2021

Does Nonattachment Predict Levels Of Experimentally Induced Social Stress And Cognitive Features Of Social Anxiety Disorder? Possible Implications For Future Treatment

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DOES NONATTACHMENT PREDICT LEVELS OF EXPERIMENTALLY INDUCED SOCIAL STRESS AND COGNITIVE FEATURES OF SOCIAL ANXIETY DISORDER? POSSIBLE IMPLICATIONS FOR FUTURE TREATMENT

A dissertation

Presented to

The College of Graduate and Professional Studies

Department of Psychology

Indiana State University

Terre Haute, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Psychology

By

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July 2021

Keywords: Nonattachment, social anxiety, mindfulness, self-focused attention, rumination, social evaluative threat

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of

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ABSTRACT

Social anxiety disorder (SAD) is characterized by a fear of negative evaluation that often results in behaviors such as avoidance intended to mitigate the risk of making a negative impression on others or making their social anxiety known (American Psychiatric Association, 2013). Engaging in self-focused attention is a covert manner in which individuals with SAD can protectively monitor their speech, behavior, and physical symptoms of anxiety (e.g., blushing) in an effort to compensate for their perceived susceptibility to negative evaluation (Clark & Wells, 1995). Self-focused attention in social anxiety has been widely studied and found to elevate rather than alleviate anxiety during social interactions (Gaydukevych & Kocovski, 2012; Mellings and Alden, 2000; Woody & Rodriguez, 2000). Although cognitive-behavioral therapy with exposure is currently the gold standard intervention for SAD, mindfulness meditation has been identified as an additional avenue to treating social anxiety (Feske & Chambless, 1995; Goldin et al., 2009). One of the ways mindfulness meditation has been found to impart its mental health benefits is by cultivating nonattachment, or the ability to "let go" of desired outcomes, including the desire to make a good impression on others, and embrace whatever transpires in one's present reality (Sahdra et al., 2010). In the present study, it was expected that high trait nonattachment would be associated with lower self-reported anxiety and cardiovascular reactivity in response to two role-play tasks designed to elicit social anxiety related to maintaining one's level of competence (agency) and/or ability to get along with others (communion). Given that the desire to make a good impression is understood to catalyze self-focused attention in the first place (Clark & Wells, 1995), it was expected that lower levels of self-focused attention during the first task would account for lower levels of social stress in participants higher in nonattachment. Rumination following the first task was also expected to

serve as an additional mediator given findings that rumination perpetuates social anxiety and that rumination is negatively associated with nonattachment (Coffey & Hartman, 2008; Mellings & Alden, 2000; Rachman et al., 2000; Wong & Moulds, 2011). Given previous literature that suggests reducing self-focused attention facilitates habituation to stressful social tasks (e.g., Renner et al., 2017; Wells & Papageorgiou, 1998), self-focused attention was expected to mediate the relationship between social evaluative threat and reduction in psychophysiological reactivity from the first to second task. Although these hypothesized relationships were not supported, nonattachment was found in ancillary analyses to be associated with lower levels of self-reported pre-task anxiety and rumination during the second exposure. In additional analyses, cardiovascular reactivity while listening to one's conversation partner via an audio recording was found to be highest in participants who reported higher levels of self-focused attention and were in a condition that enhanced agency threat. Finally, individuals under agency threat who experienced a greater decrease in self-focused attention from the first to second task were found to experience significantly less cardiovascular reactivity during the second listening task. The implications of these findings for future clinical research, especially with regard to ways in which mindfulness meditation could be optimally integrated into exposure therapy, are discussed.

ACKNOWLEDGEMENTS

I would like to thank those who have provided me with the knowledge, resources, strength, and love along the way that have enabled me to reach the end of my graduate education. First and foremost, I would like to thank my family, friends, and fellow students who have supported me along the way. Thank you, Sam Ziegler, for being my closest friend over the past 5 years in the program, and for sharing the same sense of creativity and dry humor that has helped us laugh through the tough days. I would also like to thank my husband for his kindness and patience throughout the long hours spent on this project and his openness to my regular ramblings about my findings (or lack thereof). Thank you, Mom and Dad, for instilling the drive and confidence to pursue my goals in the first place and for providing any kind of support I needed along the way.

I would also like to express my deep gratitude for the professors and supervisors who have provided me with the knowledge and skills to take on this project, from formulating this research idea in the first place to defending it. I would like to thank Dr. Joseph McNamara for the opportunity to shadow numerous exposure therapy sessions in which I witnessed active efforts to reduce attentional avoidance during exposures, which led me to connect the concepts of mindfulness and social anxiety in the first place. I would also like to acknowledge the additional inspiration imparted by the writings of the Early Church Fathers, who richly illustrated the lifelong struggle of orienting our attention away from ourselves and towards others. Additionally, I would like to also thank Dr. Michael Urban for his particularly strong influence on my clinical knowledge, approach to conceptualization, and problem-solving that has permeated my abilities as a researcher as well. I would like to extend additional thanks my

fellow lab members, Katie Niehus, Ari Feinstein, Cara Luchtefeld, and Joseph Twitdy, who have helped collect the data that made this dissertation possible.

Thank you, Dr. Kevin Jordan, for taking on the role of dissertation chair as well as for the time and effort it took to see this project through. There have been several times in which I thought I had looked at and formulated things from every angle, and you contributed new findings and insights that elevated this project in ways I couldn't hope to achieve myself. Thank you also for putting me on the path of health psychology and eventually finding my niche as a pain psychologist. Finally, I would like to thank my two other committee members, Dr. Virgil Sheets and Dr. Kevin Bolinskey. Thank you, Dr. Sheets, for the intellectually stimulating discussions in your social psychology class as well as your kind insights about the dissertation process along the way. Thank you, Dr. Bolinskey, for instilling my foundational knowledge of statistics and confidence in my abilities that have enabled me to take on the aspect of this project about which I was most apprehensive. Running statistics, as it turns out, is actually quite fun!

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INTRODUCTION

Social anxiety disorder (SAD) is the fourth most common mental disorder in the United States and is the second most common anxiety disorder in the United States population overall (Kessler, Berglund, et al., 2005). This relatively prevalent disorder is marked by excessive fear, and often avoidance, towards interacting with others and being evaluated in a social context (American Psychiatric Association, 2013). Cognitive-behavioral therapy (CBT) that includes exposure in which clients are assisted in confronting their feared scenarios has been found to be the most effective treatment for SAD (Feske & Chambless, 1995; Hofmann & Otto, 2008). However, the efficacy of CBT for SAD tends to be lower than for other anxiety disorders such as post-traumatic stress disorder, and a considerable number of individuals with SAD fail to sufficiently benefit from this treatment modality. For example, Otto et al. (2000) found that only a quarter of participants with SAD achieved full remission status following 12 weeks of treatment. Thus, a major undertaking in SAD research has been to identify factors that could potentially augment components of CBT for this disorder, namely exposure therapy, given its integral role in treatment.

According to Rescorla and Wagner (1972), exposure therapy for anxiety disorders may be more or less effective depending on the level of attentional focus on exposure tasks (Craske et al., 2014). When one fully attends to a feared stimulus (e.g., a dog in the case of an animal phobia) in the absence of the feared outcome (e.g., being bitten), negative expectations can be maximally disconfirmed (e.g., dog ≠ bite), resulting in reduced fear levels in future exposures. However, anxious patients are often observed to distract themselves during exposures (e.g., avoiding looking at the feared stimulus), which has been found to dramatically reduce treatment gains. For example, distraction during exposure therapy for individuals with obsessive-

compulsive disorder (Grayson et al., 1982) and claustrophobia (Kamphuis & Telch, 2000) has been found to result in significantly poorer treatment outcomes. For this reason, exposure therapy manuals and protocols often recommend that therapists reduce distraction and maximally increase attentional focus during exposure exercises (e.g., Hirai et al., 2007).

The two leading cognitive theories of SAD suggest that socially anxious individuals are particularly vulnerable to maladaptive attentional focus during exposures, whether inside or outside of a clinical setting. Clark and Wells (1995) argue that social anxiety is maintained by intense pressure to make a good impression on others and strong doubts about one's ability to do so, leading these individuals to turn inwards and fixate on their physical sensations (e.g., blushing) and negative evaluative thoughts rather than observing the potentially positive reactions of the people around them. This process also prevents individuals with SAD from processing social cues, which further decreases their perceived self-efficacy. Ultimately, their withdrawn interpersonal stance encourages less friendly behavior from others, confirming negative self-evaluations. In this way, individuals with SAD can be exposed to a number of social situations and never experience fear-reducing learning experiences as a result of their self-focused attention.

In contrast, according to the model posited by Rapee and Heimberg (1997), the tendency of socially anxious individuals to view others as inherently threatening and judgmental leads to excessive attending to cues they believe to be indicative of social threat, which amplifies and maintains their anxiety. There is strong empirical support for both the Rapee-Heimberg model (e.g., Bar-Haim et al., 2007; Heinrichs & Hofmann, 2001; Mogg et al., 2004) and the Clark-Wells model (e.g., Chen et al., 2002; Grant & Beck, 2006; Mellings & Alden, 2000). Findings by Calamaras et al. (2012) suggest that these two models do not necessarily conflict in that some

individuals with SAD were found to be self-focused while others were found to be hypervigilant towards threat. There is also some support for a hypervigilance-avoidance hypothesis, which describes initial scrutiny of threat followed by avoidance in individuals with social anxiety (Williams et al., 1988; Wieser et al., 2009). Despite the differences in these models, they share one major component in common: the prevention of fear-reducing, corrective learning experiences as a result of distorted attention during social situations.

Experimental studies support that maladaptive attentional focus during social exposure tasks can result in more negative learning experiences and greater anxiety. Mellings and Alden (2000), for example, found that participant-reported self-focused attention during a social interaction was associated with negative appraisals of one's self following the performance and poorer memory about details related to their conversation partners. Increasing self-focused attention through experimental manipulations has also been found to increase anticipated task anxiety and anxious body language (Woody & Rodriguez, 2000) as well as negative thoughts regarding performance (Gaydukevych & Kocovski, 2012). In contrast, in a small (N=8) but seminal study Wells and Papageorgiou (1998) found that exposure therapy with the addition of encouragement to focus attention externally towards other people reduced anxiety and negative expectations of social events (e.g., "I'll look like a fool") as well as increased focus towards one's environment significantly more than exposure alone. Moreover, in a more recent and larger study (N=45), Renner et al. (2017) found that a focus-of-attention behavioral experiment (FABE) in which patients alternated between self-focused and externally focused attention during exposures was more efficacious than exposure alone. The success of these interventions is consistent with the prediction of Rescorla and Wagner (1972) that a fear extinction procedure is only as effective as the attention it is given.

Attention modification procedures designed to reduce vigilance to socially threatening stimuli have been found to produce positive effects. For example, a task involving ignoring threatening pictures and orienting towards accepting pictures was found to increase self-confidence in individuals with low self-esteem (Dandeneau et al., 2007). Moreover, a probe detection task that trained orientation away from threatening faces was found to reduce both clinician- and self-reported SAD symptoms (Amir et al., 2009). These data may suggest that attention modification procedures during social exposures may be helpful for socially anxious individuals who are more hypervigilant to threat in addition to those who are more self-focused.

Taken together, these studies suggest that individuals high in social anxiety have characteristic attention biases that can prevent corrective learning experiences and fear reduction in exposure therapy, and that encouraging an external focus of attention, at least according to two small studies, can augment exposure therapy. However, it can be difficult for socially anxious individuals to decrease their self-focused attention and/or hypervigilance towards threat during a social situation after simply being instructed to do so, given that these are major safety behaviors for individuals with SAD (Renner et al., 2017). Moreover, even if socially anxious individuals successfully focus their attention outward, cognitive theories of SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997) and behavioral studies (e.g., Winton et al., 1995) suggest that these individuals are more likely to interpret benign social stimuli in a negative manner. For example, patterns of amygdala activation in response to neutral faces in individuals with SAD suggest greater perception of threat in response to ambiguous social cues (Cooney et al., 2006). Thus, exposure therapy for social anxiety should be most effective while facilitating a flexible focus of attention, as opposed to self-focus and/or hypervigilance toward threat, and reducing negative interpretations of social events.

Mindfulness meditation, a practice involving directing focus toward present experiences with openness and curiosity rather than immediate judgement of events (Kabat-Zinn, 1990), has been proposed as a method of enhancing exposure therapy for anxiety disorders. Treanor (2011) argues that mindfulness can facilitate extinction learning during exposures by increasing the patient's attention toward various aspects of feared stimuli during the exposure, and by acting as a retrieval cue for past corrective learning experiences during future exposures. A mindful state promoting a broadened and flexible focus of attention during exposures may be particularly beneficial for individuals with SAD, given their characteristic attention biases that prevent positive social experiences. Moreover, mindfulness meditation discourages automatic labeling of events, which may prevent negative interpretations of social cues (e.g., taking a neutral facial expression at face-value rather than as a sign of poor social performance). The success of mindfulness-based interventions for improving social anxiety symptoms, negative perceptions of social events, and attention regulation in individuals with SAD (Cassin & Rector, 2011; Goldin et al., 2009; Norton et al., 2015) as well as evidence that trait mindfulness is associated with lower general social anxiety (Schmertz et al., 2012) and stress responses to social evaluation (Brown et al., 2012) further suggests that mindfulness may be a useful adjunct to exposure therapy.

Levels of nonattachment, or the ability to relate to one's experience in an adaptable manner without grasping to desired experiences or avoiding negative experiences, are found to be high in those who regularly practice mindfulness meditation (Sahdra et al., 2010). There is strong support that nonattachment is a major mechanism by which mindfulness reduces anxiety, depression, ruminative thinking, and other mental health problems (Coffey & Hartman, 2008; Whitehead et al., 2019). Mindfulness meditation could also be beneficial for treating SAD in that

it promotes nonattachment. For example, reduced attachment towards earning social approval could reduce performance-related anxiety and obviate the need for safety behaviors such as excessive self-focused attention. Moreover, nonattachment is inversely related with rumination, which plays a large role in maintaining SAD (Mellings & Alden, 2000; Rachman et al., 2000; Wong & Moulds, 2011). It may therefore be beneficial to explore the relationship between nonattachment, social anxiety, and various maintaining factors to potentially inform future treatment.

In the present study, participants completed two consecutive social exposure tasks involving a role-played interaction in front of an audience. Questionnaires administered before and after the exposures allowed the researcher to examine if nonattachment predicted greater or lesser anxiety (both as indicated by self-report and cardiovascular reactivity), ruminative thoughts, and self-focused attention in response to the exposures. It was predicted that individuals high in nonattachment would be least prone to social stress during the exposures, and that this relationship would be mediated by rumination and self-focused attention. Consistent with previous literature on the benefits of reducing self-focused attention (e.g., Renner et al., 2017; Wells & Papageorgiou, 1998), self-focused attention was also expected to function as a mediator between social evaluative threat and reduction in psychophysiological reactivity from the first to second role-play. It is hoped that evidence from this study could be used to inform future mindfulness-based interventions for SAD.

LITERATURE REVIEW

Clinical features of SAD

Social anxiety disorder (i.e., SAD) is defined in the DSM-5 as a condition lasting 6 months or longer in which the individual experiences intense anxiety about social interactions

(e.g., conversations) or performance situations (e.g., giving a speech) (APA, 2013) that leads to impaired functioning. The level of anxiety experienced by individuals with SAD in feared social situations is out of proportion to what outcomes can be reasonably expected from these events. For example, while intense stress levels resulting from a high-stakes job interview would not necessarily constitute pathology, the same level of fear resulting from conversing with a coworker may be cause for concern. Exposure to feared social situations almost always produces great discomfort as well as feelings of vulnerability to being negatively evaluated. Individuals with SAD may also become preoccupied with their physical symptoms of anxiety such as blushing and are further distressed about others potentially noticing these symptoms. Due to the distress and worry produced by social situations, individuals with SAD often avoid these situations either completely or in more subtle manners (e.g., avoiding eye contact). A "performance only" specifier allows for the classification of individuals who experience anxiety about performance situations exclusively.

Estimates from large-scale epidemiological surveys of the 12-month and lifetime prevalence rates of SAD in the United States are about 7% and 12% respectively, making SAD the second most common anxiety disorder nationwide (Kessler, Berglund, et al., 2005; Kessler, Chiu, et al., 2005; Ruscio et al., 2008). Although specific phobia has slightly greater prevalence rates, cases of SAD are more likely to be classified as moderate or severe (in terms of impairment in functioning, suicidality, etc.). Prevalence rates of SAD tend to be higher in younger age groups, females, and individuals of lower socioeconomic status (Grant et al., 2005). As for race, African Americans and Hispanic individuals have been found to be less at risk for SAD (Ruscio et al., 2008).

SAD tends to develop in childhood or early adolescence, with a median age of onset at 13 (Chavira & Stein, 2005; Kessler, Berglund, et al., 2005; Stein & Stein, 2008). It is estimated that about 50% of individuals with SAD develop the disorder by age 11 and 80% by the end of their teen years. Onset in adulthood is comparatively rare and generally follows a distressing interpersonal event or major life transition (APA, 2013). The prevalence of SAD in older adulthood is markedly lower, about 2%, although it is unclear whether these lower numbers reflect the developmental trajectory of the disorder or cohort effects (Gum et al., 2009). Individuals with SAD tend to experience a chronic course of symptoms, with 60-80% not having experienced recovery (2 or more years without symptoms) during the first 20 years following symptom onset and 40-60% not recovering within 40 years. These low rates of recovery may be due in part to SAD being an undertreated condition. It is estimated that about a third of individuals with SAD, even as low as 20% in one large epidemiological survey, receive treatment (Grant et al., 2005; Ruscio et al., 2008). When individuals with SAD do receive treatment, typically in their late 20's, over 15 years has often passed since the onset of their symptoms.

Over 90% of individuals with SAD have been found to report impairment in major areas of functioning, with over a third of individuals endorsing severe impairment (Ruscio et al., 2008). Regardless of symptom severity, the most commonly reported fear among individuals with SAD is performance/public speaking situations (Grant et al., 2005; Ruscio et al., 2008). This is consistent with findings that about 90% of individuals note impaired speaking performance as a result of SAD symptoms, with slightly lower percentages for impairment in relationships and social life (Craske, 1999; Ruscio et al., 2008; Wallach et al., 2009). Further adding to reduced levels of functioning, it is estimated that about two-thirds of individuals SAD

have a comorbid mental disorder, with higher rates of comorbidity in individuals with five or more social fears. Additional anxiety disorders, mood disorders, as well as avoidant and dependent personality disorders most commonly co-occur with SAD (Grant et al., 2005; Keller, 2006).

