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# Difficulty disengaging attention from appearance words among women with high social anxiety

Jose Silgado

*Louisiana State University and Agricultural and Mechanical College*

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DIFFICULTY DISENGAGING ATTENTION FROM APPEARANCE WORDS  
AMONG WOMEN WITH HIGH SOCIAL ANXIETY

A Thesis  
Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
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in

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by  
Jose Silgado,  
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## ABSTRACT

Pathological eating behaviors (PEB) and body dissatisfaction are more prevalent among women with higher social anxiety (HSA) than women with lower social anxiety (LSA). Attentional bias may play a role in these relationships. Attentional bias toward appearance is related to PEB and body dissatisfaction. Further, difficulty disengaging attention from threat is thought to maintain anxiety among HSA individuals. It follows that some HSA women may find scrutiny regarding their appearance threatening and difficulty disengaging attention from appearance cues may play an especially important role in PEB and/or body dissatisfaction among HSA women. The present study tested this theory, hypothesizing that: (1) HSA women would exhibit greater difficulty disengaging attention from appearance words than LSA women, and (2) HSA women with greater difficulty disengaging attention from appearance words would exhibit greater PEB and body dissatisfaction than HSA women with lower difficulty disengaging attention and LSA women. Difficulty disengaging was examined among 52 undergraduate women (HSA = 26, LSA = 26). Although HSA women reported higher scores on measures of PEB and body dissatisfaction than LSA women, HSA women did not exhibit more difficulty disengaging attention and difficulty disengaging did not moderate the relationships between social anxiety and PEB/body dissatisfaction. Follow-up analyses revealed that HSA women were more likely to engage in binge-eating and restricted eating than LSA women, but difficulty disengaging attention was only related to purging behaviors (regardless of social anxiety status). Among women who engaged in PEB, LSA women with higher difficulty disengaging reported the highest number of PEB.

## INTRODUCTION

Higher social anxiety (HSA; i.e., fear of scrutiny from others), pathological eating behaviors (PEB; e.g., binge-eating, purging, restricted eating), and body dissatisfaction (i.e., discrepancy between the perceived and the ideal body weight and shape) tend to co-occur at particularly high rates. In fact, HSA (meeting or exceeding clinical cut-off scores on social anxiety measures) was reported in 88% of women with eating disorders (ED) compared to 30% of women without ED (Hinrichsen, Wright, Waller, & Meyer, 2003). Furthermore, higher levels of social anxiety have been found among women with ED than women with some other anxiety disorders (panic disorder, agoraphobia, generalized anxiety disorder; Grabhorn, Stenner, Stangier, & Kaufhold, 2006) and women with depressive disorders (e.g., major depression, dysthymia, adjustment disorder; Grabhorn, et al., 2006). Body dissatisfaction has been found to be positively correlated with social anxiety in women with ED (Striegel-Moore, Silberstein, & Rodin, 1993). Further, higher levels of social anxiety are related to higher levels of body dissatisfaction in samples of non-treatment seeking female adolescents (Mayer, Muris, Meesters, & Zimmermann-van Beuningen, 2009; Schutz & Paxton, 2007) as well as among female undergraduates (Gilbert & Meyer, 2003) and adult women in the community (Striegel-Moore, et al., 1993).

There is evidence that clinically elevated social anxiety (i.e., social anxiety disorder or SAD) and PEB may share a specific relationship. To illustrate, SAD, but not panic disorder, generalized anxiety disorder, or obsessive compulsive disorder, accounted for unique variance in PEB after controlling for anxiety and depression disorder comorbidity among women in treatment for anxiety disorders (Becker, DeViva, & Zayfert, 2004). In fact, some data suggest that SAD may be a more common comorbid disorder with ED than obsessive-compulsive

disorder (Godart, Flament, Lecrubier, & Jeammet, 2000; Halmi, Eckert, Marchi, & Sampugnaro, 1991), a disorder that has been widely researched in regard to its comorbidity with ED (see Swinbourne & Touyz, 2007). Some researchers have even suggested that SAD may be a risk factor for ED (Brewerton, Lydiard, Ballenger, & Herzog, 1993; Bulik, Sullivan, Fear, & Joyce, 1997).

