor of SAD by confirming these biased beliefs. Those with SAD tend to self-report increased use of safety behaviors during social interactions (e.g., reassurance-seeking, low eye-contact, fidgeting), which may be construed as having poor social skills rather than as a method to reduce social anxiety (Heerey & Kring, 2007; Varlet et al., 2014). Further, asymptomatic individuals often view those with SAD as being less intelligent, less attractive, and having poorer social skills (Alden & Taylor, 2004; Paulhaus & Morgan, 1997). Thus, it appears that those with SAD tend to evoke less positive reactions from others. Cumulatively, trends in the literature appear to show that individuals with SA engage in observable coping strategies to alleviate anxiety associated with negative self-perceptions and others' evaluations within social situations. These coping strategies also may appear to others as being less skilled, which may affect interpersonal functioning. Consequently, interpersonal models of SAD may hinge on a dysregulated cycle of how individuals with SAD interact with the world, and how the world interacts with those with SAD.

On the other hand, there is a paucity of research regarding the specific types of relationships in which this cycle may differentially present. More specifically, these metaperceptions, others' views, and social self-concept constructs in SAD may be dependent on the individuals with whom those with SAD interact. For example, Davila and Beck (2002) suggested that those with SAD tend to utilize interpersonal styles that reflect reduced assertiveness, conflict and emotional expression avoidance, and heightened dependency across relationships with friends, acquaintances, family, and romantic partners. This implies that SAD may be associated with broadband, inhibited social strategies (Davila & Beck, 2002). Literature on adolescent social anxiety has found that unfamiliar observers also tend to rate those with SA concerns as being more anxious and as having lower social skills during unstructured social interactions (Glenn et al., 2019). Moreover, different individuals (e.g., unfamiliar peers, parents, clinicians) tend to report on and perceive different facets of SA as compared to the individual (De Los Reyes et al., 2013; Deros et al., 2018). However, additional work is needed regarding differences across both close friend relationships and interactions with unfamiliar individuals in adult samples.

Taken together, social interactions are central to psychological health. More specifically, the quality of social perceptions and behaviors contributes to interpersonal functioning. Incorporating interpersonal frameworks into basic cognitive and information processes with specific respect to SAD may provide evidence regarding different presentations and impairments of SAD among different levels of social relationships. However, less work has been conducted regarding the cognitive, attentional, and emotional effects of disruptions (i.e., exclusion) within these different social relationships.

Psychophysiology (Event Related Potentials)

Inclusion of psychophysiological measures into research paradigms may address such issues in investigating underlying, covert mechanisms of executive function and cognitive processing. For example, use of electroencephalography (EEG) in particular may offer critical insight into temporal recruitment and allocation of neural resources in response to tasks that require cognitive skills to complete (Luck, 2014). More specifically, such neural resources may be directly measured through assessment of event-related potentials (ERPs; Luck, 2014). ERPs provide information regarding the degree to which neural activity occurs through changes in scalp voltage potentials (Friedman et al., 2001; Luck, 2014). These ERPs consist of positive and negative fluctuations in scalp potentials in response to specific events within experimental manipulations and serve as indices of covert attentional and cognitive processes. Moreover, these ERPs are classified into different subcomponents in response to the cognitive activities that elicit them (Luck, 2014). Because of this, ERPs may provide valuable information regarding subtle neural differences in how information may be detected and processed between experimental groups that may demonstrate similar overt behaviors, and additionally may bolster self-report and behavioral measures assessing similar constructs.