Performance anxiety and interaction anxiety are often distinguished from one another in SAD research (Hook et al., 2013; Leary, 1983; Liebowitz, 1987). Performance anxiety refers to discomfort arising from situations in which one is being observed or evaluated, whereas interaction anxiety involves reciprocal communication (e.g., meeting and talking with others). Performance anxiety and interaction anxiety often co-occur, as evidenced by performance situations being most commonly feared in socially anxious individuals as well as by the high correlation between measures of interaction and those that measure performance anxiety (Heidenreich et al., 2011; Mattick & Clarke, 1998). However, some differences between performance and interaction anxiety have been found in the literature. For example, self-confidence related to social evaluative tasks such as public speaking is lower in individuals with performance anxiety compared to individuals with interaction anxiety. Moreover, preoccupation with physical symptoms and post-task rumination can be more prominent in individuals high in performance anxiety (Holzman et al., 2014; Hook et al., 2005).

An additional distinction made in social anxiety literature is between individuals with subclinical levels of social anxiety and individuals who meet full criteria for SAD. Due to the higher prevalence rate of subclinical social anxiety in the population (about 20%) versus SAD (lifetime prevalence of about 12%), participants with subclinical social anxiety are often relied upon in SAD research (Crişan et al., 2016; Ruscio et al., 2008). Individuals with subclinical levels of social anxiety have been found to exhibit similar affective, physiological, and cognitive

features found in individuals with SAD, such as high levels of self-focused attention and negative rumination following a social event (Mellings & Alden, 2000). In a more recent study, Crișan et al. (2016) found that individuals with subclinical social anxiety experienced high negative affectivity, negative beliefs related to the consequences of negative social evaluation, cortisol reactivity, and behavioral changes (e.g., fearful facial expressions) that mirror individuals with SAD. Such similarities between these two populations support the use of research on subclinical social anxiety to inform the treatment of SAD.

Etiology

Cognitive

Albert Bandura's social cognitive perspective (e.g., Bandura, 2001) is one of the earliest theories to emphasize the role of cognitive processes in determining interpersonal behavior. The concept of self-efficacy is central to Bandura's theory. If individuals doubt that that they are capable of producing positive outcomes through an action, Bandura explains, they will be less inclined to carry out that action. The construct of self-efficacy has had strong research support through the decades and has been found to play a role in a number of mental disorders. Bandura (1983), for example, demonstrated that individuals who doubted their ability to handle potential negative outcomes of an event exhibited phobic avoidance of that event. Bandura also emphasized the importance of attention in social learning, stating that merely exposing individuals to certain stimuli does not guarantee that they will be perceived; individuals must adequately recognize and attend to a stimulus in order to learn from it (Bandura, 1969). Bandura believed this concept to be self-evident, and the crucial role of attention in the learning process has been well-documented (e.g., Nissen & Bullemer, 1987; Jiang & Chung, 2001; Treisman & Gelade, 1980).

Decades later, Bandura's ideas are reflected in one of the two most prominent cognitive theories of SAD. Clark and Wells (1995) have proposed that social anxiety is maintained through poor self-efficacy regarding one's social skills and high levels of self-focused attention on internal cues (e.g., negative evaluative thoughts, blushing) that are frequently misinterpreted as representing failure during social situations. Because self-focused attention prevents one from attending fully to their conversation partners, individuals with SAD may fail to attend to external evidence (e.g., smiling conversation partners) that may counteract their negative beliefs, which in effect, maintains their social anxiety. In contrast, Rapee and Heimberg (1997) argue that SAD is maintained through a schema that others are bound to judge one negatively, leading to excessive attention toward social cues perceived as threatening (e.g., changes in facial expression), intensifying their anxiety. These two cognitive theories of the maintenance of social anxiety have been frequently discussed and evaluated in SAD research. While some studies support the notion that vigilance and attention toward possible negative social evaluation perpetuates the disorder, others suggest that it is actually attentional avoidance of social stimuli that maintains the disorder (Mogg et al., 2004). These contrasting findings, respectively, make the Rapee-Heimberg model and Clark-Wells model appear to conflict at first glance.

Attention biases in research are most commonly assessed through the emotional Stroop test, in which participants say aloud the colors in which various words are written (Bögels & Mansell, 2004). Researchers using this methodology conclude that participants are selectively attending to certain words if they are delayed in naming their colors relative to other words. Numerous researchers using this methodology have found that socially anxious individuals are delayed in naming the colors of words related to social threat (e.g., "offended") (e.g., Andersson et al., 2006; Becker et al., 2001; Grant & Beck, 2006). Although the delayed response to these

threat words is often interpreted to represent vigilance toward social threat and difficulty disengaging from these stimuli, no available evidence clearly suggests that vigilance rather than other cognitive processes accounts for delays in color-naming. Because these results may very well represent cognitive avoidance (e.g., distracting oneself from the threatening word, and in turn, the color of the ink) or merely a startle response rather than vigilance for threat, these results must be interpreted with caution. Additionally, the ecological validity of these sorts of experiments has been questioned (Bögels & Mansell, 2004).

The modified dot-probe task allows researchers to better distinguish avoidant from vigilant responding to socially threatening stimuli. In this task, participants view one threatening and one neutral word on a computer screen, after which a dot appears in the location of one of the previously displayed words. Quick button presses in response to the dot suggests that the participant was selectively attending to the word previously displayed in that area. The results of studies using this technique have been mixed, with some studies supporting vigilance toward or difficulty disengaging from threat words (Amir et al., 2003; Asmundson & Stein, 1994) and others finding no significant results using this methodology (Horenstein & Segui, 1997; Pishyar et al., 2004).

More promising findings have resulted from studies that use dot-probe tasks involving pictures of faces rather than text. For example, Pishyar et al. (2004) failed to find significant results using the text version of the task but found evidence for hypervigilance to social threat when they used negative faces for threatening stimuli as did Mogg et al. (2004). Sposari and Rapee (2007), however, found that participants with SAD attended to *all* types of facial expressions more than controls without SAD. Moreover, additional studies using the same method found evidence for avoidance of faces (Chen et al., 2002; Yuen, 1994). These mixed

results may be due to the limitations of computer tasks in simulating social threat as well as slight differences in methodology. The program used by Sposari and Rapee (2007), for example, allowed participants to view the faces for 500 ms whereas this time was double the amount in the study by Chen et al. (2002). A shorter amount of time may reduce the likelihood the participant has time to orient away from a threatening word following detection.

The results of studies in which eye-tracking technology is used to measure attention to stimuli have also been mixed but have produced more nuanced results. Horley et al. (2003) found evidence that individuals with SAD avoid looking at various types of facial expressions while Garner et al. (2006) found evidence of hypervigilance to neutral faces in socially anxious individuals. The results of later studies, however, suggested that individuals with SAD initially scrutinize faces, especially those with angry expressions, and subsequently disengage (Horley et al., 2004; Garner et al., 2006; Wieser et al., 2009). This is consistent with the vigilance-avoidance hypothesis (e.g., Williams et al., 1988) that states that anxious individuals initially scan for and detect threatening stimuli, after which they revert to an avoidance state (Grisham et al., 2015). Although some studies have observed continued focus on faces without an avoidance component (Buckner et al., 2010; Gamble & Rapee, 2009; Schofield et al., 2012), the evidence to date suggests that the processes described in the Clark and Wells (1995) and Rapee and Heimburg (1997) models can co-occur.

Although computer tasks such as those using eye-tracking technology can allow for detailed data on gaze duration and location, their lack of ecological validity limits their support for cognitive models of SAD. Both Clark-Wells and Rapee-Heimberg models begin with the assumption that one is in danger of being negatively evaluated or rejected. Words and unmoving faces on computer screens do not pose these threats, and therefore may not warrant the intense

self-monitoring or vigilance in which individuals with SAD may engage during actual social events. In contrast, Mellings and Alden (2000) carried out a task in which participants described themselves to a research assistant for ten minutes. Subsequent questionnaire data suggested that socially anxious individuals were more self-focused and had more negative evaluative thoughts during this interaction. Moreover, increasing self-focused attention during social tasks through various methods (e.g., using mirrors) has been found to increase anxiety (Bögels, et al., 2002; Gaydukevych & Kocovski, 2012). Woody and Rodriguez (2000) additionally noted that both socially anxious and non-socially anxious controls experience greater anxiety in conditions designed to increase self-focused attention (giving and hearing a speech about their present thoughts, feelings, etc.). The present author is unaware of any studies to date involving live interactions that suggest vigilance toward threatening social stimuli, which would be consistent with the Rapee-Heimberg hypothesis, as opposed to self-focused attention. It is possible that the mixed research findings on attention biases in SAD is in part due to studies involving interpersonal interactions being less common compared to computer studies, which may produce more inconsistent data.

Additional evidence suggests that the discrepant results in studies of attention biases in individuals with SAD could be due to the possibility that levels of vigilance and avoidance vary from patient to patient. Calamaras et al. (2012) used a dot-probe paradigm and a questionnaire that measured threat expectancy to determine if participants with SAD varied in their style of attentional focus. Two significantly different groups emerged: one with a predominantly avoidant style and another with a predominantly vigilant style. Fascinatingly, after the two groups underwent cognitive-behavioral therapy, the nature of symptom reduction in participants corresponded with their pre-treatment attentional style. The vigilant group exhibited significantly

less fixation on social threat cues following treatment, and the avoidant group became significantly more attentive to social cues as a result of reduced self-focused attention. This study has generated preliminary evidence that vigilance and avoidance are two unique attentional styles associated with SAD that correspond with either the Rapee-Heimberg or Clark-Wells model of social anxiety maintenance. Thus, conflicting research findings that support one model over the other may not exclusively be explained by error and methodological differences, but could reflect the existence of two unique styles of attention that can maintain SAD.

In addition to attention biases, ruminative cognitions before and after social events appear to intensify symptoms of SAD and maintain the disorder as well. Clark and Wells (1995) first postulated that individuals undergo a detailed "post-mortem" review of their performance following social interactions. Rachman et al. (2000) later corroborated this theory, finding that SAD was correlated with higher levels of negative post-event processing (PEP). The thoughts that occur during PEP tend to be experienced as intrusive and difficult to control. Additional studies on PEP clarified the relationship between PEP and other cognitive processes related to SAD. For example, Mellings & Alden (2000) found that individuals who reported higher self-focused attention during a social interaction were more likely to experience negative PEP, and that this association was strongest in socially anxious participants. The results of an experimental study by Gaydukevych and Kocovski (2012) found that socially anxious participants experienced more frequent PEP during a social interaction if self-focused attention was elevated through pre-task instructions. In a similar study, Holzman and Valentiner (2016) found that initial positive impressions about one's social performance were found to have an inverse relationship with negative PEP for participants in the self-focused attention condition, suggesting that self-focused attention leads to diminished positive thinking about one's performance over time.

Clark and Wells (1995) also postulate that individuals with SAD engage in anticipatory processing that can provoke anxiety even before a social interaction begins. A later qualitative study by Hinrichsen and Clark (2003) consisting of several semi-structured interviews clarified the construct of anticipatory processing, consisting of cognitions related to potential ways to avoid or escape the situation and negative outcomes that can occur, mental imagery about what they will look like during the situation, as well as engagement in safety behaviors (e.g., rehearsing what to say). A questionnaire study by Vassilopoulos (2008) found that individuals with high social anxiety are more likely to mentally prepare themselves with regard to how they will hide their anxiety during social situations and how they can avoid these situations altogether. Experimentally induced anticipatory processing has been found to lead to increased self-reported anxiety, and in turn, poorer speech performance (Wong & Moulds, 2011). Altogether, self-focused attention, hypervigilance towards threat, anticipatory processing, and post-event processing create a negative experience of social situations for individuals with SAD that may prevent corrective social learning experiences from occurring.

Behavioral

Behavioral theorists propose that patterns of negative emotions associated with anxiety disorders develop as a result of classical conditioning and are maintained, along with characteristic behaviors, through operant conditioning. Classical fear conditioning occurs when a previously neutral stimulus (NS) becomes a conditioned stimulus (CS) that elicits fear as a result of having been paired with an unpleasant, unconditioned stimulus (UCS) in the past. In this manner, social anxiety arises due to a history of distressing experiences (UCS) in social situations (CS). Frequent and/or prolonged exposure to the CS in the absence of the UCS leads to a reduction of fear of the CS due to it no longer being a reliable predictor of the UCS, a process

referred to as fear extinction. With regard to operant conditioning, socially inhibited behavior can arise from a history of punishment (e.g., rejection) or insufficient reinforcement (e.g., acceptance) following efforts to interact with others. In the instance of punishment during these interactions, an individual may additionally experience negative reinforcement due to relief from anxiety during periods of isolation, further encouraging avoidance of social situations. Even through observing the social events of others, such as the bullying of another individual, social behavior can be further discouraged.

Together, the processes of classical and operant conditioning can lead to an association of negative feelings and outcomes with social interaction, thus provoking anxiety and reducing motivation for social engagement. The literature on social anxiety suggests interactions with peers appear to be particularly influential learning experiences. Bullying and other forms of relational mistreatment from peers have been correlated with increased rates of social anxiety in children, adolescents, and adults (Craig, 1998; McCabe et al., 2003; Storch et al., 2003).

The behavioral tenet of generalization provides an explanation for why individuals with SAD have been found to exhibit high threat expectancy across a variety of social situations (Lucock & Salkovskis, 1988). Negative interpersonal experiences could lead one to associate people with being ostracized or other negative outcomes, explaining why many individuals with SAD are inhibited and anxious even around people who display friendly, unthreatening behavior. While generalization and conditioning provide a cogent explanation of the onset and nature of SAD symptoms, behavioral conceptualizations alone cannot explain how these symptoms are maintained. It would take a very consistent, large amount of negative social interactions in order for SAD to be maintained for decades without treatment, as it often does, assuming the stance that it is fueled by conditioning alone (Clark & Wells, 1995). Once the number of positive or

neutral social experiences outweigh the negative experiences, behaviors associated with SAD should undergo extinction, but this is clearly not the case considering the sheer number of individuals with SAD, the ubiquity of social interactions, and the longevity of symptoms. In this regard, the previously discussed cognitive approach appears to be a crucial additional component in the maintenance of SAD.

Compared to the literature on cognitive models of SAD, empirical research on the role of conditioning in SAD is relatively sparse. However, the studies that have been done on this topic suggest that both learning through previous social experiences and generalization are components in the onset and maintenance of SAD. Hermann et al. (2002), for example, repeatedly exposed participants with and without SAD to an unpleasant odor (UCS) that was preceded by a picture of a neutral face (CS+), and to another picture of a neutral face that was not paired with an odor (CS-). Elevated skin conductance and startle responses indicated that participants with SAD had greater expectancy of the unpleasant odor during this fear acquisition process, especially when presented with the CS- face (although this particular face had not been paired with the odor). In other words, the fear responses of participants with SAD had generalized to unthreatening social stimuli. Moreover, when both the CS+ and CS- faces were repeatedly presented without the UCS during the extinction learning phase of the experiment, the reduction in fear responses to both faces was delayed in participants with SAD. These findings suggest that individuals with SAD are more likely to expect social threat in the absence of danger, and that these expectancies are less likely to change as a result of innocuous social interactions.

Avoidance learning is key in a more recent cognitive-behavioral theory of anxiety maintenance proposed by Lovibond (2006). According to this model, avoidance of a feared

stimuli reduces the expectancy of its occurrence, which in turn reduces anxiety. The reduction of anxiety functions as negative reinforcement, encouraging future avoidance, and strengthens the belief that the avoidance was warranted. Ly and Roelofs (2009) found support that this general model of anxiety maintenance also applies to SAD, demonstrating that individuals with high social anxiety were more expectant of threat during an avoidance conditioning task. Taken together, the cognitive processes proposed in the Clark-Wells, Rapee-Heimberg, and Lovibond models appear to facilitate fear and avoidance learning.

Personality Factors

While the predominant models of SAD in the literature are cognitive and behavioral, personality factors associated with SAD also have a considerable amount of empirical support (Kaplan et al., 2015). The five-factor theory (FFT) proposed by McCrae and Costa (1999) describes a developmental perspective of personality that allows for a deeper conceptualization of consistent patterns of behavior, including those found in mental disorders. FFT describes personality traits as *basic tendencies* that are rooted in one's biology while acknowledging an indirect effect of the environment on developing consistent behaviors. Basic tendencies and external influences are theorized to give rise to *characteristic adaptations*, which are observable behaviors, strivings, and attitudes (including self-concept) that form in response to environmental demands. The nature of these adaptations rests primarily on the nature of one's basic tendencies, which include varying levels of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness.

It is well-established in the literature that individuals with SAD score high on measures of neuroticism and low on measures of extraversion. Norton et al. (1997), for example, examined these traits in individuals with generalized social anxiety and non-generalized social anxiety.

While anxiety sensitivity and low extraversion were associated with both types of social anxiety, neuroticism most significantly predicted generalized social anxiety. This may suggest that high neuroticism accounts for the consistency of social anxiety across the lifespan more than low extraversion. Although findings on the relationship among the other three personality factors and SAD are mixed, Kaplan et al. (2015) found a possible explanation for these mixed results by considering facets of the five factors in their analyses. For example, low openness to experience was only associated with social anxiety when trust, a facet of agreeableness, was also low. This finding suggests that personality factors have complex associations with SAD, especially when examining these factors at the level of facets.

Although these studies suggest important relationships between SAD and certain traits, the non-experimental, questionnaire-based design of these studies limit what can be known about the directionality of these associations. Do individuals develop SAD because they are innately anxious and introverted, or are these individuals anxious and introverted because they have SAD? The previously discussed cognitive and behavioral models describe a number of factors that can result in introverted and neurotic tendencies in individuals with SAD. The Clark-Wells model, for example, posits that negative beliefs lead to an inward focus of attention and aversion to social situations, characteristics that could manifest as introversion on a measure of personality. However, longitudinal data suggests that behavioral inhibition (BI), a heritable trait involving avoidance and fearful reactions to novel stimuli such as people, predates social anxiety disorder occurring later in life (Kagan et al., 1998; Stein & Stein, 2008). Hirshfeld-Becker et al. (2007) found that preschool-age children with high levels of BI assessed five years later were three times more likely to experience onset of SAD compared to noninhibited children. Moreover, about half of individuals with SAD report shyness in childhood (Cox et al., 2005).

Taken together, there is clear empirical evidence to date that personality and temperamental factors are associated with SAD, and at least in some cases, predate the onset of SAD.

Biological

The numerous studies on the pathophysiology of SAD suggest genetic and neurological underpinnings of the disorder. There has been one genome-wide linkage study of SAD to date, in which chromosome 16 appeared to be most strongly associated with this disorder. One of the genes in this area suspected to be associated with SAD is SLC6A2, which encodes the norepinephrine transporter protein (Gelernter et al., 2004). The norepinephrine transporter is involved in the reuptake of both dopamine and norepinephrine, and abnormalities in transmission of these neurotransmitters have been found in individuals with SAD (Mathew et al., 2001; Tiihonen et al., 1997). Dysfunction in serotonin, oxytocin, GABA, and glutamate is suspected as well (Marazziti et al., 2015). As for specific brain regions, increased activity in the amygdala has most commonly been found in response to emotionally expressive faces in individuals with SAD relative to healthy controls. Hyperactivation in the parahippocampal gyrus and globus pallidus has also been found in individuals with SAD (Brooks & Stein, 2015; Hattingh et al., 2013).