It is noteworthy that relationships between HSA, PEB, and body dissatisfaction are also evident in undergraduate non-treatment seeking samples. Given that undergraduate women are particularly vulnerable to PEB, including ED (Heatherton, Nichols, Mahamedi, & Keel, 1995), it is important to investigate this age cohort as elucidation of factors related to PEB in this high-risk group could have important prevention and treatment implications. Among undergraduates, PEB are greater among those with HSA compared to those with lower social anxiety (LSA; McLean, Miller, & Hope, 2007; Silgado, Timpano, Buckner, & Schmidt, 2010; Wonderlich-Tierney & Vander Wal, 2010). Similarly, social anxiety is higher among those with clinically meaningful PEB (i.e., those that exceed clinical cut-off scores on measures of PEB) compared to those with lower levels of PEB (McLean, Miller, & Hope, 2007). Undergraduate women with HSA also report higher levels of body dissatisfaction than those with LSA (Cash, Cash, & Butters, 1983; Cash & Flemming, 2002; Cash, Thériault, & Annis, 2004; Kowner, 2002). Furthermore, HSA among undergraduate women was positively correlated with appearance anxiety (Dion, Dion, & Keelan, 1990).

Understanding HSA's relationships with PEB and body dissatisfaction in this particularly vulnerable population (i.e., undergraduate women) is important because co-occurring HSA, PEB, and body dissatisfaction are of clinical concern. HSA among undergraduates has been linked to significant functional impairments such as insomnia, depression, and alcohol and cannabis use

related problems (Buckner, Bernert, Cromer, Joiner, & Schmidt, 2008; Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007; Buckner & Schmidt, 2009). HSA has also been linked to functional impairments in non-undergraduate samples such as greater number of “disability days” (i.e., days when individual was too sick to perform usual activities), reduced quality of life, and reduced satisfaction with family, social relations, and work (Fehm, Beesdo, Jacobi, & Fiedler, 2008). Similarly, PEB among women are associated with substantial functional impairment and serious health risks such as gastrointestinal complications, dental problems, self-mutilation, and suicide attempts (Ahren-Moonga, Holmgren, von Knorring, & af Klinteberg, 2008; Harwood & Newton, 1995; Zimmerli, Walsh, Guss, Devlin, & Kissileff, 2006). Body dissatisfaction is also related to functional impairment and distress such as lower self-esteem, lower interpersonal confidence, fewer sexual experiences, and less intimacy in romantic relationships (Cash & Flemming, 2002). The combination of impairments related to HSA, PEB, and body dissatisfaction may lead individuals with these co-occurring conditions to even worse complications than any one condition by itself.

Unfortunately, little empirical work has been done to identify possible mechanisms underlying HSA’s relationships with PEB or body dissatisfaction. Attentional bias is one possible cognitive construct that may play a role. The aim of the present study was to examine the role of one type of attentional bias (difficulty disengaging) in social anxiety’s relationships with PEB and with body dissatisfaction among undergraduate women. In the sections that follow, various types of attentional bias and different methodologies used to assess those biases will be described. Next, a brief review on the current state of the literature on attentional bias and social anxiety will be provided. Brief reviews of the attentional bias literature regarding PEB and body dissatisfaction will also be provided, followed by a description of the current study.

## **Attentional Bias – Types of Bias and Experimental Methodologies**

There are several types of attentional bias including hypervigilance, avoidance, vigilance-avoidance, and difficulty disengaging attention. Hypervigilance is the scanning of the environment for potential threat (Eysenck, 1992). Avoidance is the selective suppression of potential threat (Foa & Kozak, 1986). Vigilance-avoidance is hypervigilance toward potential threat followed by avoidance of the potential threat (Mogg, Mathews, & Weinman, 1987). And difficulty disengaging attention is the prolonged allocation of attention to potential threat after it has been seen and processed (Fox, Russo, Bowles, & Dutton, 2001).