To investigate utilization of neural resources underlying information processing abilities, assessing for ERPs that are present during tasks that require utilization of such executive functioning processes may prove advantageous. For example, the P3 component is a positive-fluctuation ERP that is elicited approximately 250-500ms following the presentation of a target stimulus that necessitates recategorization and interpretation into existing cognitive schemas, particularly when an individual is not expecting such stimuli to be presented (Luck, 2014). The amplitude of this component also has been posited as reflecting the intensity of cognitive processing as opposed to solely the latency of such processes (see Friedman et al., 2001 for a review). Moreover, the P3 has been noted as being comprised of a number of subcomponents, including the P3a and P3b. Notably, support has shown that the P3a may arise in the frontal regions as an index of executive function recruitment (Luck, 2014) whereas the P3b may arise in the parietal region as an index of specific attentional allocation processes (Gutz et al., 2015; Luck, 2014; Meinhardt & Pekrun, 2003). Toward these ends, a number of studies have shown that amount of neural resources recruited to complete task procedures is proportional to the amplitude of these subcomponents (Kok, 2001; Luck, 2014; Meinhardt & Pekrun, 2003). Moreover, sustained attention toward emotionally-salient stimuli also has been demonstrated through inhibition of P3 amplitudes peaks (Schupp et al., 2000). Thus, assessment of the P3 and comprising subcomponents may provide valuable information regarding how many attentional resources may be devoted to certain events, particularly those that may be unexpected (e.g., differential exclusion by strangers vs. close others).

Over and above examination of attentional resource allocation through modulated P3 components during social exclusion, impairments in emotion processing in SAD also may be observed through collection of the late positive potential (LPP) component (Bublatzky et al., 2014; Muhlberger et al., 2009; Schmitz et al., 2012). The LPP is a slow, positive fluctuation that can be observed between 300ms and 400ms following the presentation of an emotionally-salient stimulus (e.g., facial expression stimuli, emotional Stroop tasks; Moran et al., 2013). The LPP also is maximally observed over parietal regions (Cuthbert et al., 2000). Accordingly, the LPP has been posited as a neural indicator of manifestation of additional perceptual processing of emotions, particularly those associated with negative and threatening facial expressions (Moran et al., 2013; Moser et al., 2008). However, within SAD samples, literature suggests that those who endorse higher levels of social anxiety tend to demonstrate larger-amplitude LPP components, particularly at delayed latencies (Schmitz et al., 2012). Schmitz and colleagues (2012) investigated the effect of social cues (e.g., eye gaze) within emotion processing in individuals with SAD using the LPP. They found that those with higher levels of SAD show enhanced LPPs toward facial stimuli with averted eye gaze, thereby suggesting that individuals with significant SAD concerns may require additional neural resources to process such facial social cues (Schmitz et al., 2012). Yet, research is mixed regarding hypervigilance toward and additional processing of faces in general regardless of expressed emotion (Muhlberger et al., 2009). For example, Muhlberger and colleagues (2009) discovered that those high in social anxiety symptoms tend to display similar amplitude LPPs in response to either emotional faces or neutral faces during passive viewing tasks. Accordingly, it may be that the LPP in those with SAD is not discriminated by different types of facial stimuli, but rather demonstrates prolonged processing of faces in general (Muhlberger et al., 2009). This may suggest that individuals who endorse high levels of social anxiety symptoms may spend longer periods of time evaluating faces and facial expressions in general, potentially reflecting impairments in cognitive processing of emotions in others overall. As a result, examination of the LPP may provide clarification on how covert emotional processes may be directly influenced by the effects of interpersonal difficulties such as social exclusion that may be exaggerated in the minds of those with SAD.

In contrast to the P3, the LPP reflects sustained attention toward target, emotionally-salient stimuli (Cuthbert et al., 2000). Moreover, due to the extended latency necessary to capture the component, the LPP reflects more conscious processing of emotionally-threatening images (Hajcak et al., 2010; Hajcak et al., 2012). The P3, however, provides an index of immediate attentional allocation toward similar stimuli. Thus, the P3 yields information regarding automatic attentional biases outside of conscious awareness whereas the LPP provides information regarding subsequent processing of emotional information. Taken together, it may be advantageous to examine these components within contexts that may allow opportunities for social rejection or exclusion as these events may prompt both short-term cognitive biases and longer-term processing of initial biases.