Imaging studies shed light on which biological processes may underlie individuals with SAD being more prone to the generalization of anxiety and resistant to extinction. Results of an fMRI study conducted by Pejic et al. (2013) suggest that differences in neural activity could account for the latter. Using a similar conditioning paradigm as Hermann et al. (2002), with recordings of critical comments as the UCS in place of an odor, the BOLD (blood-oxygen-level-dependent imaging) data of participants with varying levels of social anxiety were examined. During the extinction process (presentation of the CS without the UCS), less neural activity was found in the amygdala and hypothalamus in individuals with higher levels of social anxiety.

Because these structures are critical for extinction learning, these findings may indicate that reduced activation of certain structures during unthreatening social encounters prevents social anxiety from being extinguished. However, it is unclear whether this lack of brain activity causes resistance to extinction in individuals with SAD, or if resistance to extinction explained by another factor (e.g., avoidance, self-focused attention) accounts for these neural patterns. Taken together, these studies suggest that components of the cognitive-behavioral approach (e.g., greater threat expectancy and resistance to extinction) are implicated in SAD maintenance. These components could potentially originate in differences in neural activity, although the directionality of this phenomenon is inconclusive.

Recent findings also suggest that neuroticism and extraversion are associated with unique neural patterns during conditioning. In an appetitive conditioning task (pairing of a CS with a reward [UCS]), Schweckendiek et al. (2016) found that amygdala activity (indicative of learning positive associations in the context of such tasks) was negatively correlated with neuroticism scores and that extraversion was positively associated with activity in the hypothalamus and thalamus. In other words, subjects with the two basic tendencies associated with SAD in multiple previous studies were found to have brain activity indicating less association of neutral stimuli with positive outcomes. This aligns beautifully with the findings of Pejic et al. (2013), as both studies found reduced activity in the same brain structures and suggested a reduced ability to learn from unthreatening stimuli in individuals with characteristics of SAD. Taken together, these studies could suggest that the traits of neuroticism and introversion within socially anxious individuals are associated with a reduced ability of the amygdala and hypothalamus to encode information related to positive and neutral associations during social situations.

Unique patterns of cardiovascular activity have also been found in individuals with SAD during social events. Rapee and Heimberg (1997) as well as Clark and Wells (1995) postulate that the response of socially anxious individuals to perceived social threat is accompanied by physiological changes, such as rapid heart rate and blushing, that are suggestive of increased cardiovascular reactivity (Gramer & Sprintschnik, 2008). However, the literature on physiological responses to social situations in individuals with SAD is highly inconsistent. For example, higher blood pressure levels and heart rate have been observed in both subclinical socially anxious individuals as well as individuals with SAD during various tasks, such as engaging in a role-plays with the opposite sex, completing math and verbal challenges in front of observers, and engaging in an impromptu speech on a subject of one's choosing (Larkin et al., 1998; Turner et al., 1986). Yet, several studies have found no differences in cardiovascular reactivity among low- and high- socially anxious individuals during speeches with pre-chosen topics under evaluative conditions despite higher self-reported social anxiety in the high-social anxiety group (Baggett et al., 1996; Grossman et al., 2001; Mauss et al., 2003). Perhaps most surprisingly, Gramer (2006) found that socially anxious individuals had *lower* systolic blood pressure levels during speech and role-play tasks that both required assertive styles of communication and were videotaped.

One difference apparent between studies that do and do not evidence increased cardiovascular activity in socially anxious individuals is the task used to evoke social threat. Counterintuitively, tasks that could be assumed to produce the most stress (speeches under evaluative conditions, especially when assertiveness is required) appear to lead to similar or lower levels of cardiovascular reactivity compared to individuals with low levels of social anxiety. Gramer and Saria (2007) proposed that these mixed results may be due to task

engagement and effort being dependent in part on the degree to which the task is perceived as possible to complete (Wright, 1996). Socially anxious individuals, Gramer and Saria (2007) argue, may experience relatively lower cardiovascular response under high levels of social threat due to perceiving failure as inevitable, and in turn, reduce their effort expenditure. Consistent with this theory, these researchers found that although experimental stressors (e.g., math computation and speech) produced greater elevations in blood pressure in socially anxious individuals in conditions of low evaluative threat, they did not differ from individuals low in social anxiety in high evaluative threat conditions. Further supporting this finding, socially anxious individuals were found to report lower perceived coping abilities. In a later study, experimentally induced anticipatory processing was found to further reduce heart rate in socially anxious individuals (Gramer & Sprintschnik, 2008). In summary, individuals with social anxiety appear to exhibit greater cardiovascular response to social situations, but this response can be equal to or even lower than individuals without social anxiety as threat level increases due to disengagement of effort.

An Integrative Model

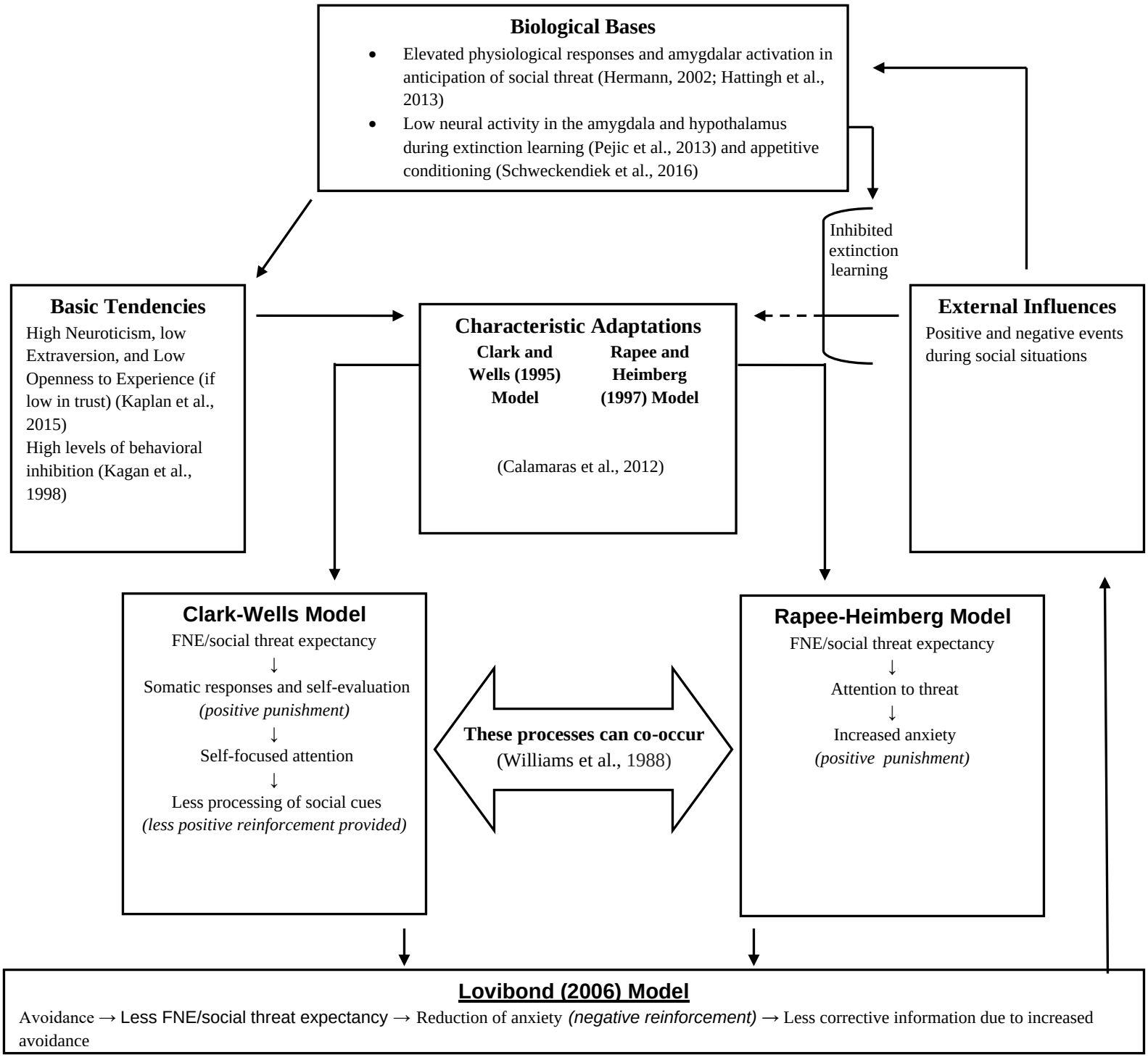
The common and contributing factors among FFT, the behavioral approach, and the cognitive approach can be integrated to produce a comprehensive model of the etiology and maintenance of SAD (see Figure 1). First, individuals with SAD may be biologically predisposed to have elevated physiological responses and amygdala activity in anticipation of perceived social threat (Hattingh et al., 2013; Hermann et al., 2002). Additionally, they may be prone to low neural activity in the amygdala and hypothalamus during low-threat or more familiar social situations, inhibiting the encoding of positive and neutral stimuli during extinction learning and appetitive conditioning (Pejic et al., 2013; Schweckendiek et al., 2016). High neuroticism and

low extraversion, which have been shown to be present in individuals with SAD (Kaplan et al., 2015), are associated with inhibited appetitive conditioning. Individuals with both of these traits, in addition to a high level of behavioral inhibition, may develop SAD if they engage in certain cognitive characteristic adaptations in response to social situations (Allan et al., 2016; Kagan et al., 1998).

Continuing with the model presented in Figure 1, individuals whose style of cognitive adaptation is more in line with the Clark-Wells model fixate on negative self-evaluations (i.e., self-focused attention). They worry that their physical reactions will be observed, leading to less processing of social cues, which both reinforces their self-concept of social ineptness and prevents them from potentially receiving positive reinforcement. Those who respond with more vigilance as in the Rapee-Heimberg model react to fear of negative evaluation and social threat expectancy with heightened attention to social threat, and they undergo positive punishment from the resulting increase in anxiety. Of course, the processes described in these models can co-occur as well (Williams et al., 1988). Due to the punishment and lack of reinforcement that results from these attentional biases, avoidance of social situations results, which according to Lovibond (2006), leads to future avoidance and less opportunities to correct maladaptive thinking. Finally, when individuals with SAD do engage in social situations, their ability to create positive and neutral associations is inhibited, as indicated by reduced activity in the hypothalamus and the amygdala during these events (Pejic et al., 2013; Schweckendiek et al., 2016). This model suggests that while reducing avoidance and correcting maladaptive thoughts are already standard in the treatment of SAD, efforts should be made to identify and modify the attentional styles of patients.

Figure 1

A five-factor cognitive-behavioral model of social anxiety disorder



Note. FNE=Fear of negative evaluation.

Treatment

Treatment guidelines based on the available literature list pharmacotherapy and cognitive behavioral therapy as the gold standard treatments for SAD (e.g., Canadian Psychiatric Association, 2006; National Collaborating Centre for Mental Health, 2013). The results of two meta-analytic studies comparing psychological and pharmacological interventions suggest that selective serotonin reuptake inhibitors (SSRIs) and benzodiazepines have the largest effect sizes among the medications included in the analyses (Fedoroff & Taylor, 2001; Gould et al., 1997). Effect sizes for these interventions were large in these studies, ranging from .72-1.89 for pharmacological interventions and .80-1.8 for cognitive-behavioral interventions (Stein & Stein, 2008). As for treatment course, while patients with SAD tend to respond more quickly to pharmacotherapy, CBT appears to have longer lasting effects (Stein & Stein, 2008). For example, Heimberg et al. (1993) found that patients who received group CBT for SAD continued to have reduced symptoms relative to patients who received an educational intervention 5 years post-treatment. However, fewer pharmacological treatment outcome studies tend to include follow-up data, rendering analyses on durability of symptom reduction from this treatment modality impossible, for example, in the meta-analyses by Fedoroff and Taylor (2001). Treatment gains from CBT may also appear more inconsistent compared to pharmacotherapy in the literature as the components of CBT implemented likely vary from study to study.

CBT for SAD typically consists of one or more treatment components, including cognitive restructuring (e.g., modifying maladaptive automatic thoughts, attitudes, or beliefs), relaxation training, social skills training, and exposure. If it becomes evident in therapy that a patient with SAD has behavioral deficits that may provoke lukewarm or rejecting responses from others, social skills training may be an appropriate direction for treatment. (Heimberg, 2002).

Exposure appears to be the most critical component of CBT for SAD, as evidenced by studies examining the individual effect sizes of CBT components (Feske & Chambless, 1995; Fedoroff & Taylor, 2001; Gould, et al., 1997). In exposure therapy, therapists assist the patient in confronting their feared stimuli or situations, gradually leading to a reduction in anxiety (Craske et al., 2014). Exposure therapy is understood to reduce anxiety through the previously discussed process of fear extinction. In the case of social anxiety, repeated exposure to a feared social situation (CS) in the absence of indicators of social threat such as negative facial expressions or verbal rejection (UCS) should lead to reduced fear regarding that situation.

Fear extinction that results from exposure is theorized to occur from two broad types of mechanisms: nonassociative (habituation) and associative (Myers & Davis, 2007). In both humans and animals, exposure to feared stimuli over time is observed to result in habituation, or a reduced affective and physiological response (e.g., May, 1977). Traditional models posit that habituation during exposures is critical in order for fear extinction to persist over time (e.g., Foa & Kozak, 1986). Although current animal and neurobiological research suggests that habituation is most likely involved in the process of extinction, habituation within exposure therapy sessions has not been found to be a reliable indicator of treatment gains long-term (Craske et al., 2014; Myers & Davis, 2007). For example, Baker et al. (2010) found that within-session habituation during exposures for acrophobia was not related to treatment gains two weeks later. Furthermore, Culver et al. (2012) found that speech-phobic individuals whose fear response was *sustained* throughout the exposures exhibited greater symptom reduction at follow-up. In summary, although habituation is a component of the extinction process, habituation during exposures may not predict long term outcomes.

Current research provides greater support for associative mechanisms as underlying the maintenance of fear extinction over time (Craske et al., 2014; Myers & Davis, 2007). Bouton (1993) has proposed that rather than the mental association between the CS and UCS being eliminated through extinction learning, an additional, competing association is formed between the CS and the absence of the UCS. This conceptualization is supported by the observation by Milad et al. (2007) that participants who have undergone fear extinction experience activation in the medial prefrontal cortex and hippocampus. These structures act to inhibit the amygdala, which is typically active both during fear conditioning and extinction, reducing affective arousal (Craske et al., 2014). As previously discussed, both activity in the amygdala and hypothalamus is reduced during extinction learning in individuals with SAD (Pejic et al., 2013; Schweckendiek et al., 2016). This is reminiscent of findings by Gramer and Saria (2007) that suggest relatively lower cardiovascular response in individuals with SAD under high levels of social threat. Although reduced brain activity could very well be a pathogenic factor preceding the onset of SAD, it is likely that the use of safety behaviors to facilitate distraction and avoidance, tendency to retreat into self-focused attention and/or threat detection, and mental withdrawal from the social situation itself common in individuals with SAD could at least in part explain these phenomena. Regardless of specific compromising factors, the evidence is clear that inhibitory learning is hindered in individuals with SAD.

These common safety behaviors may explain why although the gold standard psychological treatment for SAD is CBT with exposure, a substantial number of patients fail to achieve remission (Otto et al., 2000). Perhaps because social interaction tends to be less avoidable than other fears (e.g., specific phobias), individuals with SAD tend to implement a variety of protective behaviors to both reduce their anxiety and avoid making a negative

impression during social interactions. Salkovskis (1991) initially postulated that patients undergoing exposure or encountering feared stimuli outside of therapy often do not experience fear extinction despite nonoccurrence of their feared outcome due to engaging in safety behaviors (Clark, 2005). Not only do safety behaviors distract patients from exposure tasks, but these behaviors also lead to the nonoccurrence of the UCS (e.g., the pain of social rejection) being erroneously attributed to having engaged these protective behaviors (e.g., assuming one only avoided social rejection by rehearsing what to say beforehand). As a result, the association between the feared social situation (CS) and feared negative outcome (UCS) remains unchallenged. Additional safety behaviors observed in individuals with SAD include avoidance of eye contact, fidgeting, and distracting one's self (Wells et al., 1995). The inhibitory effect of safety behaviors on exposure has been supported by trials comparing exposure therapy for SAD with and without instruction to refrain from safety behaviors, with the former condition resulting in significantly more treatment gains (Wells et al., 1995; Kim, 2005; Morgan & Raffle, 1999).

Common safety behaviors discussed in these studies involve redirecting one's attention during social interactions, for example, towards the self to monitor physical symptoms or speaking performance. Although hypervigilance towards threat was not noted in these studies, this pattern has been observed in socially anxious participants on computerized tasks such as the dot-probe task (Amir et al., 2003; Asmundson & Stein, 1994). Evidence that training attention bias toward and away from threat can causally influence anxiety (e.g., MacLeod et al., 2002) and that distraction during exposure tasks reduces treatment gains (e.g., Borkovek & Sides, 1979; Kamphuis & Telch, 2000; Schmid-Leuz et al., 2007) has led a number of researchers to examine the effectiveness of attention training interventions in individuals with SAD. Amir et al. (2008) first used the modified dot probe task to induce socially anxious participants to direct their

attention away from socially threatening faces and toward neutral faces. Following a single session of this paradigm consisting of 160 trials, participants in the attention modification program (AMP) displayed significantly less attention toward threatening faces and were rated higher on their speaking performance in a subsequent speech task. A later randomized controlled trial containing 8 sessions of AMP resulted in significantly less orientation to threatening faces and lower self- and clinician- rated anxiety (Amir et al., 2009)

Other researchers such as Schmidt et al. (2009) have also found support for the modified dot-probe task in reducing symptoms of SAD. No support, however, has been found for the superiority of versions of this task administered online (as opposed to in a research setting) relative to control conditions (Boettcher et al., 2012; Carlbring et al., 2012; Neubauer et al., 2013). A likely explanation of this discrepancy between the standard dot-probe task and the internet-based version is that although both versions are computerized, the standard intervention occurs in the context of live social contact (with research assistants, etc.), facilitating generalization of the attention training to real world social encounters. This hypothesis is supported by an experiment performed by Kuckertz et al. (2014) in which participants were asked in one condition to complete a fear-activating social task (making a phone call, etc.) before engaging in internet-based AMP. Compared to the AMP group in the study by Carlbring et al. (2012), this intervention resulted in greater reductions in social anxiety symptoms at four months post-treatment. Although this greater effect may be due to the addition of exposure, it is also possible that the pre-training social task acted as a retrieval cue, facilitating activation of the acquired attentional style of orientation away from threatening cues in future social situations.

An additional discrepancy of research findings on the effectiveness of AMP for treating SAD arises when researchers include a training condition that *increases* orientation to threat, as

opposed to orientation away from threat and control conditions exclusively. Klumpp and Amir (2010) included a standard AMP condition that trained orientation away from faces expressing disgust and toward neutral faces, a condition that trained orientation toward disgusted faces, and a control attention that orientated attention to both neutral and disgusted faces. The neutral-orientation and threat-orientation groups were found to have significantly lower self-rated anxiety levels to the control group with no significant differences between these two groups. These results were attributed to the possibility of either condition producing greater attentional control. However, using a similar study design, Heeren et al. (2012) found that training attention towards positive faces, but not to angry faces, led to reductions in reported anxiety, speech indicators of anxiety (e.g., searching for words), and physiological arousal after the attention training task and at two-week follow-up.