Several different experimental methodologies have been employed to research the different attentional biases. These methodologies include Stroop, dot-probe, eye-tracking, and Posner paradigms. In the following paragraphs, these methodologies are described and limitations inherent to the earlier methodologies (i.e., Stroop and dot-probe tasks) are explained.

The Stroop task (Stroop, 1935) is an early method of investigating attentional processing (in this case, hypervigilance). In the Stroop task, participants are presented with words (e.g., threat-related, neutral) in different colored fonts and participants are asked to indicate, as quickly as possible, the color of the ink in which a word is presented while suppressing the actual meaning of the word. Hypervigilance is inferred when color naming takes longer with a threat-related word relative to a neutral word because it is believed that the content of the word attracts attention and interferes with naming of the color (Stroop, 1935). However, it is not clear if longer latencies in color naming are due to hypervigilance. For example, the longer time taken to name the colors could be caused by the individual trying to avoid the threatening meaning of the word (De Ruiter & Brosschot, 1994).

To overcome limitations from the Stroop task, the dot-probe task (MacLeod, Mathews, & Tata, 1986) was created. In a dot-probe task, participants are presented with two stimuli simultaneously, one threat-related and one neutral, followed by a visual probe (e.g., “\*”) that replaces one of the two words. Participants are then asked to indicate, as quickly as possible, the location of the dot-probe. It is hypothesized that hypervigilance occurs when reaction times (RTs) are faster for stimuli that are followed by the visual probe because it is believed the individual’s attention was allocated to the stimulus in that location prior to the visual probe appearing. A dot-probe task can also be used to measure avoidance such that RTs for stimuli that are avoided should be faster when the visual probe is presented in the opposite location. A limitation of the dot-probe task, however, is that due to the presentation of two stimuli at the same time, an individual could potentially either attend to both stimuli simultaneously or shift their attention from stimulus to stimulus, therefore making it difficult to determine whether threat-related stimuli elicit hypervigilance or difficulty disengaging attention (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). Even more problematic is that prolonged attention to one of the presented stimuli does not automatically mean hypervigilance toward that stimulus, as it could also mean avoidance of the opposite stimulus (Cisler, Bacon, & Williams, 2009).

Eye-tracking methodologies have also been employed to measure attentional bias. Eye-tracking paradigms can record the position of eye gaze over time without requiring the participant to provide an explicit response. Researchers can then examine initial fixation, number of total fixations, fixation durations, etc. Initial fixations to threat-related stimuli suggest hypervigilance, initial fixation followed by avoidance suggests vigilance-avoidance, and maintenance of fixations on threat-related stimuli over time suggests difficulty disengaging

attention. A limitation of eye-tracking paradigms is that eye gaze is only partially correlated with selective attention, as it is possible to allocate attention to stimuli that are outside the focal point of the eye (Bögels & Mansell, 2004).

The Posner task (Posner, 1988) began to be used to investigate attentional biases given the limitations inherent to the dot-probe task. The Posner task was designed to measure hypervigilance as well as disengagement difficulty by presenting participants with one target cue (a word or picture) either on the right or the left of the screen, followed by a visual probe (e.g., “\*”) either where the target cue was located or on the opposite location. Difficulty disengaging attention is thought to occur when participants have slower RTs for stimuli in the opposite location of the probe.