Relatedly, there are a number of different methodologies that can elicit these separate components. Notably, literature supports use of non-affective oddball tasks to elicit the P3 (for a review see Hruby & Marsalek, 2003; Schupp et al., 2000), as well as motivated-attention affective oddball and passive picture viewing tasks that elicit the LPP (e.g., Bublatzky et al., 2014; Hajcak et al., 2013; Moran et al., 2013; Schupp et al., 2000). Oddball tasks elicit these components by recruiting neural resources to respond to randomly-presented or unexpected targets within a set of frequent distractors (Schupp et al., 2000). As an example, Gutz and colleagues (2015) utilized the Cyberball task, which may be considered a modified version of an oddball paradigm, to assess the impact of social exclusion on the P3. This oddball task elicited the P3 through use of an unexpected event (i.e., social exclusion) among distractors (i.e., social inclusion through ball-tossing participation; Gutz et al., 2015). Moreover, as the task progresses, the probability of a participant being excluded increases (i.e., higher frequency of the "unexpected" oddball event), which may capitalize on the sensitivity of P3 subcomponents to expectancy and intensity of cognitive resources allocated to complete a task (Luck, 2014; Friedman et al., 2001; Gutz et al., 2015). Using this method, Gutz and colleagues (2015) discovered that the Cyberball oddball task elicited enhanced P3 components, specifically the P3b, when excluded. This has been replicated in other forms of the oddball task (Halgren et al., 1998; Luck 2014), thereby highlighting the utility of this method in eliciting the P3.

Oddball and passive-viewing tasks utilizing emotionally-salient stimuli also have been posited as ways to elicit the LPP. Indeed, facial expressions that have been utilized as target and distractor stimuli have been associated with modulated LPP response (e.g., Bublatzky et al., 2014; Hajcak et al., 2013; Leng et al., 2018). For example, Moser and colleagues (2008) utilized a modified Flankers task in which stimuli included arrays of two facial expressions (i.e., reassuring vs. threatening) that were congruent or incongruent with a target expression. Flankers tasks have traditionally utilized relatively neutral stimuli, particularly congruent and incongruent arrow directions. However, the use of facial expressions within a psychophysiological paradigm such as this provides insight into an individual's abilities to attend to and cognitively recategorize facial expressions as a target or a distractor stimulus. Thus, this may reflect distinct biases in automatic attention toward and subsequent processing of emotion (Moser et al., 2008; Rossignol et al., 2012). Using this method, Moser and colleagues (2008) demonstrated that those who endorsed higher levels of social anxiety tended to display biases toward threatening facial expressions such that threatening target faces elicited stronger LPP and P3 responses whereas there were no differences in ERP response in those low in social anxiety concerns. Moreover, tasks requiring passive viewing of emotional expressions have been used to assess general biases toward emotionally-salient information (e.g., Krompinger et al., 2008; Becker & Detweiler-Bedell, 2009). The extant literature has indicated that such findings have been mixed within social anxiety samples (e.g., Yuan et al., 2014). However, there is a paucity of research that examines modification of the LPP in broader behavioral contexts such as exclusion despite extensive work conducted using emotionally-salient contexts (i.e., threatening vs. neutral facial stimuli). Such work has been conducted in samples of children (Crowley et al., 2010) and healthy undergraduate students (Crowley et al., 2009). Yet, an important gap exists for adult samples who may experience considerable impairments in social functioning. Taken together, these findings suggest that understanding under what conditions the LPP may be elicited and modulated may clarify the distinct stages of processing at which biases toward emotions that are critical for social functioning may occur in individuals with SAD.

APPENDIX C

Note: Due to the COVID-19 pandemic, the present document was not able to be fully completed as it was originally proposed. Below are methods and materials sections that corresponded to this work as it was originally proposed.

Participants

The sample for the present study will be recruited from the undergraduate student population at Oklahoma State University via an online recruitment system (SONA) in which students will receive course credit for research participation. Participants will be given a short form of the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) as a pre-screener via the online recruitment system to create groups comprised of individuals who meet for high and low levels of SA concerns. Those who score in the extremes of SA concerns (i.e., one standard deviation above or below the standardized mean of SA concerns on the SIAS) will be recruited into the study. Those who score above the average level of SA concerns will be recruited into the study within the high SA (HSA) group. These recruitment procedures align with those previously conducted utilizing high and low SA groups (e.g., Judah et al., 2016a). Participants who are randomly assigned into the friend exclusion group will be asked to bring a close friend to attend the study with them during their scheduled participation appointment time.