These discrepant results may be due to several factors, including differences in duration of treatment, face stimuli, symptom severity, and timing of outcome measures (e.g., Heeren et al. [2012] did not collect post-speech data). An additional possibility not noted by Heeren et al. (2012) is variation in attention biases. Kuckertz et al. (2014) and Amir et al. (2011) observed that individuals with the greatest attention biases towards threat experienced the most anxiety reduction from the AMP intervention. This may suggest that individuals with SAD with a more vigilant attentional style in line with the Rapee and Heimberg (1997) model may benefit from treatment more than individuals who are more self-focused as described by Clark and Wells (1995). It is possible that individuals whose social anxiety is more derived from negative evaluative thoughts about their social performance and others being made aware of their social anxiety (by blushing, etc.) are less affected by digitally displayed faces that do not pose these

dangers. Thus, variation in the attention biases among these studies may also explain these discrepant results.

Wells and Papageorgiou (1998) were the first researchers to examine how directing individuals with SAD to shift their focus of attention towards others during exposures impacted habituation relative to exposure alone. Using a single-case model, four patients with SAD received the exposure with external focus intervention followed by exposure alone, while four received these interventions in the reverse order. Overall, the external focus intervention resulted in a mean reduction in anxiety and negative expectations that was three times greater than exposure alone. This in consistent with the Clark and Wells (1995) model which posits that negative beliefs that maintain the disorder fail to be disconfirmed when individuals with SAD direct their attention away from their environments and toward themselves. These results are a stark contrast with the number of computer-based studies in which orientation away from threatening faces resulted in decreased social anxiety (e.g., Amir et al., 2008). The simplest explanation for this discrepancy may be that in-vivo exposures create a unique opportunity for adaptive inhibitory learning to take place as a result of observing the live reactions of others during social situations. For example, an individual could learn that his or her fear of rejection is unsupported while conversing with another person during an exposure task, whereas computer tasks exclusively promote disengagement from socially threatening stimuli.

Clark (1999) tested a similar intervention first described in his (1997) therapy manual in which patients are first asked to focus on themselves during a social interaction, then subsequently asked to focus entirely on their conversation partner and what is being discussed. Patients are then encouraged to orient their focus towards others and refrain from safety behaviors during future challenges. Additional components of this intervention include behavioral experiments, reviewing

videos of the patient in social situations, and psychoeducation on the cognitive model. Clark (1999) reported that in an initial study of 15 patients with social phobia, there was a substantial 15-point average reduction on the Fear of Negative Evaluation Scale (FNE) at follow-up (Watson & Friend, 1969). In later studies, this intervention was found to be significantly more effective than fluoxetine and self-administered exposure as well as exposure with applied relaxation (Clark et al., 2003; Clark et al., 2006). Until recently, little was known about the effectiveness of the individual treatment component of being instructed to focus on the self and subsequently focus externally. Renner et al. (2017) examined the effectiveness of this definitive treatment component, instructing individuals high in social anxiety to switch between self-focus and external focus twice over four exposure trials (i.e., reading aloud to an audience). Compared to exposure alone, the attention-switching intervention produced significantly greater reductions in anxiety and self-focused attention as well as higher rated performances. The effect of condition on anxiety level was also found to be mediated by focus of attention, supporting the Clark and Wells (1995) model.

In summary, although CBT is recognized as the gold standard treatment for SAD, many patients do not experience full symptom remission (Canadian Psychiatric Association, 2006; National Collaborating Centre for Mental Health, 2013; Otto et al., 2000). Given evidence of the presence of attention biases in SAD that may compromise recovery, computerized attention training programs and manipulation of attention in cognitive or behavioral interventions have been explored. Although the results of most studies on computerized attention training suggest that directing one's gaze away from threatening social cues results in improvement in SAD symptoms (Amir et al., 2008; Amir et al., 2009; Heeren et al., 2012; Schmidt et al., 2009), instructions to direct attention towards others has been found to significantly boost treatment gains during exposure and cognitive therapy (Clark, 1997; Clark, 1999; Clark et al., 2006; Renner et al., 2017;

Wells & Papageorgiou, 1998). This discrepancy is likely due to external focus of attention providing more opportunity for adaptive learning experiences in live social interactions. However, simply encouraging individuals with SAD to focus their attention externally may be limited in effectiveness due to abandonment of attention biases and safety behaviors being difficult in the presence of social threat (Renner et al., 2017) as well as intrusive evaluative thoughts. It may be a fruitful effort, then, to explore novel methods of increasing engagement to exposure tasks to maximally achieve inhibitory learning.

Mindfulness and Nonattachment

Mindfulness is a form of meditation rooted in Buddhist tradition that is designed to increase one's awareness of the present moment and reduce automatic and unconscious processes that evaluate or judge one's lived experience. An operational definition of mindfulness proposed by Kabat-Zinn (2003) is "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" (pp. 145). Living mindfully, Borkovec (2002) has noted, facilitates attention toward the intrinsic qualities of an event or activity while minimizing extrinsic factors such as expectations that can lead to anxiety and depressive symptoms. A key ingredient to mindfulness is letting go of judgement toward thoughts that arise during the meditation, simply acknowledging them as thoughts, and returning to the present moment (Kabat-Zinn, 2009). Whether focusing on a certain stimulus (most commonly one's breathing) or taking in one's surroundings more broadly, mindfulness allows one to appraise these events without judging or labeling, but with curiosity and openness to experience (Treanor, 2011). Mindfulness meditation has grown in popularity in western countries over the past 50 years and has been integrated into psychological treatments (Kabat Zinn, 2003).

Mindfulness-based stress reduction (MBSR), developed by Kabat-Zinn at a stress clinic within the University of Massachusetts Medical Center in 1979, is the most empirically supported form of mindfulness training (Goldin & Gross, 2010; Kabat-Zinn, 2003). The intervention described by Kabat-Zinn (1990) consists of eight sessions of formal instruction with daily homework accompanied by guided meditation audio recordings. Specific exercises include focusing on the breath, completing a "body scan" of internal sensations, mindful walking, and mindful eating. In addition to these exercises that involve focused attention on specific stimuli, MSBR also encourages a broader, open monitoring of any experience in the present moment (Goldin & Gross, 2010; Lutz et al., 2008). Both forms of mindfulness meditation enhance observation and make one more aware of the temporary nature of thoughts and feelings. MBSR is empirically supported to reduce ruminative thinking (Ramel et al., 2004), levels of stress in healthy individuals (Chiesa & Serretti, 2009), and distress associated with chronic pain (Grossman et al., 2007), as well as anxiety and depression (Hofmann et al., 2010).

Research on trait mindfulness, or the propensity to be aware of the present moment, has provided the earliest support that mindfulness may be a helpful intervention for individuals with social anxiety (Brown & Ryan, 2003). First, mindfulness has been shown to be negatively correlated with neuroticism and low self-esteem, traits that have been identified as more prevalent in SAD (Brown & Ryan, 2003; Izgiç et al., 2004; Norton et al., 1997; Niemiec et al., 2010). Emotional reactivity to relational conflict has also been observed to be lower in individuals with higher levels of trait mindfulness (Barnes et al., 2007). Physiological data has supported the relationship between mindfulness and social anxiety as well. Brown et al. (2012), for example, found that trait mindfulness is associated with lower release of cortisol in response to a social stressor. Finally, a negative relationship has been found between trait mindfulness and

social anxiety in questionnaire studies (Hayes-Skelton & Graham, 2013; Rasmussen & Pidgeon, 2011; Schmertz et al., 2012). Expectations of negative outcomes and distress, decentering (i.e., recognizing emotional and cognitive experiences, accepting them, and not over-identifying with one's thoughts), and self-esteem have been found to explain the relationship between trait mindfulness and social anxiety in meditation studies (Hayes-Skelton & Graham, 2013; Rasmussen & Pidgeon, 2011; Schertz et al., 2012).

While the above data on trait mindfulness and social anxiety offer preliminary support for the inverse relationship between mindfulness and social anxiety, randomized controlled trials are necessary to determine the effectiveness of mindfulness-based interventions. Koszycki et al. (2007) conducted the earliest and largest number of studies on efficacy of MBSR for treating SAD. For example, in their 2007 randomized trial, 53 patients with SAD participated in either 8 weeks of MBSR or 12 sessions of group CBT, and it was found that although both groups experienced lower scores on self-report and clinician ratings of social anxiety, scores were significantly lower in the CBT group. These results suggest that although mindfulness contributes unique factors that lead to symptom reduction in SAD, unique elements of CBT such as exposure remain critical components of treatment for this disorder.

In a later study on a new form of group therapy integrating mindfulness and acceptance components (Mindfulness and Acceptance-Based Group Therapy; MAGT), Kocovski et al. (2009) found that this intervention produced significantly decreased levels of social anxiety, depression, and obsessive thinking as well as increased levels of mindfulness. In a later study comparing MAGT with group CBT, these interventions were found to lead to significant reductions in social anxiety with no significant differences between groups (Kocovski et al., 2013). While not directly assessed in the study, it may be that the group component of MAGT

compared to individual MSBR leads to increased exposure to social situations typically promoted in CBT. In a later study examining mechanisms of change, Kocovski et al. (2015) noted that while modifying negative attitudes and beliefs about social situations was a key factor in determining change in group CBT exclusively, self-reported mindfulness was related to improvement in symptoms in both groups. It is possible that the components of CBT such as exposure to social situations and cognitive reappraisal fosters a reduction in anxiety that allows patients to be less vigilant and/or self-focused during social interactions, and thus more focused on the social situation itself.

Goldin and colleagues were the first to use imaging techniques to examine physiological indicators of the benefits of MBSR for SAD. Goldin et al. (2009) initially examined fMRI and questionnaire data on 14 participants with SAD before and after undergoing MBSR. These researchers found that not only did MBSR reduce self-reported social anxiety and improved self-esteem, but also increased activity in brain regions responsible for attentional regulation. Perhaps even more impressive is the finding that the mindfulness intervention reduced activity in the dorsomedial and medial prefrontal cortices, suggesting less self-focused attention. These findings provide preliminary but strong support that mindfulness can improve maladaptive attention biases that can maintain SAD. In later studies, mindfulness-based interventions were found to lead to increased activity in brain areas associated with attention and emotional regulation (Goldin & Gross, 2010; Goldin et al., 2012)

In addition to broader findings on how mindfulness can reduce the intensity of anxiety, mindfulness has also been found to reduce factors associated with social anxiety and increase protective factors. Beauchemin et al. (2008), for example, found that a 5-week mindfulness training for adolescents with learning disorders not only reduced social anxiety, but also

improved social skills and academic performance. Citing the cognitive-interference model of learning disability, these authors concluded that these benefits were achieved as a result of reduced self-focused attention often found in individuals with learning disorders. According to the Clark-Wells model (Clark & Wells, 1995), increased attentiveness to conversation partners and registering of social cues should improve the flow of conversations, creating more positive and corrective social experiences.

Mindfulness has also been found to lead to reduced negative anticipatory and post-event processing of social situations. For example, a combination of mindfulness and cognitive therapy has been found to lead to reduced emotional reactions to social stressors as well as anticipatory processing (Britton et al., 2012). Moreover, Cassin and Rector (2011) found that individuals with SAD who underwent training in mindfulness experienced reduced distress when negative post-event processing was experimentally induced compared to participants who received a distraction intervention. Shikatani et al. (2014) later found that mindfulness was as equally useful in reducing negative post-event processing as cognitive restructuring, a well-established treatment for social anxiety.

Self-compassion is another area which mindfulness meditation has been found to enhance. The ability to accept and have rapport with one's self may be especially important for individuals with SAD, as a core feature of this disorder is self-criticism. This was supported by Werner et al. (2012), who not only found that individuals with SAD exhibited less self-compassion than controls, but also that self-compassion predicted less fear of evaluation and judgement from others. The literature to date suggests that mindfulness may be a strong option to achieve a greater sense of self-compassion in this population. In a trial of MBSR for young adults with SAD, Hjeltnes et al. (2017) found that this intervention was associated with

significant improvement in social anxiety, self-esteem, general psychological distress, and self-compassion; the latter with the largest effect sizes in the study. Therefore, self-compassion appears to be a meaningful target in clinical interventions to address social anxiety disorder.

An additional benefit of mindfulness that may facilitate corrective learning experiences during exposure is its discouragement of labeling and judgement of events (Kabat-Zinn, 1990). By encouraging participants to redirect their attention away from spontaneous judgements and interpretations of their performance (e.g., "I'm doing a terrible job"), attentional resources needed to continue focusing on the exposure itself are increased. This state of openness and nonjudgement may also reduce the impact of negative interpretations of what transpires during exposure on adaptive inhibitory learning. For example, automatic negative performance appraisals that are bound to arise during the exposure may be more likely to be regarded as "just a thought" and not necessarily reflective of reality while in a state of mindfulness. It is possible that the anxiety resulting from perceptions of poor performance becomes a chronically present UCS for individuals with SAD during social interactions, rendering complete fear extinction in social situations extremely difficult. This may explain why SAD can be a chronic disorder despite multiple interpersonal interactions over time and why exposure therapy for SAD is not always successful. It is possible that mindfulness may break the cycle of both attention biases and negative automatic thoughts in limiting inhibitory learning during exposure.

To determine participant characteristics and treatment factors most likely to lead to positive treatment outcomes, Hjeltnes et al. (2018) conducted post-treatment interviews with individuals with SAD who completed a trial of group MBSR. Commitment to practicing mindfulness, higher levels of engagement with fellow members of the group, using mindfulness to confront stressful situations rather than to withdraw, and becoming more open to changing

existing social dynamics in one's life were associated with greater treatment outcomes. The theme of using mindfulness to approach rather than avoid social interactions, as well as increase interpersonal contact, is especially critical with regard to future directions for treatment.

Mediation analyses and qualitative interviews have been conducted to shed light on why mindfulness meditation might be helpful for treating SAD as well as under which conditions this intervention is most effective. Schmertz et al. (2012) found, in addition to a negative correlation between mindfulness and social anxiety, that this relationship was partially mediated by beliefs about how likely a social interaction is to be negative and the consequences of negative social interactions. This mediation relationship is consistent with the principles of mindfulness. For example, the key facet of letting go of expectations in mindfulness may be a unique means by which individuals with SAD can reduce negative anticipatory processing as well as post-event processing (e.g., about possible negative consequences of the interaction), leading to reduced psychological distress.

In traditional Buddhist thought, a primary mechanism by which mindfulness meditation reduces psychological distress is by cultivating nonattachment (Sanskrit: virāga), or release from the tendency to "cling" to desired experiences and fixed ways of experiencing the world (Sahdra et al., 2010). Buddhist scholars claim that living in a state of mindful awareness awakens one to the ever-changing nature of reality and suffering that results from dependence on desired events, relationships, possessions, or ideas that are ultimately temporary. In response, one learns to "let go" and become detached from maladaptive mental fixations. This release is believed to extend to one's fixed beliefs or mental models, leading to a more accurate, objective, and interconnected view of the world (Sahdra et al., 2015).

Although nonattachment is a fairly recent construct in psychological literature, nonattachment has been supported to be a major mechanism by which mindfulness meditation improves self-reported psychological well-being and reduces stress, rumination, depression, and anxiety (Coffey & Hartman, 2008; Whitehead et al., 2019). Nonattachment has also been found to be positively correlated with measures of mindfulness, as well as self-compassion, social connectedness, autonomy, and nonreactivity (Sahdra et al., 2010). The relationship between mindfulness and nonattachment is understandable, as nonattached individuals could be expected to have an increased ability to live in the moment due to being able to "let go" of the past and concerns of loss (e.g., of loved ones, status in social situations, etc.). The heart of nonattachment therefore appears to be an acceptance of the here and now rather than what "should" be.

Interventions such as mindfulness meditation that promote nonattachment could possibly be beneficial for addressing the numerous cognitive and behavioral processes that maintain and intensify SAD. First, the previously discussed self-focused and/or hypervigilant attentional styles commonly observed in individuals with SAD are ultimately generated as a protecive mechasnism against the threat of of negative evaluation (Clark & Wells, 1995; Rapee & Heimberg, 1997). In theory, reduced attachment towards social approval and fixed ideas surrounding social interactions (e.g., one's ability to get along with others) should obviate the need for these attention biases in the first place. Moreover, the desire of nonattached individuals to experience the present moment in a realistic and objective manner, rather than through the filter of one's thoughts and beliefs, could facilitate positive experiences in social situations (e.g., noticing positive social cues). Finally, given that individuals with SAD experience negative ruminative thoughts that intensify and maintain anxiety in social situations (Mellings & Alden, 2000; Rachman et al., 2000; Wong & Moulds, 2011), evidence that nonattachment is inversely related

with rumination is promising. Thus, it may be beneficial to explore the effect of nonattachment on social anxiety and its various maintaining factors to inform future treatment.

Current Study

The purpose of the present study is to examine how nonattachment, a related but distinct construct to mindfulness, is associated with psychophysiological correlates. The foregoing suggests that nonattachment is negatively associated with anxiety and rumination, and could be potentially predictive of lower self-focused attention. Furthermore, nonattachment may have salubrious physiological correlates such as reduced cardiovascular reactivity. Archival data from a previously conducted experimental study was used to examine the function of nonattachment in regard to its relationship with psychophysiological correlates.

The previously conducted experimental study used a modified version of the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) to elicit a stress response (as measured by cardiovascular reactivity and self-reported anxiety) in order to examine moderators of the stress response. To determine the relationship between these various factors, participants in the present study engaged in the same social task twice in which they were told they would be evaluated on their competence (agency threat) and/or likeability (communion threat), similar to what has been conducted in other studies (see Smith & Jordan, 2015). Participants completed several questionnaires on their personality before the tasks and about their emotional state after the tasks to determine which individual differences predicted variation in self-reported anxiety, ruminative thoughts, and self-focused attention. A blood pressure monitor was also used to collect cardiovascular readings throughout the experiment to examine fluctuations in blood pressure.

The experimental design included four conditions to examine the effects of different kinds of social evaluative threat (independent variable) on cardiovascular reactivity as measured

by systolic and diastolic blood pressure as well as self-reported cognitive and emotional states (dependent variables). In the communion threat condition, participants were told that they were being evaluated based on how likeable, interesting, and friendly they were during the tasks. Similarly, in the agentic threat condition, participants were told that they were being evaluated based on their competence, intelligence, and skill during the task. In the combined threat condition, participants were told they were being evaluated based on both competence and likeability. Finally, in the control condition, participants completed the same tasks but were not told they were being evaluated in any way. It was hypothesized that:

1. The effect of social evaluative threat on cardiovascular reactivity and self-reported anxiety will be moderated by self-reported levels of nonattachment as measured by the Nonattachment Scale (See Appendix A), in that higher levels of nonattachment will be correlated with lower reactivity in self-reported anxiety and blood pressure.
2. The relationship between nonattachment and anxiety (as measured by both blood pressure and self-reported anxiety) will be partially mediated by self-focused attention and negative ruminative thoughts (as measured by the Focus of Attention Questionnaire and Rumination and Reflection Questionnaire; See Appendices B and C). In other words, high levels of nonattachment will be associated with low levels of ruminative thoughts and self-focused attention, which in turn will be associated with lower anxiety.
3. Consistent with previous literature demonstrating that reducing self-focused attention augments habituation to stressful social tasks (e.g., Renner et al. 2017; Wells & Papageorgiou, 1998), self-focused attention is expected to function as a mediator between social evaluative threat and the psychophysiological (blood pressure or anxiety) change score of the second exposure to the social task minus the first exposure to the social task.