### **Attentional Bias Among Women with High Social Anxiety**

Information processing paradigms have informed theories of attentional bias in both normative and clinical levels of anxiety. A principal feature of one of these theories is that individuals experiencing elevated state anxiety quickly process information that they perceive as threatening to prepare for a fight or flight response (Beck, 1985). Quickly processing threatening information ensures higher chances of survivability for the individual as he or she is able to rapidly detect threat or danger in the surrounding environment. However, individuals with elevated trait anxiety tend to erroneously perceive stimuli as threatening even if their perception does not quite correspond with objective dangers in the environment; whereas in normative anxiety, estimation of threat corresponds more closely with real dangers in the environment. Quick processing of perceived threat among those with elevated trait anxiety is thought to be excessively tuned to detect negative stimuli which results in a propensity to allocate attentional resources to negative stimuli (Beck & Clark, 1997). Because of this allocation of attention

toward negative stimuli, there is also a suppression of information from the environment that may disconfirm the threat given the lack of attentional resources available for this other kind of information (Beck, 1985; Beck, Emery, & Greenberg, 1985). Thus, both the quick processing of perceived threat and the suppression of disconfirming evidence requires an attentional bias toward threat related stimuli.

Beck and Clark (1997) developed a three-stage cognitive model of anxiety based on Beck (1985)'s original theory that includes attentional biases among those with elevated trait anxiety. The three stages are: the *initial registration* stage (automatic classification of stimulus as threatening), the *immediate preparation* stage (quick change of cognitive, affective, behavioral, and physiological patterns to react to threat), and the *secondary elaboration* stage (processing of the meaning of the potentially threatening stimuli with more elaboration). In the initial registration stage, individuals with elevated trait anxiety automatically classify potentially threatening stimuli as threatening (even if the stimuli are non-threatening) so that they can assign processing priority to the potentially threatening stimuli over other stimuli. The quick nature of processing potentially threatening stimuli as threatening makes trait anxious individuals more sensitive to (i.e., more likely to look for) threat-related stimuli in the environment than individuals without elevated trait anxiety (Eysenck, 1992). Sensitivity to threat-related stimuli leads trait anxious individuals to initially extract information from a broad area of their environment and then focus on the potentially threatening stimuli. Furthermore, the sensitivity to threat-related stimuli that trait anxious individuals exhibit may also lead to scanning the environment for potential threat more than individuals without trait anxiety (i.e., hypervigilance; Eysenck, 1992). Hypervigilance toward perceived threat in those with elevated trait anxiety is thought to be excessive and makes it difficult for the individual to attend to other stimuli in the

environment. The lack of attentional resources available for other stimuli interferes with the opportunity to re-evaluate the situation as less threatening and thus can maintain elevated trait anxiety (Mogg & Bradley, 1998).

Attentional biases in those with clinical anxiety disorders are thought to be specific to the type of stimuli the individual perceives as threatening based on his or her disorder (Beck, et al., 1985). In regards to HSA specifically, it is thought that due to their elevated fear of scrutiny, individuals with HSA perceive certain social cues as threatening (e.g., socially evaluative words such as “stupid” or “boring”) due to the possibility that they indicate negative evaluation (Rapee & Heimberg, 1997). Hypervigilance to threatening social cues may maintain elevated trait social anxiety because of the lack of attentional resources available for other stimuli (Mogg & Bradley, 1998). Since focusing on specific features of our environment usually leads to the exclusion of other features of our environment (Posner, 1988), hypervigilance to social threat cues leaves little attention available to attend to positive or neutral stimuli that may disconfirm the individual’s beliefs regarding the threatening stimuli (Fox, et al., 2001). There is empirical evidence suggesting hypervigilance toward social threat cues among those with HSA. Specifically, studies using word stimuli have found that individuals with SAD appear to have a hypervigilance toward social threat words compared to neutral words (Amir, Freshman, & Foa, 2002; Asmundson & Stein, 1994). Hypervigilance toward social threat words appears specific to those with SAD, as participants with other anxiety disorders (e.g., panic disorder) do not show hypervigilance toward social threat compared to other types of threat (e.g., panic, general concerns; Maidenberg, Chen, Craske, & Bohn, 1996).