An a priori power analysis (Cohen, 1988) using effect sizes found in previous studies (η^2 = .08 – .25; Moser et al., 2008; Muhlberger et al., 2008; Gutz et al., 2015; Chen et al., 2016) suggests a total of 16 – 40 individuals will be needed to achieve adequate power (i.e., β = .80, α = .05). Due to anticipation of potential trial rejection and data loss due to physiological data cleaning (i.e., approximately 20% of trials rejected due to physiological artifacts), as well as based on comparable samples used in empirical research utilizing similar task designs (e.g., Moser et al., 2008; Gutz et al., 2015; Chen et al., 2016), data from 50 participants will be collected. More specifically, there will be approximately 12 - 13 participants recruited for each between-subject group (i.e., HSA vs. LSA; close-other dyad vs. stranger).

Questionnaires

Interpersonal Sensitivity Measure (IPSM; Boyce & Parker, 1989). The IPSM is a 36-item measure of an individual's propensity to be excessively sensitive toward negative interpersonal interactions and social feedback from others. This questionnaire will be used as an index of self-reported baseline levels of enhanced sensitivity to exclusion or rejection as well as self-focused social efficacy. Each item in the measure is rated on a Likert scale ranging from 1 (i.e., "very unlike me") to 4 (i.e., "very like me"). Total scores range from 36 to 144, with higher scores reflecting higher levels of interpersonal sensitivity. IPSM total scores also have shown adequate levels of internal consistency in community control samples (Cronbach's α = .85-.91; Boyce & Parker, 1989; Harb et al., 2002) and in samples with SAD (Cronbach's α = .90; Harb et al., 2002). However, IPSM scores also may be broken down into sub-scale scores within the following dimensions: Interpersonal Awareness (Items 2, 4, 10, 23, 28, 30, 36), Need for Approval (Items 6, 8, 11, 13, 16, 18, 20, 34), Separation Anxiety (Items 1, 12, 15, 17, 19, 25, 26, 29), Timidity (Items 3, 7, 9, 14, 21, 22, 32, 33), and Fragile Inner-Self (Items 5, 24, 27, 31, 35). Internal consistency estimates range from .67 to .81 for these subscale scores in community samples, and from .40 to .81 SAD samples (Boyce & Parker, 1989; Harb et al., 2002).

Cognitive Tasks

Letter-Number Sequencing Subtest (LNS; Wechsler, 2008a, 2008b). The LNS is a subtest of the Wechsler Adult Intelligence Scale – IV that indexes an individual's ability to manipulate and organize lexical and numerical information over and above attending to and holding that information in working memory (Wechsler, 2008b). LNS has shown to be the most highly-correlated with the Digit Span WAIS-IV subtest (r = .69), contributes substantially to the working memory factor (loading for total group = .77), which is a good indicator of general intelligence (Sattler & Ryan, 2009). Moreover, LNS accounts for 45% of the overall variance in general intelligence out of the supplemental WAIS-IV subtests (Sattler & Ryan, 2009). Aligning with past research (Baker et al., 2014), this task will be used as an index of intelligence as a way to control for individual variability in executive functions that may contribute to baseline differences in emotion expression identification. In LNS, participants are instructed to listen to a series of letters and numbers. Participants then repeat the sequence of numbers back in ascending order and the sequence of letters back in alphabetical order. The full task begins with sequences of 3 letters and numbers and ends with sequences of 8 letters and numbers. Each sequence length is presented for three trials. The task is completed after participants fail to order each sequence length correctly across each trial. Total subtest raw scores, which range from 0 to 30 with a maximum letter-number sequence of 8 letters and numbers, will be used for analyses to capture the full range of variability in LNS scores.

Emotion Processing Tasks.