METHOD

Participants

The present study utilized an existing data set from a sample of 142 undergraduate students enrolled in introductory psychology classes at a medium-sized Midwestern University. A minimum age of 18 was required for participation in the study. The final sample ranged between 18 and 37 years of age (M = 19.23, SD = 2.23), with 66% of participants identifying female and 34% as male. Of the 141 participants who responded to the race/ethnicity item of the demographic questionnaire, 48% were White/Caucasian, 34% were Black/African American, 11% were Hispanic/Latino(a), 5% were Asian/Asian American, 1% were American Indian or Alaskan Native, and 1% chose not to report their race/ethnicity or identified with another racial or ethnic group. The majority of participants were first-year college students (70%), followed by second-year students (23%), third-year students (5%), fourth-year students (1%), and students who exceeded four years of undergraduate education (1%).

Participants were recruited on a voluntary basis through the SONA Experiment Management System, which allows participants to register for university-based studies online. In order to participate in the study, participants were asked to abstain from substances containing caffeine and nicotine for at least two hours before their scheduled research session in order to reduce error from altered cardiovascular activity. For the same reason, participants taking heart medications such as beta-blockers were not included in the sample.

Measures

Physiological Measures. Heart rate, systolic blood pressure (SBP), and diastolic blood pressure (DBP) were measured using a Dinamap Model 100 monitor, which calculates blood pressure using the occillometric method. These readings were taken every 90 seconds during the baseline and recovery phases, and 10 seconds into each task phase (see procedure below). Blood

pressure was averaged for each phase of the experiment (baseline, exposure, recovery 1, re-exposure, recovery 2) to increase overall reliability (Kamarck et al., 1992). The cardiovascular activity of participants was collected by positioning an appropriately sized blood pressure cuff on the non-dominant upper arm.

Cardiovascular reactivity, along with self-reported anxiety during the task, was used to operationalize social anxiety in the present study. The use of social tasks to examine social anxiety and its associated features regardless of dispositional social anxiety is found in the literature (e.g., Mahone et al., 1993). The aim to extend these results to future studies on interventions for SAD is further supported by findings that experimentally induced social anxiety results in psychological states highly similar to those experienced by individuals who meet criteria for a diagnosis of SAD (rumination, self-focused attention, etc.) (Mellings & Alden, 2000).

Questionnaire Measures

Focus of Attention Questionnaire (FAQ). The Focus of Attention Questionnaire (FAQ; Woody, 1996) is a 10-item questionnaire that assesses the direction of attentional focus during social interactions. One half of the items assesses the degree of self-focused attention experienced during a social event (e.g., preoccupation with physiological responses) and the other half assesses the degree of attention towards others. Each item is given a rating from 1 (not at all) to 5 (totally), yielding separate summed scores for self-focused and other-focused attention. Acceptable internal consistency has been found for both the self-focused ($\alpha = .76$) and other-focused ($\alpha = .72$) subscales, with a non-significant correlation of -.07 between the scales.

Nonattachment Scale (NAS). The nonattachment scale (NAS; Sahdra et al., 2010) is a 30-item measure of the degree to which one is able to relate to life experiences in a flexible, accepting manner (e.g., “I can enjoy pleasant experiences without needing them to last forever”).

Participants indicated their level of nonattachment in various life domains on a scale of 1 (disagree strongly) to 5 (agree strongly), yielding a single summed score. Sahdra et al. (2010) reported adequate internal consistency ($\alpha = .94$) and test-retest reliability ($r = .87$, $p < .001$) for this measure.

Rumination-Reflection Questionnaire. Post-task rumination was assessed using 10 items adapted from the rumination subscale of Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999). The items were reworded to the present perfect continuous tense (e.g., "I have been dwelling over what happened") to capture the participants' immediate impressions after the task. Items were rated on a scale of 1 (strongly disagree) to 5 (strongly agree), yielding a single summed score. In the original publication, coefficient alpha for the rumination subscale was reported to be .90.

State Trait Personality Inventory. A twelve-item questionnaire used by Smith and Jordan (2015) derived from the State-Trait Personality Inventory (STPI; Spielberger & Reheiser, 2004) was used to assess the emotional state of participants before the first social task and following both social tasks. Participants rated various statements about current feelings of anxiety and anger (e.g., "I feel nervous," "I feel aggravated") on a scale of 0 (not at all) to 3 (very much so), yielding separate summed scores for anxiety and anger. For the purposes of the present study, only the anxiety summed scores were used. Smith and Jordan (2015) reported reliabilities for anxiety and anger ratings to be .79 and .63, respectively.

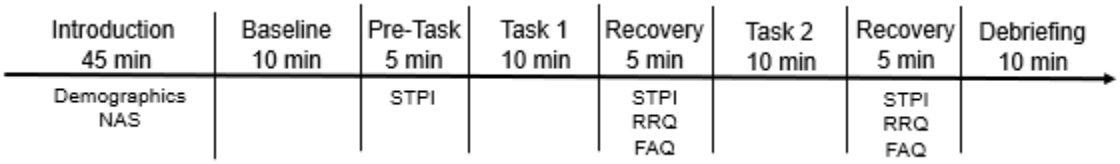
Procedure

Temporal Sequence

Participants were randomly assigned to one of the four conditions upon arrival, with sessions lasting approximately 1 hour and 40 minutes. A timeline of the experiment is shown in Figure 2.

Figure 2

Temporal sequence of the experiment



Participants were first briefed on the nature of the study and signed the informed consent form. They subsequently completed the demographics questionnaire (see Appendix E) and various individual difference questionnaires, including the NAS. Upon completion of these questionnaires, participants were told that they would later be engaging in a social activity in which they talk about various topics. Participants were then fitted with a blood pressure cuff.

Baseline. To first collect baseline cardiovascular readings during a minimally stimulating activity, participants were asked to look at and rate pictures of natural scenery based on how pleasant they appeared. Participants had one minute each to indicate on a form their preferred picture in a pair, after which they turned to the next page to rate the next pair. Participants rated 10 pairs of pictures in total. Blood pressure was assessed at 10 seconds, 300 seconds, 390 seconds, 480 seconds, and 570 seconds. Subsequently, participants completed pre-task questionnaires, including the STPI.

Social Tasks. To induce social threat, participants were then asked to complete a role-played interaction in front of male and female "raters." Depending on the condition, participants were told that they were being rated based on how likeable, interesting, and friendly they were (communion threat condition), how intelligent, competent, and skilled they were (agency threat

condition), or on how both likeable and intelligent they were (combined threat condition). Participants in the control condition were asked to complete the role-played interaction as well, but were not accompanied by raters during their performance and were told that their performance would not be evaluated.

In the communion threat, agency threat, and combined threat conditions, the role-play was preceded by two research assistants with clipboards entering the room to "rate" the performance of participants. Raters always consisted of one male and one female. The research assistants, ranging from 20-30 years of age, were instructed to maintain a neutral expression throughout the experiment, verbalize only to prompt participants to speak for the full 90 seconds, and minimize social or emotive cues during the role-play. Assistants were also trained to mark on their sheets of paper at the beginning and end of the participants' speaking segments as if they were "rating" their performance.

Participants in all conditions received instructions via audio recording on how to complete the role-play. Participants were instructed to listen to a male actor playing a hostile passenger who had just been in a car accident with the participant. Listening segments lasted for approximately 90 seconds. Subsequently, participants were asked to respond to the hostile passenger for 90 seconds. This was followed by an additional 90-second segment from the hostile passenger, acting as if he was reacting to the participant's previous response. This was followed up by the participants being asked to respond to the passenger again for 90 seconds. Blood pressure was assessed 10 seconds after the beginning of each speaking and listening segment. The pre-recorded instructions, of which participants received a hard copy, are as follows:

> For this task, we would like you participate in a role-played interaction. The interaction revolves around a car accident. Both you and the person you will interact with were **the**

> **passengers**, **NOT** the drivers of the cars involved in the accident. First, let me describe to you the events leading up to the interaction. You've been out for the day with your younger brother doing some shopping. He has had his license for 2 years and he is a good driver. He loves his old red Toyota. Your brother is an honor student, gets good grades, and is responsible. You stop at one shopping center that is pretty crowded. He drives slowly in the parking lot looking for a space to park. As he passes a gray van, it **abruptly** backs up and hits your brother's car on the right side. Specifically, the gray van strikes the side of your brother's car near the right front tire. It was clear that the driver **never looked**. The passenger in the gray van is a young man and the driver is an older woman. When the older woman gets out, she looks confused about what just happened. The young man gets out and **inappropriately blames you and your younger brother**. You will now listen to the passenger of the other car speak for a few seconds. You're going to hear his point of view of what happened. Then we would like you to role play and respond to him for 90 seconds. You can go over your own point of view about what happened and respond to his inappropriate blaming of you and your younger brother. You will then stop and the other driver will respond. After his second response, we will ask you to respond for another 90 seconds. Now imagine that this accident has just happened and the passenger of the other car steps out and addresses you. Again, you will hear his point of view, and afterwards, we will ask you to respond.

After the first role-play task, which lasted about 10 minutes, one research assistant prompted participants to complete post-task questionnaires, which included the STPI, FAQ, and RRQ. After these questionnaires were completed, the research assistants re-entered the room and let the participant know that they would be repeating the role-play task and that they could repeat things they said during the first role-play. Apart from abbreviated instructions, the procedure for the second role-play task was identical as the first. Following the second role-play task, participants once again took the same post-task questionnaires. Finally, participants were debriefed on the true purpose of the experiment, told that they were not actually being evaluated during the role-play task, and thanked for their participation.

RESULTS

Preliminary Analyses

The data was screened for missing data prior to analysis. A total of 29 participants had missing questionnaire data, with 4 missing more than one data point per questionnaire. One

participant did not complete any items on the pre-task State-Trait Personality Inventory (STPI). Participants' mean scores for completed items on the Nonattachment Scale (NAS) as well as the post-task administrations of the STPI, Rumination-Reflection Questionnaire (RRQ), and Focus of Attention Questionnaire (FAQ) were entered in place of missing items on the respective questionnaires.

Descriptive Analyses

Table 1 presents descriptive statistics related to nonattachment as measured by the NAS, self-focused attention as measured by the first administration of the FAQ, and rumination as measured by the first administration of the RRQ. The mean score for nonattachment (M = 123.80, SD =19.08) in the present study was similar to that of the mean score of 127.67 (SD = 33.98) reported in Sahdra et al.'s (2010) original study, which also utilized an undergraduate sample. Teachman et al. (2005) reported mean FAQ self-focused attention scores for undergraduates who participated in role-plays designed to enhance self-focused attention (M = 12.21, SD unreported). The mean score for self-focused attention during the first speaking task was slightly higher in the present study (M = 16.5, SD =3.94). The mean score for rumination (M = 29.52, SD = 8.31) was similar to that of the mean score of 35.13 (SD = 10.1) in the undergraduate sample used in the original analysis of the RRQ conducted by Trapnell and Campbell (1999).

Table 1

Descriptive Statistics for Nonattachment, Rumination, and Self-Focused Attention Across Conditions

	Nonattachment[a]	Rumination[b]	Self-Focused Attention[c]
M	123.80	29.52	16.50
SD	19.08	8.31	3.95
Range	102	40	17
Internal Consistency	0.89	.89	.69

[a]Nonattachment was measured with the Nonattachment Scale, with scores ranging from 30-180 and higher scores suggesting higher levels of nonattachment. [b] Rumination was measured with the Rumination subscale of the Rumination-Reflection Questionnaire, with scores ranging from 10-50 and higher scores suggesting higher levels of rumination. [c]Self-Focused Attention was measured with the self-focused attention subscale of the Focus of Attention Questionnaire, with scores ranging from 5-25 and higher scores suggesting higher levels of self-focused attention.

Results of Experimental Threat Manipulation

Psychophysiological reactivity (i.e., blood pressure change and anxiety change) in response to the social tasks was analyzed as task - baseline change scores in 2 (high vs. low agency threat) X 2 (high vs. low communion threat) factorial ANOVAs. Main effects for agency threat and communion threat were examined to determine if participants in the agency, communion, and combined conditions experienced greater psychophysiological reactivity relative to controls. Cohen's *d* for main effects and mean comparisons as well as partial η^2 for main effects and interactions were used to describe effect sizes.

Baseline Equivalence of Groups

One-way ANOVAs revealed that men had a higher baseline level of systolic blood pressure (M = 115.72, SD = 12.21) compared to women (M =107.33, SD = 10.77), F = 16.12, p < .001. This finding is consistent with other college samples (Alhawari et al., 2018). A 2 (high vs.

low agency threat) X 2 (high vs. low communion threat) X 2 (gender) ANOVA indicated there were no significant interactions between gender, type of threat, and baseline SBP. Controlling for these various baseline variables did not produce any significant changes in the results of the analyses discussed in the following sections.

Homogeneity of variance was found to be upheld, and systolic blood pressure change scores were found to slightly deviate from normality. Transforming these data did not alter the pattern of results, and therefore untransformed variables are reported in the subsequent analyses. In an analysis of covariance (ANCOVA), using age, gender, and race/ethnicity as covariates was not found to impact the effect of agency and/or communion threat on psychophysiological reactivity scores.

Primary Analyses

Correlation analyses conducted among scores for nonattachment as well as rumination and self-focused attention following the first role-play in the entire sample are displayed in Table 2. Rumination had a positive correlation with self-focused attention ($r = .57$, $p < .001$), suggesting that higher levels of self-focused attention during the social tasks were associated with higher levels of ruminative thoughts following the tasks. Nonattachment was not significantly correlated with either rumination ($r = -.09$, $p = .28$) or self-focused attention ($r = .06$, $p = .46$). These analyses were repeated only including individuals in the social threat conditions (agency, communion, and combined). As with the previous analyses, rumination was correlated with self-focused attention ($r = .53$, $p < .001$), and nonattachment was not correlated with self-focused attention ($r = .06$, $p = .53$). The relationship between rumination and nonattachment ($r = -.14$, $p = .15$) was not significant.

Table 2

Correlations Among Research Variables of Interest

Variable	Nonattachment	Rumination	Self-Focused Attention
Nonattachment	-		
Rumination	-.092	-	
Self-Focused Attention	.062	.567**	-

** $p < .001$

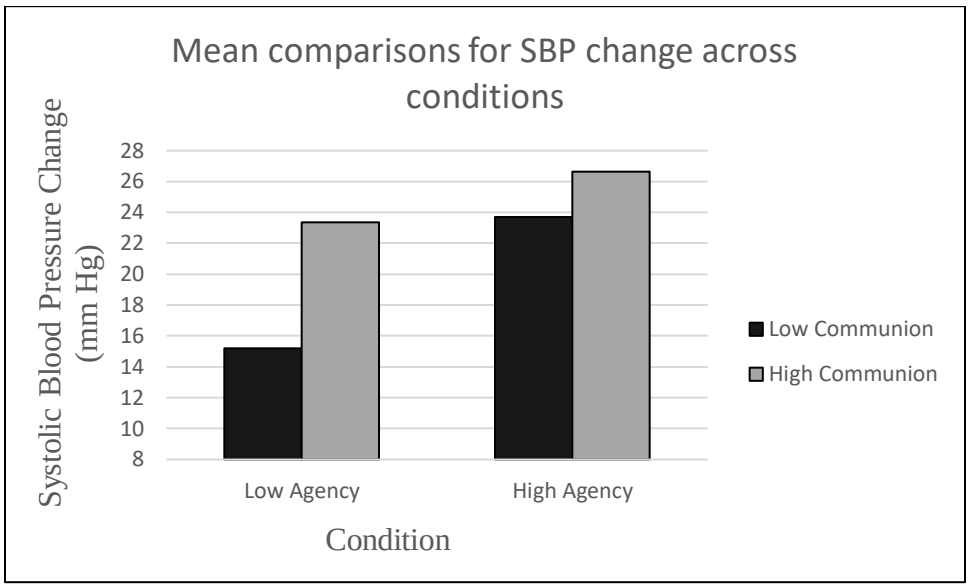
Effects of Social Evaluative Threat

Systolic Blood Pressure

Participants in conditions involving agency threat exhibited greater changes in systolic blood pressure (SBP) from baseline to the first social task compared to those in low agency threat conditions (25.14 mmHg vs. 19.16 mmHg, *SE*s = 1.63, 1.81), $F(1,126) = 6.06$, $p < .05$, $\eta^2 = .05$, $d = .43$. Participants in conditions involving communion threat also experienced greater SBP change than those who were not in those conditions (25.04 mmHg vs. 19.51 mmHg, *SE*s = 1.96, 1.48), $F(1,126) = 5.13$, $p < .05$, $\eta^2 = .039$, $d = .41$. The agency X communion threat condition interaction did not approach significance, $F(1,126) = 1.21$, $p = .27$. Figure 3 displays the results of follow-up mean comparisons for SBP change across conditions. Compared to the control condition, SBP change was significantly greater in the agency threat condition, $t = 3.05$, $p < .01$, $d = .75$, communion threat condition, $t = 2.34$, $p < .05$, $d = .59$ and the combined threat condition $t = 3.93$, $p < .001$, $d = .97$. Mean comparisons between the agency, communion, and combined conditions were not significant.

Figure 3

Mean comparisons for SBP change across conditions



Diastolic Blood Pressure

Participants in conditions involving agency threat exhibited greater changes in diastolic blood pressure (DBP) from baseline to the first social task compared to those in low agency threat conditions (16.19 mmHg vs. 12.76 mmHg, *SE*s = 1.08, 1.10), $F(1,128) = 5.0$, $p < .05$, $\eta^2 = .037$, $d = .39$. DBP change was not significantly greater in high communion threat conditions compared to those with low communion threat (15.31 mmHg vs. 13.75 mmHg, *SE*s = 1.08, 1.12), $F(1,128) = 1.00$, $p = .32$, $\eta^2 = .01$. The agency X communion threat condition interaction did not approach significance, $F(1,128) = .17$, $p = .68$, and therefore follow-up mean comparisons were not executed.

Self-Reported Anxiety

Participants in conditions involving communion threat exhibited greater changes in self-reported anxiety as measured by the STPI from baseline to the first social task compared to those

in low communion threat conditions (5.80 vs. 4.0, *SE*s = .60, .57), $F(1,139) = 5.0$, $p < .05$, $\eta^2 = .034$, $d = .38$. Anxiety change was not significantly greater in high agency threat conditions compared to those with low agency threat (5.42 vs. 4.30, *SE*s = .60, .60), $F(1,139) = 1.81$, $p = .18$, $\eta^2 = .01$. The agency X communion threat condition interaction was not significant, $F(1,139) = 2.70$, $p = .12$.