There is empirical evidence, however, that suggests that hypervigilance is not the only type of attentional bias playing a role in elevated trait social anxiety. For example, several

studies have found that those with HSA (but not those with LSA) seem to *avoid* social threat compared to neutral cues (Chen, Ehlers, Clark, & Mansell, 2002; Mansell, Clark, Ehlers, & Chen, 1999). Findings of avoidance of social threat seem to contradict findings regarding hypervigilance among those with HSA toward social threat. Given research tends to find avoidance of social threat at later stages of processing (i.e., when using longer presentation times), avoidance may be explained by the second and third stages of the three-stage cognitive model of anxiety developed by Beck and Clark. These stages explain how individuals with elevated trait anxiety quickly change their cognitive, affective, behavioral, and physiological patterns to react to potential threat (e.g., fight or flight) and then process the meaning of the potentially threatening stimuli with more elaboration (Beck & Clark, 1997). In summary, these last two stages suggest that individuals with elevated trait anxiety can prepare for the potential threat in a variety of ways- one of which is to avoid the threat stimuli to prevent or minimize the anxiety elicited by it.

Some researchers, however, have combined stage one with stages two and three of Beck and Clark's three-stage model to form the vigilance-avoidance model of anxiety (Mogg, Bradley, De Bono, & Painter, 1997). It follows from Beck and Clark's three-stage model that a person with HSA may initially experience hypervigilance toward social threat stimuli but subsequently avoid the stimuli to prevent, or minimize, further increases in state anxiety caused by the stimuli. This pattern of vigilance-avoidance of social threat may maintain elevated trait social anxiety because the hypervigilance of social threat makes it easier for the individual to detect stimuli that could be potential threat (thus increasing state anxiety), but then the avoidance of the stimuli prevents habituation to the stimuli or the reclassification of such stimuli as non-threatening (Mogg, et al., 1997). In fact, some empirical research supports the vigilance-avoidance model

among those with HSA (Garner, Mogg, & Bradley, 2006; Vassilopoulos, 2005; Wieser, Pauli, Weyers, Alpers, & Mühlberger, 2009). Using eye tracking paradigms, Wieser, Pauli, Weyers, et al. (2009) and Garner et al. (2006) both found that college students with HSA, compared to students with LSA, demonstrated an initial vigilance toward emotional faces compared to neutral faces at the beginning of the presentation of the stimuli, but then avoided such faces. Likewise, another study found a similar pattern of attention using social threat words compared to neutral words (Vassilopoulos, 2005).

However, not all research on attentional biases supports the contention that vigilance followed by avoidance is occurring among those with HSA. In fact, results from several studies contradict the vigilance-avoidance model (Buckner, Maner, & Schmidt, 2010; Horley, Williams, Gonsalvez, & Gordon, 2003; Mogg, et al., 1997; Wieser, Pauli, Alpers, et al., 2009). Some of these studies used eye tracking paradigms to record eye gaze of participants with HSA compared to LSA participants while viewing facial stimuli. Horley et al. (2003) found that although their HSA participants demonstrated significantly more avoidance of the eyes throughout the entire experiment, they did not exhibit initial hypervigilance. Participants with HSA in the Wieser, Pauli, Alpers, et al. (2009) study demonstrated initial hypervigilance toward the eyes of the stimuli, but no significant differences in avoidance compared to participants with LSA. Participants with HSA in the Buckner et al. (2010) study did not differ in initial hypervigilance to disgust faces compared to those with LSA. Further, those with HSA fixated *more* on disgust faces toward the end of the facial presentation compared to those with LSA, suggesting no avoidance of stimuli.