Facial Flanker Paradigm (FFP; Eriksen & Eriksen, 1974; Moser et al., 2008). Based on a paradigm developed by Moser and colleagues (2008), participants will view a series of pictures of faces displaying either neutral or emotional facial expressions. This task will be used to assess attentional and cognitive biases as well as information and emotion processing as indexed by the LPP. The FFP is based on a modification of the Eriksen Flankers task, which is a version of an oddball paradigm (Eriksen & Eriksen, 1974). Within this task, participants are exposed to sets of three facial images comprised of two similar positively- or negatively-valenced emotional facial expressions (i.e., distractors) and 1 facial expression displaying the opposing emotion (i.e., target). Similarly, traditional Flankers paradigms utilize congruent and incongruent trials of stimuli. Thus, the FFP utilizes congruent trials of three facial stimuli all showing the same expression (i.e., threatening or reassuring), as well as incongruent trials of facial stimuli.

Incongruent facial stimuli trials include either two faces displaying a threatening expression and one face displaying a reassuring expression, or two faces displaying a reassuring expression and one face displaying a threatening expression. All participants will be exposed to an equal number (12 blocks of 48 trials) of counterbalanced incongruent and congruent trials for each reassuring and threatening expression following two blocks of 24 practice trials (Moser et al., 2008).

In line with Moser and colleagues (2008), a fixation cross will be presented at the center of the screen for an average of 2100ms (range = 1800ms to 2400ms) during the interstimulus interval to reduce eye movement and to focus participants' attention on the task. Stimuli will be presented against a black background in the center of the screen for a duration of 500ms (Moser et al., 2008). Participants also will be seated approximately 50cm from the computer screen. Using right and left arrow keys on a keyboard, participants will be instructed to categorize the target face as either being positively- or negatively-valenced as fast and as accurately as they can when presented with a blank response screen after the 500ms stimulus presentation window.

Procedure

All procedures will be approved by the Institutional Review Board at Oklahoma State University. During recruitment, participants will respond to SONA advertisements for participation in either the stranger exclusion or "close other" exclusion conditions. After scheduling their research appointments in the laboratory, informed consent will be completed for both participants as well as for their close other (hereafter referred to as dyads) in the "close other" exclusion condition. Following informed consent, participants and dyads will have a neutral-expression photograph taken for inclusion in the Cyberball task. Participants will complete a series of baseline questionnaires (i.e., demographics, SIAS, SPS, IPSM, BFNE, FPES) online using the Qualtrics platform. Participants will then complete a computerized version of the Letter-Number Sequencing (LNS) subtest of the Wechsler Adult Intelligence Scale, 4th Edition (WAIS-IV). Following completion of questionnaires, trained research assistants will attach sensors to record EEG and EOG (i.e., vertical and horizontal eye movements), as well as peripheral physiological measures such as ECG (i.e., heart rate) and skin conductance measurements during behavioral and cognitive tasks. EOG and ECG data will serve as indices of physiological reactivity and stress to study task manipulations (e.g., Cyberball, FFP). Participants will then complete the RMET as an index of baseline abilities to accurately identify a range of emotional expressions. Next, participants will complete a modified oddball task based on work developed by Moser and colleagues (2008). Following this oddball task, participants will be complete both the inclusive version and the exclusive version of the Cyberball task with a stranger or as a dyad. These Cyberball versions will be counterbalanced across participants. Immediately after responding to exclusion manipulation check items for each Cyberball task, participants will complete a second and third oddball task using different sets of images. After completion of all tasks, participants and dyads will be debriefed.

Physiological Recordings. EEG data will be collected using MP150 hardware from BIOPAC Systems. AcqKnowledge software will be used to record EEG data from sensors. This activity will be collected using nine sensor channels (F3, Fz, F4, C3, Cz, C4, P3, Pz, P4) using Electro-Cap International Inc. electrode caps. Activity will be recorded at a sampling rate of 250Hz and will be passed through a bandpass filter of .1-35Hz. All EEG sensor channels will be referenced to a sensor placed on the right mastoid. Additionally, right and left mastoid sensors will be averaged and each channel will be re-referenced to this average following data collection. Lateral eye-movements will be measured using a silver-chloride sensor placed on the skin surrounding the outer corners of each eye, and vertical eye-movements will be measured using sensors placed above and below the right eye. Peripheral physiological data (i.e., ECG, GSR) also will be collected. Heart rate data will be collected using two silver-chloride sensors placed on the torso. The first sensor will be placed beneath the left clavicle adjacent to the shoulder, and the second sensor will be placed on the left ribcage adjacent to the navel. This placement corresponds to a traditional three-lead configuration (Andreassi, 2007). Galvanic Skin Response data will be collected using two silver-chloride sensors on the pads of the index and ring fingers of the non-dominant hand.