Effects of Nonattachment on Psychophysiological Reactivity

For hypothesis 1, correlational analyses followed by hierarchical regression analyses with the rationale of the order of each step coming from previous research (see Smith & Jordan, 2015) were used to test: 1) the association between nonattachment and cardiovascular reactivity, 2) the association between nonattachment and psychological (i.e., anxiety) reactivity, and 3) the moderating effect of nonattachment on social evaluative threat. Nonattachment was uncorrelated with systolic blood pressure reactivity ($r = .05$, $p = .55$), diastolic blood pressure reactivity ($r = -.04$, $p = .67$), and psychological (i.e., anxiety) reactivity ($r = .10$, $p = .22$). Hierarchical regression analyses revealed that nonattachment was not associated with systolic blood pressure reactivity ($t = .13$, $p = .89$), diastolic blood pressure reactivity ($t = -.81$, $p = .42$), or psychological reactivity ($t = .88$, $p = .38$). None of the test results on the moderating effect of nonattachment on stress were significant (see Tables 3-5). The above findings are all contrary to hypothesis 1.

Table 3

Results of Hierarchical Regression Examining if Nonattachment Moderates the Effect of Social Threat on Systolic Blood Pressure Change

Model	Variable	Unstandardized B	Standard Error	Coefficients β	*t*	*p*
1	(Constant)	22.23	1.20		18.59	.00
	agency	2.99	1.20	.21	2.50	.01
	communion	2.76	1.20	.20	2.31	.02
2	(Constant)	22.23	1.20		18.61	.00
	agency	2.95	1.20	.21	2.47	.06
	communion	2.78	1.20	.20	2.33	.02
	agencyXcommunion	-1.31	1.20	-.09	-1.10	.27
3	(Constant)	21.17	8.06		2.63	.01
	agency	2.93	1.21	.21	2.42	.02
	communion	2.78	1.20	.20	2.32	.02
	agencyXcommunion	-1.30	1.21	-.09	-1.07	.29
	Nonattachment	.01	.07	.01	.13	.89
4	(Constant)	22.34	8.14		2.75	.00
	agency	15.46	8.07	1.10	1.92	.06
	communion	.10	8.12	.01	.013	.99
	agencyXcommunion	-1.37	1.22	-.10	-1.12	.27
	Nonattachment	.00	.07	.00	.020	.98
	AgencyXnonattachment	-.10	.07	-.90	-1.57	.12
	CommunionXnonattachment	.02	.07	.18	.303	.76
5	(Constant)	21.91	8.13		2.70	.01
	agency	14.09	8.13	1.00	1.73	.09
	communion	.85	8.13	.06	.104	.92
	agencyXcommunion	8.66	8.13	.62	1.07	.29
	Nonattachment	.00	.07	.00	.046	.96
	AgencyXnonattatchment	-.09	.07	-.80	-1.39	.17
	CommunionXnonattachment	.02	.07	.14	.241	.81
	AgencyXcommunionXnonattachment	-.08	.07	-.72	-1.25	.22

Table 4

Results of Hierarchical Regression Examining if Nonattachment Moderates the Effect of Social Threat on Diastolic Blood Pressure Change

Model	Variable	Unstandardized B	Standard Error	Coefficients β	*t*	*p*
1	(Constant)	14.50	.77		18.86	.00
	agency	1.72	.77	.19	2.23	.03
	communion	.78	.77	.09	1.02	.31
2	(Constant)	14.50	.77		18.80	.00
	agency	1.71	.77	.19	2.21	.03
	communion	.79	.77	.09	1.02	.31
	agencyXcommunion	-.28	.77	-.03	-.37	.72
3	(Constant)	18.65	5.19		3.59	.00
	agency	1.80	.78	.20	2.30	.02
	communion	.78	.77	.09	1.02	.31
	agencyXcommunion	-.36	.78	-.04	-.47	.64
	Resilience	-.03	.04	-.07	-.81	.42
4	(Constant)	18.43	5.29		3.48	.0
	agency	2.43	5.25	.28	.46	.64
	communion	2.77	5.28	.31	.52	.60
	agencyXcommunion	-.32	.80	-.04	-.40	.69
	Resilience	-.03	.04	-.07	-.75	.46
	AgencyXresilience	-.01	.04	-.08	-.13	.90
	CommunionXresilience	-.02	.04	-.23	-.38	.70
5	(Constant)	18.61	5.30		3.51	.00
	agency	3.00	5.30	.34	.57	.57
	communion	2.46	5.30	.28	.46	.64
	agencyXcommunion	-4.45	5.30	-.50	-.84	.40
	Resilience	-.03	.04	-.07	-.76	.45
	AgencyXresilience	-.01	.04	-.14	-.24	.81
	CommunionXresilience	-.02	.04	-.20	-.34	.73
	AgencyXcommunionXresilience	.03	.04	.47	.79	.43

Table 5

Results of Hierarchical Regression Examining if Nonattachment Moderates the Effect of Social Threat on Self-Reported Anxiety Change

Model	Variable	Unstandardized B	Standard Error	Coefficients β	*t*	*p*
1	(Constant)	4.86	.41		11.83	.00
	agency	.56	.41	.11	1.35	.18
	communion	.91	.41	.19	2.22	.03
2	(Constant)	4.87	.41		11.92	.00
	agency	.55	.41	.11	1.35	.18
	communion	.93	.41	.19	2.28	.02
	agencyXcommunion	-.69	.41	-.14	1.70	.09
3	(Constant)	2.48	2.74		.90	.37
	agency	.50	.41	.10	1.22	.22
	communion	.92	.41	.19	2.25	.03
	agencyXcommunion	-.66	.41	-.13	-1.60	.11
	Nonattachment	.02	.02	.07	.88	.38
4	(Constant)	3.52	2.73		1.29	.20
	agency	2.66	2.71	.538	.98	.33
	communion	-5.79	2.73	-1.17	-2.12	.04
	agencyXcommunion	-.80	.41	-.16	-1.95	.05
	Nonattachment	.01	.02	.04	.51	.62
	AgencyXnonattachment	-.02	.02	-.42	-.76	.45
	CommunionXnonattachment	.05	.02	1.37	2.48	.01
5	(Constant)	3.37	2.74		1.23	.22
	agency	2.31	2.74	.47	.84	.40
	communion	-5.58	2.74	-1.13	-2.04	.04
	agencyXcommunion	1.70	2.74	.34	.62	.54
	Nonattachment	.01	.02	.05	.55	.59
	AgencyXnonattachment	-.01	.02	-.34	-.62	.54
	CommunionXnonattachment	.05	.02	1.34	2.42	.02
	AgencyXcommunionXnonattachment	-.02	.02	-.51	-.92	.36

Analysis of Mediators of Psychophysiological Reactivity

To test for hypothesis 2, mediation analyses in the present study were conducted using the Baron and Kenny (1986) causal steps approach for testing mediation followed by testing of the indirect effect using the PROCESS macro (Hayes & Scharkow, 2013). This method assumes that mediational models reflect causal relationships between variables, with the independent variable referred to as the causal variable and the dependent variable as the outcome variable. Because these mediators are specifically thought to operate under the condition of social evaluative threat, control participants were not included in the analyses. This method of examining potential mediators related to psychophysiological reactivity among participants exclusively in social threat conditions and excluding controls has been implemented in previous studies (e.g., Ford & Collins, 2010).

The first step of the Baron and Kenny (1986) approach is examining the *c* path, or the relationship between the causal variable (nonattachment) and outcome variables (cardiovascular reactivity and self-reported anxiety reactivity following the first social task). In contrast to hypothesis 1 in the present study, there was no correlation between the causal variable nonattachment and the outcome variables of systolic blood pressure reactivity (r = .01, p = .91), diastolic blood pressure reactivity (r = -.11, p =.30), or anxiety reactivity (r = .15, p = .13). In line with the second step of the causal steps approach, the *a* path, or the relationship between the casual variable (i.e., nonattachment) and mediating variables (i.e., rumination and self-focused attention), was examined. The correlation between rumination following the first task and nonattachment was in the expected direction but nonsignificant (r = -.14 p = .15). There was not a significant correlation between nonattachment and self-focused attention (r = .06, p = .53).

The third step of the casual steps approach involves examining the *b* path, or the relationship between the mediating variables (i.e., self-focused attention and rumination) and outcome variables (i.e., psychophysiological reactivity). Self-reported anxiety reactivity was found to be correlated with both self-focused attention ($r = .37$, $p < .001$) and rumination ($r = .40$, $p < .001$). Though in the expected direction, systolic blood pressure reactivity was not significantly correlated with self-focused attention ($r = .18$, $p = .08$) or rumination ($r = .15$ $p = .15$). Diastolic blood pressure reactivity was not significantly correlated with self-focused attention ($r = .11$, $p = .29$) or rumination ($r = .07$, $p = .47$).

In the fourth step, mediation is further supported if the *c* path, or relationship between the causal variable (i.e., nonattachment) and outcome variable (i.e., self-reported anxiety and cardiovascular reactivity) is diminished or is no longer present when controlling for the mediator. The indirect effect of the mediators (self-focused attention and rumination) on the relationship between the causal variable (nonattachment) and outcome variables (cardiovascular reactivity and self-reported anxiety) were examined utilizing the PROCESS macro for SPSS (Hayes & Scharkow, 2013). Contrary to hypothesis 2, none of the indirect effects were significant (see Tables 6, 7, and 8). The indirect effect of rumination on the relationship between nonattachment and systolic blood pressure reactivity was not significant (β = -.02, BootSE = .02, 95% CI = -.06 to .01). The indirect effect of rumination on the relationship between nonattachment and diastolic blood pressure reactivity was not significant (β = -.004, BootSE = .01, 95% CI = -.02 to .01). The indirect effect of rumination on the relationship between nonattachment and anxiety reactivity was not significant (β = -.02, BootSE = .01, CI = -.04 to .01). The indirect effect of self-focused attention on the relationship between nonattachment and systolic blood pressure reactivity was not significant (β = -.0003, BootSE = .02, CI = -.04 to .04). The indirect effect of self-focused

attention on the relationship between nonattachment and diastolic blood pressure reactivity was not significant (β = -.0001, BootSE = .01, CI = -.02 to .02). The indirect effect of self-focused attention on the relationship between nonattachment and anxiety reactivity was not significant (β = .005, BootSE = .01, CI = -.02 to .03).

Table 6

Results of Mediation Analysis Examining if Rumination or Self-Focused Attention Mediate the Relationship between Nonattachment and Systolic Blood Pressure Activity

					Bootstrap analyses (5000 bootstrap sample)		
Mediator	IV-M (a path)	M-DV (b path)	IV-DV (total effect)	IV-DV (direct effect)	Indirect effect (a X b)	BCa 95% CI lower	BCa 95% CI upper
Rumination	-.07	.26	.01	.03	-.02	-.06	.01
Self-focused attention	-.001	.65^	.01	.01	-.0003	-.04	.04

Simple mediation analyses with nonattachment as the independent variable, rumination or self-focused attention as the mediator, and systolic blood pressure reactivity as the dependent variable. ^ p = .08

Table 7

Results of Mediation Analysis Examining if Rumination or Self-Focused Attention Mediate the Relationship between Nonattachment and Diastolic Blood Pressure Activity

					Bootstrap analyses (5000 bootstrap sample)		
Mediator	IV-M (a path)	M-DV (b path)	IV-DV (total effect)	IV-DV (direct effect)	Indirect effect (a X b)	BCa 95% CI lower	BCa 95% CI upper
Rumination	-.07	.06	-.05	-.04	-.004	-.02	.01
Self-focused attention	-.001	.23	-.05	-.05	-.0001	-.02	.02

Simple mediation analyses with nonattachment as the independent variable, rumination or self-focused attention as the mediator, and diastolic blood pressure reactivity as the dependent variable.

Table 8

Results of Mediation Analysis Examining if Rumination or Self-Focused Attention Mediate the Relationship between Nonattachment and Anxiety Reactivity

					Bootstrap analyses (5000 bootstrap sample)		
Mediator	IV-M (a path)	M-DV (b path)	IV-DV (total effect)	IV-DV (direct effect)	Indirect effect (a X b)	BCa 95% CI lower	BCa 95% CI upper
Rumination	-.07	.25**	.04	.06	-.02	-.04	.01
Self-focused attention	.01	.44**	.04	.03	.005	-.02	.03

Simple mediation analyses with nonattachment as the independent variable, rumination or self-focused attention as the mediator, and anxiety reactivity as the dependent variable.

Analysis of Self-Focused Attention as Mediator

To test hypothesis 3, six mediation analyses in the present study were conducted to determine if 1) the relationship between agency threat and systolic blood pressure change from task 1 to task 2 was mediated by self-focused attention during the first task, 2) the relationship between agency threat and diastolic blood pressure change from task 1 to task 2 was mediated by self-focused attention during the first task, 3) the relationship between agency threat and anxiety change from task 1 to task 2 was mediated by self-focused attention during the first task, 4) the relationship between communion threat and systolic blood pressure change from task 1 to task 2 was mediated by self-focused attention during the first task, 5) the relationship between communion threat and diastolic blood pressure change from task 1 to task 2 was mediated by self-focused attention during the first task, and 6) the relationship between communion threat and anxiety change from task 1 to task 2 was mediated by self-focused attention during the first task. The change scores described above (i.e., task 1 to task 2) represent habituation, and therefore, this language will be used in the following results.

The first step of the Baron and Kenny (1986) approach is examining the *c* path, or the relationship between the causal variable (threat condition) and outcome variables (habituation of psychophysiological variables from task 1 to task 2). There was not a significant correlation between agency threat and habituation of systolic blood pressure, diastolic blood pressure, or anxiety (r = -.15, p = .13, r = -.11, p = .28, r = .16, p = .11, respectively). There was a significant correlation between the communion threat condition and habituation of anxiety (r = .17, $p < .05$), meaning participants exposed to communion threat experienced more habituation of anxiety. There was not a significant correlation between communion threat and habituation of systolic

blood pressure (r = .16, p = .11). There was a trend for significance of habituation of diastolic blood pressure (r = .20, p = .055).

In line with the second step of the causal steps approach, the *a* path, or the relationship between the casual variable (i.e., agency or communion threat) and mediating variable (i.e., self-focused attention), was examined. The correlation between agency threat and self-focused attention was not significant (r = .07, p = .47). The correlation between communion threat and self-focused attention was not significant (r = -.02, p = .85).

The third step of the casual steps approach involves examining the *b* path, or the relationship between the mediating variable (i.e., self-focused attention) and outcome variables (i.e., psychophysiological reactivity). Self-focused attention was not significantly correlated with habituation of systolic blood pressure (r = .10, p = .33), diastolic blood pressure (r = .11, p = .28), or anxiety (r = -.02, p = .88).

In the fourth step, mediation is further supported if the *c* path, or relationship between the causal variable (i.e., threat condition) and outcome variable (i.e., psychophysiological habituation) is diminished or is no longer present when controlling for the mediator. The indirect effect of the mediator (self-focused attention) on the relationship between the causal variable (threat condition) and outcome variables (psychophysiological habituation) were examined utilizing the PROCESS macro for SPSS (Hayes & Scharkow, 2013). Contrary to hypothesis 3, none of the indirect effects were significant (see Tables 9 and 10).

Table 9

Results of Mediation Analysis Examining if Self-Focused Attention Mediates the Relationship between Agency Threat and Systolic Blood Pressure, Diastolic Blood Pressure, or Anxiety

					Bootstrap analyses (5000 bootstrap sample)		
Outcome	IV-M (a path)	M-DV (b path)	IV-DV (total effect)	IV-DV (direct effect)	Indirect effect (a X b)	BCa 95% CI lower	BCa 95% CI upper
Systolic blood pressure	.14	.32	-2.02	-2.07	.04	-.39	.49
Diastolic blood pressure	.14	.24	-1.02	-1.05	.03	-.26	.35
Anxiety	-.31	.004	.63	.63	.001	-.13	.12

Simple mediation analyses with agency threat as the independent variable, self-focused attention as the mediator, and habituation of systolic blood pressure, diastolic blood pressure, or anxiety as the dependent variable. ^ $p = .08$

Table 10

Results of Mediation Analysis Examining if Self-Focused Attention Mediates the Relationship between Communion Threat and Systolic Blood Pressure, Diastolic Blood Pressure, or Anxiety

					Bootstrap analyses (5000 bootstrap sample)		
Outcome	IV-M (a path)	M-DV (b path)	IV-DV (total effect)	IV-DV (direct effect)	Indirect effect (a X b)	BCa 95% CI lower	BCa 95% CI upper
Systolic blood pressure	-.12	.32	2.10	2.13	-.04	-.43	.34
Diastolic blood pressure	-.12	.25	1.75	1.79	-.03	-.36	.21
Anxiety	.08	.01	-.79	-.29	-.001	-.10	.10

Simple mediation analyses with communion threat as the independent variable, self-focused attention as the mediator, and habituation of systolic blood pressure, diastolic blood pressure, or anxiety as the dependent variable. ^ $p = .08$

The indirect effect of self-focused attention on the relationship between agency threat and habituation of systolic blood pressure was not significant (β = .04, BootSE = .20, 95% CI = -.39 to .49). The indirect effect of self-focused attention on the relationship between agency threat and the habituation of diastolic blood pressure was not significant (β = .03, BootSE = .14, 95% CI = -.26 to .35). The indirect effect of self-focused attention on the relationship between agency threat and habituation of anxiety was not significant (β = .001, BootSE = .06, CI = -.13 to .12). The indirect effect of self-focused attention on the relationship between communion threat and habituation of systolic blood pressure was not significant (β = -.04, BootSE = .18, 95% CI = -.43 to .34). The indirect effect of self-focused attention on the relationship between communion threat and the habituation of diastolic blood pressure not significant (β = -.03, BootSE = .14, 95% CI = -.36 to .21). The indirect effect of self-focused attention on the relationship between communion threat and habituation of anxiety was not significant (β = -.001, BootSE = .04, CI = -.10 to .10).

Ancillary Analyses

Given the above null findings, exploratory analyses were conducted to examine the relationships among nonattachment and self-focused attention at different time points in the study. The archival data used in this study were part of a larger study that also assessed blood pressure reactivity while listening to the role-played interaction. In other words, blood pressure was not only assessed while the participant was speaking, but also, while the participant was listening. Therefore, reactivity during the listening phase of the experiment was examined. Furthermore, correlations among variables of interest at different phases of the experiment were conducted. Significant results are presented below.

Relationships among Nonattachment and Variables of Interest in Different Phases

Although there were no significant relationships between nonattachment and the hypothesized outcome variables (cardiovascular reactivity and post-task anxiety), there was a positive correlation between nonattachment and pre-task anxiety (r = -.24, p < .01), suggesting that individuals that were higher in nonattachment experienced less anxiety prior to engaging in the first social task. Similarly, although no significant correlation between nonattachment and rumination following the first task was found, nonattachment was negatively correlated with rumination following the second task (r = -.23, p < .05), suggesting that individuals higher in nonattachment experienced less rumination following the second task.