Mixed support for the vigilance-avoidance model makes the utility of the vigilance-avoidance model among those with HSA unclear. Thus, it has been posited that elevated trait

social anxiety is associated not necessarily with hypervigilance or vigilance-avoidance, but rather with difficulty disengaging attention from social threat cues (Amir, Elias, Klumpp, & Przeworski, 2003). It has been suggested (Fox, et al., 2001) that after the trait anxious individual attends to threat, he or she has an increased focus on the threat stimulus and a prolonged allocation of attention to that stimulus after it has been seen and processed (i.e., difficulty disengaging). This theory is in line with the second stage of Beck and Clark's three-stage model which says that following the initial allocation of attention toward threat the focus of cognitive processing narrows down to the threat stimulus (Beck & Clark, 1997). It has been suggested that difficulty disengaging attention from threat cues may contribute to rumination on negative experiences among those with elevated trait anxiety (Fox, et al., 2001). In the case of individuals with HSA, difficulty disengaging attention from social threat cues may increase the tendency to ruminate on the possibility that the negative social threat is directed at them. As the individual remains fixated on the socially threatening cue, difficulty disengaging attention may increase state anxiety because of the lack of attention given to other aspects of the environment that may disconfirm the perceived social threat (Buckner, et al., 2010).

Difficulty disengaging attention from social threat cues among those with HSA may be the most promising model of attentional bias as it seems to be able to explain the discrepancies found in the research on attentional processing and social anxiety. In support of the difficulty disengagement model of social anxiety, Amir et al. (2003) found that those with SAD had greater difficulty disengaging attention from social threat words than non-socially anxious controls. This difference was not observed for neutral or positive words. Amir and colleagues also found that those with SAD did not differ in hypervigilance toward social threat words compared to the non-socially anxious controls. Amir et al. concluded that hypervigilance toward

social cues in general (as opposed to social threat) among those with HSA is the primary reason past research has found an attentional bias among those with HSA. However, they posit that difficulty disengaging attention from social threat cues specifically is the underlying attentional bias among those with HSA. Using an eye tracking paradigm, Buckner et al. (2010) also found support of difficulty disengaging attention from social threat among those with HSA.

Specifically, they found that individuals with HSA disengaged from disgust faces (but not happy faces) at a significantly slower rate than LSA individuals.

### **Attentional Bias Among Women that Engage in Pathological Eating Behaviors**

Theories of PEB suggest that the influence of certain aspects of cognition play a key role in the development and maintenance of PEB. Specifically, individuals with PEB are thought to have maladaptive schemas related to appearance (e.g., overemphasize importance of thinness in their lives). Maladaptive schemas regarding appearance are thought to produce a hypervigilance towards stimuli related to these schemas (e.g., body weight and shape; Williamson, Muller, Reas, & Thaw, 1999). Hypervigilance towards appearance occurs because ‘fatness’ and being overweight are perceived as threatening by individuals that place an over-importance on thinness and are overly concerned with gaining weight (Fairburn, Cooper, & Shafran, 2003). Quick detection of these threatening stimuli enables an individual to avoid situations (e.g., looking in the mirror) that elicit anxiety or negative affect (Mathews, Richards, & Eysenck, 1989). In the case of individuals that engage in PEB, they may perceive appearance cues as threatening to their self-esteem (Waller, Watkins, Shuck, & McManus, 1996) and, thus, experience negative affect. According to the affect regulation model of PEB, engaging in PEB is an attempt to remove oneself from awareness by cognitively narrowing attention down to the immediate environment, thereby reducing negative affect (Heatherton & Baumeister, 1991). Thus, engaging in PEB may

be an attempt to reduce negative mood states associated with perceived threatening appearance cues. There is some empirical evidence to support the affect regulation model of PEB. For example, binge-eating appears to occur more frequently on days when women with bulimia nervosa (BN) experience higher negative affect (Crosby et al., 2009). Further, negative affect is high prior to a binge-eating episode, decreases during the binge-eating episode, and then increases after the binge-eating episode (Deaver, Miltenberger, Smyth, Meidinger, & Crosby, 2003).