Physiological data will be processed using the EEGLAB version 13.5.4b (Delorme & Makeig, 2004) and ERPLAB version 7.0 (Lopez-Calderon & Luck, 2014) applications within MATLAB. A Butterworth low-pass filter with a half-amplitude cutoff of 30Hz and a 12dB roll off will be applied to data offline. TTL signals will be used to mark activity in response to stimulus events. EEG activity will be epoched for 200ms prior to stimulus onset and will serve as a baseline period for ERP activity. P3 amplitude and latency will be measured in a window of 100-800ms after each player receives the ball during the Cyberball task in line with Gutz and colleagues (2015). LPP amplitude and latency will be measured in a window of 200-800ms after stimulus presentation during the FFP in line with previous literature (Moser et al., 2008; Moran et al., 2013). Artifact rejection will be completed using Independent Component Analysis within ERPLab to remove lateral and vertical eye movements. Accordingly, following Independent Component Analysis and upon visual inspection of the data, any remaining trials that include such artifacts will be excluded from creation of component amplitude grand averages. Similarly, participants will be excluded from analysis if 25% or more of their experimental trials are rejected (Luck, 2014). Peripheral heart rate data will be processed using QRSTool (Allen et al., 2007) to extract R-wave peaks to be used in calculation of respiratory sinus arrhythmia (RSA), which will serve as an index of parasympathetic nervous system function during tasks (i.e., low RSA associated with greater anxiety symptoms; Friedman, 2007). Peripheral skin conductance data will be processed using offline filters.

Analytic Strategy. The present study will utilize a mixed factorial design with between-subject factors of SA (Low SA concerns, High SA concerns) and interpersonal dyad group (close other, stranger), and a within-subjects factor of Cyberball manipulation (exclusion, inclusion). As a result, these factors will be assessed on multiple outcomes, including reaction time, P3 amplitude, and LPP amplitude, using a series of mixed-model ANOVAs. Preliminary analyses will be conducted to evaluate effects due to percentage of correct emotion identification responses in the FFP. In line with Field (2009), we will assess data for assumptions of normality, homogeneity of variance, and sphericity. Homogeneity of variance across treatments will be assessed using an F_{max} test. We will assess for sphericity using Mauchly's test, and make appropriate Huynh-Feldt or Greenhouse-Geisser corrections accordingly (Field, 2009; Girden, 1992). If significant interaction effects are observed, post-hoc dependent samples *t*-tests using Bonferroni corrected α criteria will be conducted to assess for differences between model factors.

VITA

Danielle Erica Deros

Candidate for the Degree of

Master of Science

Thesis: THE COGNITIVE EFFECTS OF SOCIAL EXCLUSION IN SOCIAL ANXIETY

Major Field: Psychology

Biographical:

Education:

Completed the requirements for the Master of Science in Psychology at Oklahoma State University, Stillwater, Oklahoma in December, 2021.

Completed the requirements for the Bachelor of Science in Biological Sciences at University of Maryland at College Park, College Park, Maryland in 2016.

Completed the requirements for the Bachelor of Science in Psychology at University of Maryland at College Park, College Park, Maryland in 2016.

Experience:

Laboratory of Emotion and Psychophysiology, Stillwater, OK
2018-Present
Graduate Student, Oklahoma State University
Primary Investigator: Dr. DeMond M. Grant, Ph.D.

Comprehensive Assessment and Intervention Program, College Park, MD
2013-2016
Undergraduate Research Assistant and Project Coordinator, University of Maryland at College Park
Primary Investigator: Dr. Andres De Los Reyes, Ph.D.