Predictors of Self-Reported Anxiety Change in response to Task 2.

The association of self-reported anxiety change from baseline to task 2 with both self-focused attention and rumination related to task 2 were examined. Consistent with the pattern of findings previously reported for task 1, self-reported anxiety change in response to task 2 was associated with both self-focused attention during task 2 (r = .38, p < .001) and rumination following task 2 (r = .28, p < .001).

Interactions between Self-Focused Attention, Condition, and Cardiovascular Reactivity

A sequence of hierarchical regressions with the rationale of the order of each step coming from previous research (see Smith & Jordan, 2015) for examining cardiovascular reactivity in response to social evaluative threat was used in the following analyses to examine if changes in blood pressure varied by phase of the experiment and level of self-focused attention. The relationship between self-focused attention and cardiovascular reactivity was tested, and the moderating effect of self-focused attention on agency and communion threat (see Table 11) was examined. Although on its own, self-focused attention was not associated with SBP reactivity

while listening (t = 1.38, p = .17) during the first task, this variable had a significant interaction with agency threat (t = 2.25, p < .05) and a trend toward significance with communion threat (t = 1.76, p = .08). This finding suggests that individuals with higher levels of self-focused attention are more susceptible to greater cardiovascular reactivity while listening under agency threat. To visually depict the interaction, a median split was implemented to sort participants into high self-focused attention and low self-focused attention to see its effect on the relationship between agency threat and SBP reactivity while listening (see Figure 4).

Figure 4

The relationship between self-focused attention and SBP reactivity while listening during task 1 based on low versus high agency threat

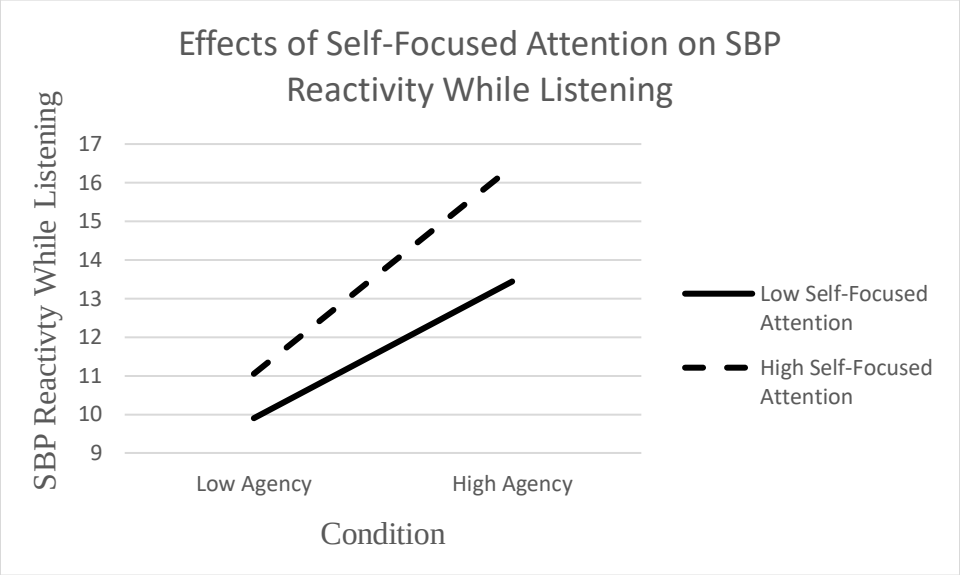


Table 11

Results of Hierarchical Regression Examining if Self-Focused Attention Moderates the Effect of Social Threat on Listening 1 Reactivity

Model	Variable	R Squared Change	Unstandardized B	Standard Error	Coefficients β	*t*	*p*
1	(Constant)	.11	12.83	.67		19.22	.00
	Agency		2.24	.67	.28	3.35	.00
	Communion		1.40	.67	.18	2.10	.04
2	(Constant)	.00	12.83	.67		19.18	.00
	Agency		2.22	.67	.28	3.32	.00
	Communion		1.41	.67	.18	2.10	.04
	agencyXcommunion		-.47	.67	-.06	-.70	.49
3	(Constant)	.01	8.99	2.87		3.14	.00
	Agency		2.14	.67	.27	3.20	.00
	Communion		1.36	.67	.17	2.05	.04
	agencyXcommunion		-.41	.67	-.05	-.61	.54
	SelfFocusedAttention1		.24	.17	.12	1.38	.17
4	(Constant)	.05	8.48	2.82		3.01	.00
	Agency		-4.13	2.88	-.52	-1.43	.15
	Communion		-3.49	2.88	-.44	-1.21	.23
	agencyXcommunion		-.58	.66	-.07	-.87	.38
	SelfFocusedAttention1		.26	.17	.13	1.52	.13
	agencyXsfa1		.39	.17	.82	2.25	.03
	communionXsfa1		.30	.17	.64	1.76	.08
5	(Constant)	.00	8.72	2.89		3.01	.00
	Agency		-4.09	2.89	-.51	-1.41	.16
	Communion		-3.40	2.89	-.43	-1.17	.24
	agencyXcommunion		.54	2.89	.07	.19	.85
	SelfFocusedAttention1		.24	.17	.12	1.38	.17
	agencyXsfa1		.39	.17	.82	2.24	.03
	communionXsfa1		.30	.17	.63	1.73	.09
	agencyXcommunionXsfa1		-.07	.17	-.15	-.40	.69

Interactions among Social Evaluative Threat, Self-Focused Attention Change, and Cardiovascular Reactivity

The same method of hierarchical regression was used to examine to the relationship between change in self-focused attention (i.e., task 2 score minus task 1 score) and cardiovascular reactivity while listening during task 2. The relationship between self-focused attention change and cardiovascular reactivity was tested, and on its own, change in self-focused attention was not associated with SBP reactivity (t = -.36, p = .72) (See Table 12). However, change in self-focused attention had a significant interaction with agency threat when predicting SBP reactivity while listening during task 2 (t = -2.14, p < .05). This finding suggests that individuals under agency threat who experienced higher SBP reactivity during the second listening task had less change in self-focused attention from task 1 to task 2. The results of two Shapiro-Wilks tests did not show significant departures from normality in the distribution of self-focused attention scores for both the first social task, $W(107) = .98$, $p = .20$, and the second social task, $W(107) = .99$, $p = .37$, suggesting that a skewed distribution was not driving these significant findings. To visually depict the interaction between change in self-focused attention and agency threat, a median split was implemented to sort participants into high change in self-focused attention and low change in self-focused attention to see its effect on the relationship between agency threat and SBP reactivity while listening during task 2 (see Figure 5).

Figure 5

The relationship between self-focused attention change and SBP reactivity while listening during task 2 based on low versus high agency threat

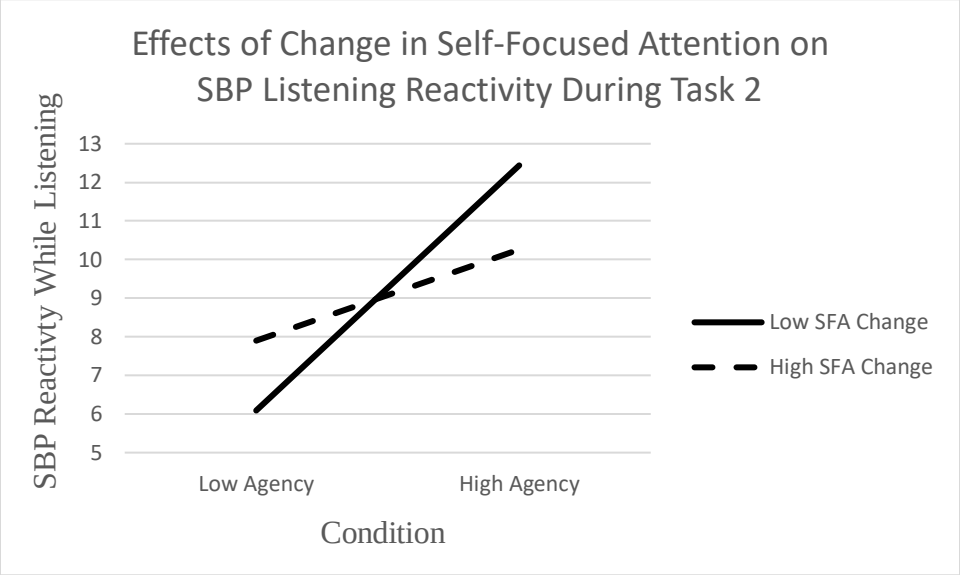


Table 12

Results of Hierarchical Regression Examining if Change in Self-Focused Attention Moderates the Effect of Social Threat on Listening 2 Reactivity

Model	Variable	R Squared Change	Unstandardized B	Standard Error	Coefficients β	*t*	*p*
1	(Constant)	.13	9.36	.68		13.67	.00
	Agency		2.13	.68	.26	3.11	.00
	Communion		2.10	.68	.25	3.06	.00
2	(Constant)	.01	9.36	.68		13.68	.00
	Agency		2.10	.68	.25	3.08	.00
	Communion		2.11	.68	.26	3.08	.00
	agencyXcommunion		-.73	.68	-.09	-1.07	.29
3	(Constant)	.00	9.30	.70		13.21	.00
	Agency		2.08	.69	.25	3.01	.00
	Communion		2.10	.67	.25	3.06	.00
	agencyXcommunion		-.78	.70	-.09	-1.11	.27
	SFAchangeScore		-.09	.24	-.03	-.36	.72
4	(Constant)	.03	9.22	.70		13.21	.00
	Agency		1.81	.70	.22	2.57	.01
	Communion		1.88	.70	.23	2.67	.01
	agencyXcommunion		-.74	.69	-.09	-1.06	.29
	SFAchangeScore		.01	.24	.00	.05	.96
	agencyXSFAchangeScore		-.52	.24	-.19	-2.14	.03
	communionXSFAchangeScore		.09	.24	.03	.36	.72
5	(Constant)	.00	9.29	.71		13.17	.00
	Agency		1.79	.71	.22	2.54	.01
	Communion		1.91	.71	.23	2.70	.01
	agencyXcommunion		-.64	.71	-.08	-.91	.37
	SFAchangeScore		-.02	.24	-.01	-.09	.93
	agencyXSFAchangeScore		-.53	.24	-.19	-2.15	.03
	communionXSFAchangeScore		.05	.24	.02	.22	.83
	agenxyXcommunionXSFAchangeScore		.18	.24	.07	.75	.46

DISCUSSION

Discussion of Findings

Social anxiety disorder (SAD) is among the most prevalent mental disorders in the United States (Kessler, Berglund, et al., 2005) and is characterized by fear of negative evaluation and avoidance of social interactions (APA, 2013). Although CBT with exposure (e.g., voluntary participation in feared activities) is the most efficacious psychological treatment for SAD at this time, it is estimated that only a quarter of individuals achieve full remission of symptoms (Otto et al., 2000). Several lines of research have identified cognitive features related to SAD, most prominently rumination and self-focused attention, that exacerbate symptoms and prevent corrective learning experiences following social interactions/exposures (Clark & Wells, 1995; Gaydukevych & Kocovski, 2012; Mellings & Alden, 2000; Woody & Rodriguez, 2000). Mindfulness meditation has been found to result in significant reductions in self-focused attention, rumination, and overall symptoms of social anxiety (Cassin & Rector, 2011; Goldin et al., 2009; Goldin & Gross, 2010; Goldin et al., 2012; Shikatani et al., 2014).

The purpose of the current study was to examine how nonattachment, or the ability to "let go" of desired experiences and be open to whatever transpires, is associated with rumination, self-focused attention, and the psychophysiological effects of social evaluative threat. Nonattachment has been found to be a primary mechanism by which mindfulness meditation improves self-reported psychological well-being and reduces stress, rumination, and anxiety (Coffey & Hartman, 2008; Whitehead et al., 2019). Therefore, in the present study, nonattachment was expected to be associated with lower levels of physiological reactivity (i.e., systolic and diastolic blood pressure) and psychological reactivity (i.e., anxiety) as a result of its established negative association with rumination, a major contributing factor to social anxiety.

Although there have been no previous studies that examinine the relationship between nonattachment and attention biases in social anxiety, self-focused attention was expected to be an additional mediator between nonattachment and the effects of social evaluative threat. As pressure to make a good impression on others is understood to give rise to self-focused attention, it was expected that nonattachment would be associated with less of this social pressure and, in turn, obviate the need for excessive self-monitoring in the first place (Clark & Wells, 1995). Finally, consistent with previous literature demonstrating that reducing self-focused attention augments habituation to stressful social tasks (e.g., Renner et al., 2017; Wells & Papageorgiou, 1998), self-focused attention was expected to function as a mediator between social evaluative threat and blood pressure/anxiety reduction from the first to second exposure.

Correlation analyses followed by hierarchical regression analyses were conducted to examine if nonattachment was associated with self-reported anxiety change and cardiovascular reactivity in response to the first task. Contrary to hypothesis 1, nonattachment was not correlated with either of these outcome variables and there were no significant interactions. Next, the relationships between nonattachment and mediating variables (self-focused attention during and rumination following the first task) were examined. Rumination and self-focused attention were not significantly associated with nonattachment. Both rumination and self-focused attention were found to be correlated with self-reported anxiety change, but not with cardiovascular reactivity. Finally, in six separate mediation analyses, the indirect effects of self-focused attention and rumination on the outcome variables were not found to be significant. Overall, the above results were not consistent with hypothesis 2.

The above steps were repeated to test hypothesis 3, that self-focused attention during the first task mediates the relationship between social evaluative threat (agency and communion) and

psychophysiological (blood pressure and anxiety) change from the first task to the second task. Neither agency threat nor communion threat was associated with cardiovascular change scores from task 1 to task 2. To be later discussed below, communion threat was positively correlated with self-reported anxiety change from task 1 to task 2. Neither agency nor communion threat were associated with self-focused attention. Self-focused attention was not correlated with either change in cardiovascular reactivity or change in self-reported anxiety from the first to second exposure. Finally, in six separate mediation analyses, the indirect effects of self-focused attention on the relationship between social evaluative threat and psychophysiological reactivity scores from task 1 to task 2 were not significant. The above results were not consistent with hypothesis 3.

Taken together, the results of the study discussed above do not support hypotheses 1 through 3. The finding that nonattachment was not associated with self-reported anxiety reactivity following the social tasks contrasts with previous research suggesting that nonattachment is negatively associated with self-reported general anxiety symptoms (Sahdra et al., 2010; Whitehead et al., 2019). This inconsistency in findings could suggest that nonattachment may be differentially related to self-reported anxiety in general and self-reported anxiety following an experimental stressor. While nonattachment is associated with lower levels of anxiety symptoms when reporting about a previous time (e.g., symptoms experienced over the past week as measured by Sahdra et al., 2010 and Whitehead et al., 2019), the relationship between trait nonattachment and anxiety significantly weakens in the face of an immediate stressor.

The lack of significant relationship between nonattachment and anxiety change following an immediate stressor could be explained by the fact that, in contrast to the previous

questionnaire studies, the anxiety of the participants in the present study was reported immediately after a task that elicited a classic fight-or-flight response, as evidenced by cardiovascular readings taken throughout the study. It would not be adaptive or sensible, for example, for individuals to experience a sense of nonattachment to whatever may transpire when the brain registers a threatening situation and the body prepares itself on a basic level to fight or run for one's life. In social situations, more specifically, the fight-or-flight response has also been found to promote prosocial behaviors when interacting with others. Von Dawans et al. (2012) found that individuals who underwent the Trier Social Stress Test for Groups (TSST-G; von Dawans et al., 2011) prior to playing interactive games displayed more sharing of resources, trustworthiness, and trust towards other players. A third variable may be more relevant than nonattachment to the body's stress response in social situations.

This is not to say, however, that nonattachment in any form has no bearing on the stress response in threatening situations. It is possible that cultivating and applying nonattachment in certain contexts, for example practicing mindfulness in stressful situations, could facilitate learning experiences over time that modulate the stress response. Recent findings by Joss et al. (2020), for example, suggest that increased levels of nonattachment following a mindfulness intervention were uniquely associated with self-reported reductions in interpersonal distress and rejection sensitivity. Therefore, it is possible that a nonattached mindset cultivated through regular practice of mindfulness may have unique benefits in comparison to general trait nonattachment. Future research is needed to determine if nonattachment cultivated through regular use of mindfulness meditation (ideally practiced in a relevant social context) modulates anxiety in response to an immediate experimental social stressor.

Consistent with previous studies (Woody & Rodriguez, 2000), self-focused attention was significantly associated with anxiety reactivity, but it was not found to function as a mediator between social evaluative threat and anxiety habituation from the first to second task as outlined in hypothesis 3. To the author's knowledge, no studies have examined the role of self-focused attention on the effects of repeated experimentally induced stress and psychophysiological habituation. In previous studies examining the effect of self-focused attention on social anxiety, no more than one social task was implemented in which self-focused attention was experimentally induced (e.g., Gaydukevych & Kocovski, 2012; Holzman & Valentiner, 2016; Woody & Rodriguez, 2000). Therefore, comparison data relevant to hypothesis 3 is limited.

As multiple exposures are often needed to achieve significant reductions in anxiety, it is possible that a relationship between self-focused attention and psychophysiological habituation could have been discerned with more than two social tasks (Craske et al., 2014). This would be expected, as both in the current study and previous studies (e.g., Holzman & Valentiner, 2016; Mellings & Alden, 2000), self-focused attention was found to be associated with greater post-task rumination, which is known to impede habituation (Shikatani et al., 2014). Trials of exposure therapy in which high levels of self-focused attention is examined as a risk factor for nonresponse to treatment may be most appropriate. In contrast, there are several examples in the literature in which enhancing other-focused attention during exposure (Wells & Papageorgiou, 1998) or alternating between self- and other-focused attention (Clark, 1999; Renner et al., 2017) has been found to augment habituation to social stressors.

Ancillary Analyses

Given that the broader experiment from which this archival study was derived included other phases, relationships among nonattachment and self-focused attention at different time

points in the study were examined in a series of ancillary analyses. First, although it was found that nonattachment was not associated with anxiety change in response to the social tasks, it was found that nonattachment was negatively associated with baseline anxiety prior to the social tasks. This result adds to the findings of Sahdra et al. (2010) and Whitehead et al. (2019), who found a relationship between self-reported anxiety symptoms experienced over the past week. Taken together, these findings suggest that there is a relationship between trait nonattachment and self-reported anxiety in the context of recent general symptoms and prior to an experimental stressor, the latter possibly reflecting lower levels of anticipatory processing.

In an additional analysis, trait nonattachment was also found to have a significant negative correlation with rumination following the second task. This finding is consistent with rumination being negatively associated with nonattachment in a questionnaire study by Coffey and Hartman (2008). The current study is the first, to the author's knowledge, to demonstrate a relationship between trait nonattachment and rumination specific to an experimental stressor. Negative rumination following social experiences is among the most powerful factors that maintain SAD over time (Shikatani et al., 2014) and was observed to be associated with self-reported anxiety following both task 1 and task 2 in current study. Rumination was not found to be a mediator between nonattachment and post-task anxiety reactivity as predicted in hypothesis 2. As previously discussed, it is possible that nonattachment may not impact one's response to social stressors unless cultivated in a relevant social context over time (e.g., through mindfulness meditation during social interactions). Similarly, it is possible that trait nonattachment could facilitate reduction in anxiety in response to a social stressor over a greater period of time and a greater number of exposures due to its association with lower rumination in response to a repeated social exposure (i.e., task 2). Additional research would be needed to determine if

nonattachment, whether dispositional or cultivated through mindfulness practice, could facilitate habituation to consecutive social stressors as a result of lower/lowered post-event rumination.

Finally, the relationship between self-focused attention and cardiovascular reactivity at various time points in the study was examined. It was found that the relationship between agency threat and SBP reactivity while listening during the first task was significantly moderated by self-focused attention, suggesting that individuals with higher levels of self-focused attention are more susceptible to greater cardiovascular reactivity while listening under agency threat. These findings are consistent with those of Smith and Jordan (2015), who also found differential effects between the communion and agency conditions. In their study, for example, agency threat was uniquely associated with the experience of shame. It is possible that in the current study, the impetus to avoid shame evoked by agency threat prompts a flurry of protective self-focused cognitive processes (e.g., thinking of what would be skillful enough to say, how to conceal physical symptoms of anxiety). This explanation also aligns with the finding that communion threat, but not agency threat, was positively correlated with self-reported anxiety change from task 1 to task 2. Communion threat may result in a relatively lower need for the aforementioned cognitive safety behaviors related to appearing competent and a greater focus on the needs and feelings of conversation partners, taking the focus off of the self and thereby facilitating habituation across social encounters.

This effect was perhaps exclusively found in a listening period because while one can "tune out" to rehearse one's speech or behavior while listening to another individual, one must be more actively engaged while speaking, and therefore, have less cognitive resources available to engage in self-focused attention. In this sense, it is possible that self-focused attention may be opportunistic depending on the level of cognitive resources available. Future studies examining

this possibility by other means of occupying cognitive resources (e.g., engaging in an attentionally demanding cognitive test) would be needed to support this theory.

It was also found that change in self-focused attention from task 1 to task 2 interacted with agency threat to predict SBP reactivity while listening, suggesting that individuals under agency threat who experience more of a decrease in self-focused attention from task 1 to task 2 experience significantly less cardiovascular reactivity during the second listening task. This is consistent with the findings of Calamaras et al. (2012), who found that self-focused individuals with social anxiety disorder tended to experience reductions in self-focused attention as a result of cognitive-behavioral therapy. Given that many patients fail to experience symptom remission following CBT (Otto et al., 2000), mechanisms of pre-emptively addressing attention biases during cognitive-behavioral treatment may be a fruitful avenue to explore.

The ancillary findings that individuals higher in self-focused attention under agency threat experience greater cardiovascular reactivity and that individuals in the agency condition with greater reductions in self-focused attention from the first to second task experience significantly less cardiovascular reactivity during the second task can also be explained in the context of past research on cardiovascular reactivity in social anxiety. For example, Gramer and Saria (2007) found that during speech and role-play tasks that, although individuals high in social anxiety experienced the greatest systolic and diastolic blood pressure changes during social tasks under low evaluative threat, there was no significant difference in cardiovascular reactivity between low-socially anxious and high-socially anxious participants in high evaluative threat conditions. These researchers reasoned that socially anxious individuals experience relatively lower cardiovascular reactivity under conditions of high evaluative threat in which they will be judged on the effectiveness of their arguments (i.e., under agentic threat) due to

reduced task engagement. In other words, when the social task is perceived to be so difficult that it is impossible to make a positive impression, individuals who are high in social anxiety experience relatively lower cardiovascular reactivity due to a resignation of effort, as making an effort is conceived to no longer impact the social outcome.

In light of the explanation of these findings by Gramer and Saria (2007) as well as other research on cardiovascular reactivity in social anxiety (e.g., Baggett et al., 1996; Gramer, 2006; Gramer & Sprintschnik, 2008; Grossman et al., 2001; Larkin et al., 1998; Mauss et al., 2003; Turner et al., 1986), higher reactivity in the first listening segment among individuals high in self-focused attention in the agency condition could be explained by task engagement. Conditions involving high levels of agentic threat, as demonstrated in these past studies, tend to result in lower than expected cardiovascular reactivity in high-socially anxious individuals, possibly due to the withdrawal of effort as it is considered highly unlikely that they will succeed. It is possible that individuals high in self-focused attention experienced the greatest cardiovascular reactivity in the first listening segment because the cognitive processes involved in self-focused attention (e.g., figuring out what to say next, making sure anxiety symptoms are not showing, considering how one is being perceived) are intended to be socially self-preserving. In other words, individuals higher in self-focused attention may experience cardiovascular reactivity due to this attention bias being a marker of still attempting to make a good impression in the face of a daunting social stressor. The stress response of these individuals may be mobilizing accordingly as they take the opportunity during the less cognitively-involved listening section of the social task to focus inward in order to contemplate their current social standing and plan their next steps. The finding that reductions in self-focused attention from the first to second social task are associated with lower cardiovascular activity in the agency

condition is consistent with this explanation; reduced engagement in inward monitoring would require less physiological mobilization.

While the above ancillary findings may seem small in their effect on SBP reactivity while listening, small increases in blood pressure are relevant at both the individual and population level. For example, pseudoephedrine has been found to increase blood pressure by approximately 1mmHg and some research suggests that it should be avoided in individuals with hypertension (Salerno et al., 2005). Moreover, reductions in SBP and DBP as low as 2mmHg have been found to result in significantly lower incidences of cardiovascular disease in individuals with and without hypertension (Blood Pressure Lowering Treatment Trialists' Collaboration, 2003; Hess et al., 2016; Wong & Wright, 2014). In their study, Hess et al., for example, considered reductions of 4.04 to 5.62 mmHg as a result of isometric exercise training to be clinically meaningful. The results of the present study therefore are not only statistically significant but are potentially clinically meaningful as well.

Strengths of the Study

The design of the current study and resulting findings have several strengths. First, the study implemented a version of the TSST modified by Smith and Jordan (2015) involving a pre-recorded audio script during the listening portions of the tasks, allowing for a high level of standardization across experimental sessions. Moreover, the current study included measures of cardiovascular reactivity along with self-reported anxiety. In addition to providing a reliable, objective measure of the participants' stress response, measuring blood pressure provided quantitative indicators of the stress response at various points during the task in a discreet manner with minimal distraction (e.g., as opposed to pausing the tasks to verbally inquire about participants' anxiety levels). This is also the first study, to the author's knowledge, to collect data

on cardiovascular reactivity specifically during speaking portions and listening portions during a social encounter. The availability of these data culminated in perhaps the most unique and compelling finding in this study, that participants with high levels of self-focused attention under agency threat had significantly greater cardiovascular reactivity during a listening portion of a social task. These findings contribute to the existing body of literature on how self-focused attention impacts the experience of social stress by potentially suggesting that self-focused attention is opportunistic; when greater cognitive space allows for more attention to be devoted to one's self, self-consciousness and social stress may naturally increase.

Limitations of the Study

The preceding findings should be interpreted in light of several limitations. First, as a nonclinical sample was used in this study, it is uncertain if the pattern of results would also apply to individuals who meet criteria for SAD. Participants with subclinical social anxiety are often relied upon in SAD research (Crişan et al., 2016; Merikangas et al., 2002) and exhibit similar fluctuations in self-focused attention and rumination in response to social stressors (Mellings & Alden, 2000). In such studies, individuals often take pre-task questionnaires related to SAD symptoms, allowing researchers to compare the outcome variables of low-and high-socially anxious individuals in statistical analyses (Borkovec et al., 1973). As the current study is based on a pre-existing data set, including a measure of social anxiety in the baseline measures was not possible. Future studies could examine if the significant relationships between the variables of interest in the current study are maintained in a clinical sample, or if patterns of results differ in high- and low- socially anxious participants.

An additional limitation of this study was that the design of the social task may have created patterns of self-focused attention. The two research assistants that served as "raters" of

the participant in the current study had minimal interaction with the research assistant. The dialogue participants heard during the listening portions was a pre-recorded audio script from another speaker to enhance standardization across experimental sessions. The fact that the participants were not listening to the speech of the research assistants themselves may have reduced the necessity of paying attention to the assistants, allowing for more attention devoted to one's self during the listening portions and the observed increases in anxiety during these segments. It is suggested that the alternating listening-talking format be repeated in a study in which participants attend to the speech directly from individuals present in the room with them. For example, rather than a pre-recorded audio script of speech being played during the listening segments, the research assistants in the room speaking directly to participants could be implemented instead.

Implications and Future Directions

Although the main hypotheses were not supported, the results of the current study contain several novel findings that build on the body of knowledge about nonattachment, self-focused attention, and psychophysiological reactivity to social threat. There is still much to be learned about the effects of nonattachment on mental health. The current study is, to the author's knowledge, the first to have identified associations between nonattachment and lower levels of anxiety in response to a coming experimental social stressor, possibly reflecting lower levels of anticipatory processing, as well as lower levels of rumination following this stressor. As rumination and anticipatory processing certainly are factors that contribute to the maintenance of social anxiety disorder, interventions that promote nonattachment may be a helpful addition to traditional cognitive-behavioral therapy for social anxiety disorder.

The strongest findings in the current study, however, center on the powerful ties between self-focused attention and psychophysiological reactivity to social stress. It was found that when one's status or competence is perceived to be evaluated or in question (i.e., when one is under agency threat), cardiovascular reactivity is at its highest when individuals high in self-focused attention are in a listening role. This may reflect an opportunistic form of self-focused attention that manifests when cognitive space is available and one's perceived competence is threatened (e.g., while listening, nodding and making utterances of agreement, etc.). Or rather, these findings may reflect a more deliberate, conscious, strategic approach in which individuals engage in protective processes related to self-focused attention (e.g., thinking about what to say next) when their perceived competence is threatened and the risk of getting "caught" being too preoccupied to adequately attend to their conversation partner is lower.

Whether self-focused attention is an automatic protective mechanism dependent on cognitive space, or a voluntary effort to think one's way out of a potentially embarrassing social experience, or both, these findings have potential implications that may point to the need for future studies on examining the properties of self-focused attention and how it changes across different phases of social interactions. If identified, greater knowledge on when self-focused attention is most likely to arise during social interactions could lead to quicker identification in therapy of a potential safety behavior that is largely invisible, as is intended by individuals with this cognitive bias to conceal signs of social anxiety. For example, therapists implementing exposure therapy for social anxiety may find it helpful to expect and inquire about their patient's focus of attention (especially while listening) in order to address it more efficiently. By reducing self-focused attention and other safety behaviors during exposure, socially anxious individuals can better attribute outcomes of not being critiqued or rejected in social encounters to these

encounters not posing these threats to the extent they anticipated in the first place, rather than due to their socially self-protective efforts.

In terms of clinical implications, in the current author's opinion, the coalescence of these findings most strongly suggests that mindfulness meditation, when used effectively during social exposures, may have a high potential for augmenting therapeutic gains. Although the findings on nonattachment in the current study were modest, the observed lower pre-task anxiety and levels of rumination following task 2 among individuals higher in nonattachment suggest that this trait is negatively associated with post-event rumination (upon consecutive exposures) and pre-task anxiety possibly related to anticipatory processing, two of the major maintaining factors of social anxiety (Mellings & Alden, 2000; Rachman et al., 2000; Wong & Moulds, 2011). Mindfulness is understood to derive many of its mental health benefits by promoting nonattachment (Coffey & Hartman, 2008; Whitehead et al., 2019) and may therefore be a useful means of promoting nonattachment in individuals with social anxiety disorder. Moreover, mindfulness enhances one's ability to gently acknowledge and redirect one's attention away from ruminative thoughts, by which individuals with social anxiety disorder are often distracted and made to feel more anxious (Clark & Wells, 1995).

Perhaps most importantly, mindfulness promotes a deliberate, singular, present focus on whatever one chooses to be the object of their attention (Kabat-Zinn, 1990). This could serve two important purposes for individuals with social anxiety disorder. First, as the current study and previous studies on attention biases suggest, self-focused attention is strongly connected to the experience of social anxiety. If during exposure therapy, processes related to self-focused attention could be combatted with a competing mechanism that demands cognitive effort and resources (e.g., mindfulness to one's conversation partner), the pattern of availability of

cognitive resources, self-focused attention, and increased anxiety could be derailed. The current study suggests that perhaps this method could be applied most practically to periods of conversations during which one is listening.

Finally, mindfulness meditation, in addition to providing a competing resource for maladaptive attention patterns, could promote attention to positive feedback and social learning experiences. As Bandura (1969) proposed, one experiences and learns through an event through the lens of how it is perceived. If one is self-focused during a social situation to the extent that they are primarily attending to their distressing inner commentary and physical sensations, that social situation would be understandably a punishing experience that promotes future anxiety and avoidance. Moreover, the ability to accurately perceive one's conversation partner(s) is compromised by self-focused attention. With greater mindful awareness towards the actual characteristics, behaviors, and expressed needs of others, socially anxious individuals' distinct sense of other people being inherently inclined to reject them can be challenged and, in turn, their diminished trust in others restored (Kaplan et al., 2015; Rapee & Heimberg, 1997). The most fundamental purpose of mindfulness, sought after from the very beginning of the practice, is to experience a situation as close to reality as possible, as opposed to through the filter of one's mental processes. Mindfulness could perhaps be used in such a way to thin the veil of maladaptive cognitive biases, promoting engagement and enjoyment rather than disengagement and discouragement in the present moment with others.

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Appendix A

Non-attachment Scale (NAS)

1. I can accept the flow of events in my life without hanging onto them or pushing them away.
2. I can let go of regrets and feelings of dissatisfaction about the past.
3. I find I can be calm and/or happy even if things are not going my way.
4. I have a hard time appreciating others' successes when they outperform me.
5. I can remain open to what life offers me regardless of whether it seems desirable or undesirable at a particular time.
6. I can enjoy pleasant experiences without needing them to last forever.
7. I view the problems that enter my life as things/issues to work on rather than reasons for becoming disheartened or demoralized
8. I can enjoy my possessions without being upset when they are damaged or destroyed
9. The amount of money I have is not important to my sense of who I am.
10. I do not go out of my way to cover up or deny my negative qualities or mistakes.
11. I accept my flaws.
12. I can enjoy my family and friends without feeling I need to hang on to them.
13. If things aren't turning out the way I want, I get upset.
14. I can enjoy the pleasures of life without feeling sad or frustrated when they end.
15. I can take joy in others' achievements without feeling envious.
16. I find I can be happy almost regardless of what is going on in my life.
17. Instead of avoiding or denying life's difficulties, I face up to them.
18. I am open to reflecting on my past mistakes and failings.
19. I do not get "hung up" on wanting an "ideal" or "perfect" life.
20. I am comfortable being an ordinary, less than perfect human being.
21. I can remain open to thoughts and feelings that come into my mind, even if they are negative or painful.
22. I can see my own problems and shortcomings without trying to blame them on someone or something outside myself.
23. When pleasant experiences end, I am fine moving on to what comes next.
24. I am often preoccupied by threats or fears.
25. I am not possessive of the people I love.
26. I do not have to hang on to people I love at all costs; I can let them go if they wish to go.
27. I do not feel I need to escape or avoid bad experiences in my life.
28. I can admit my shortcomings without shame or embarrassment.
29. I experience and acknowledge grief following significant losses, but do not become overwhelmed, devastated, or incapable of meeting life's other demands.
30. I am not possessive of the things I own.

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Appendix B

Focus of Attention Questionnaire (FAQ)

1. I was focusing on the other person's appearance or dress.
2. I was focusing on the features or conditions of the physical surroundings (e.g., appearance, temperature).
3. I was focusing on what I would say or do next.
4. I was focusing on the impression I was making on the other person.
5. I was focusing on how my conversation partner might be feeling about himself/herself.
6. I was focusing on what I thought of my conversation partner.
7. I was focusing on my level of anxiety.
8. I was focusing on what the other person was saying or doing. Not at all Somewhat To a moderate degree
9. I was focusing on my internal bodily reactions (i.e., heart rate).
10. I was focusing on past social failures.

Answer choices for every statement:
Strongly Disagree (1)
Disagree (2)
Neither agree nor Disagree (3)
Agree (4)
Strongly Agree (5)

Woody, S. R. (1996). Effects of focus of attention on anxiety levels and social performance of individuals with social phobia. *Journal of Abnormal Psychology, 105*, 61-69.

Appendix C

Rumination-Reflection Questionnaire (RRQ) (Modified)

The following questions ask about your thoughts concerning the speaking tasks you completed. Since the task...

1. I have been dwelling over what happened.
2. I have been playing back in my mind how I acted.
3. I have been rehashing things I said or did.
4. My thoughts keep going back to the tasks.
5. I haven't wasted time thinking about it; it's over and done with.
6. I have found myself reevaluating something I said or did.
7. I have been ruminating/dwelling about myself.
8. It has been easy for me to put unwanted thoughts about the tasks out of my mind.
9. It has been hard for me to shut off thoughts about myself.
10. My attention has been focused on aspects of myself I wish I'd stop thinking about.

Answer choices for every statement:
Strongly Disagree (1)
Disagree (2)
Neither agree nor Disagree (3)
Agree (4)
Strongly Agree (5)

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Appendix D

State-Trait Personality Inventory (STPI) (Modified)

Please answer the following questions about how you feel RIGHT NOW using the scale below:

1. I feel calm
2. I am tense
3. I am relaxed
4. I feel aggravated
5. I am worried
6. I am annoyed
7. I feel friendly
8. I feel nervous
9. I feel angry
10. I feel anxious
11. I feel irritated
12. I feel warm and kind-hearted

Answer choices for every statement:
Not at all (0)
Somewhat (1)
Moderately (2)
Very Much so (3)

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Appendix E

Demographics Questionnaire

1. Subject ID _____

2. Today's Date: _____

3. Gender: Male Female Transgender

4. Which race/ethnicity do you identify with:

African American/Black
Non-Hispanic White
White Hispanic / Latino American
Asian
Pacific Islander
Persian
Arab
American Indian or Alaska Native
Other

5. How would you classify yourself in terms of religious faith or spirituality?

Atheist
Buddhist
Hindu
Jehovah's Witness
Jew
LDS (i.e., Mormon)
Muslim
New Age
Traditional African religion
Lutheran
Roman Catholic
Episcopalian
Methodist
Presbyterian
Christian
Baptist

Pentecostal
Adventist
Taoist
Unitarian
Baha'i
Other (please specify) _____

8. Please enter your marital status:

Married
Single
Divorced

9. What is your age: _____

10. Year in school:

Freshman
Sophomore
Junior
Senior

11. How many hours of sleep did you get last night?

Less than 2 hours
3 hours
4 hours
5 hours
6 hours
7 hours
8 hours
More than 9 hours