Hypervigilance toward appearance may also lead to or exacerbate the internalization of the thin ideal (from media, peers, etc.) and confirm maladaptive schemas regarding appearance. The internalization of the thin ideal may lead to PEB as an attempt to reach that ideal. For instance, past research has found that believing one would be better liked by others if thinner is significantly associated with higher levels of PEB (Jones, Vigfusdottir, & Lee, 2004).

Research on attention seems to support the contention that women that engage in PEB are hypervigilant to cues related to appearance (e.g., body shape, weight) as well as food cues. Individuals with PEB demonstrate hypervigilance toward negative appearance words (e.g., “fat”, “blubber”) relative to control words (Jones-Chesters, Monsell, & Cooper, 1998; Rieger et al., 1998). Furthermore, hypervigilance to food and appearance pictorial stimuli has been documented among those with PEB relative to neutral pictures (Stormark & Torkildsen, 2004; Walker, Ben-Tovim, Paddick, & McNamara, 1995). Similarly, women that engage in PEB exhibit hypervigilance toward food-related words relative to control words (Ben-Tovim & Walker, 1991; Ben-Tovim, Walker, Fok, & Yap, 1989; Overduin, Jansen, & Louwense, 1995; Placanica, Faunce, & Job, 2002). Studies have also found that women that engage in PEB exhibit hypervigilance more toward “negative” food stimuli (e.g., fattening foods such as pizza) than

“positive” food stimuli (e.g., non-fattening foods such as celery; Shafran, Lee, Cooper, Palmer, & Fairburn, 2007).

Yet, there is some evidence to suggest women with PEB *avoid* appearance cues. Engel et al. (2006) used attention retraining to train women to either attend toward appearance words or attend away from appearance words. They found that participants that had been trained to attend *away* from appearance words scored higher on a measure of PEB following the retraining session than those that were trained to attend *toward* appearance words. This finding suggests that attention away from appearance cues may play a role in the development or maintenance of PEB among women.

Other evidence suggests women with PEB exhibit *vigilance-avoidance* of food cues. For instance, Boon, Vogelzang, and Jansen (2000) found that women that engaged in PEB did not exhibit either hypervigilance to or avoidance of food stimuli compared to neutral stimuli during an attention task. However, in a word recognition task completed after the attention task, participants were faster at recognizing food stimuli they had previously seen in the attention task than neutral stimuli. Authors of that study concluded that for their participants to be able to recognize the food stimuli faster in the recognition task, the participants had to initially allocate their attention toward the food words and then avoid them during the eye-tracking task (i.e., vigilance-avoidance).

It is noteworthy that none of the above studies used methodology designed to measure difficulty disengaging attention. Therefore, it is unknown if difficulty disengaging attention from appearance cues is also playing a role. It may be that difficulty disengaging attention from appearance increases rumination about one’s own appearance. And given research shows ruminating about one’s own appearance is positively correlated with levels of PEB (Maner et al.,

2006), it may be that difficulty disengaging attention from appearance maintains PEB among women that engage in PEB because of the increase in rumination regarding one's own appearance. However, difficulty disengaging attention has not been empirically researched among women that engage in PEB. Thus, the proposed study may shed some light on difficulty disengaging attention from appearance cues and PEB.

### **Attentional Bias Among Women with Elevated Body Dissatisfaction**

Hypervigilance toward appearance cues is the only attentional bias that has been tested in regards to body dissatisfaction. However, results are mixed. Using eye tracking paradigms, researchers found that women with elevated state body dissatisfaction demonstrated hypervigilance toward attractive aspects of appearance on other women and toward unattractive aspects of appearance on themselves; the opposite result was found for women with lower body dissatisfaction (Jansen, Nederkoorn, & Mulken, 2005; Roefs et al., 2008). Also, retraining attention toward appearance words (compared to emotional, neutral, and food words) seems to produce higher levels of body dissatisfaction among undergraduate women (Smith & Rieger, 2006, 2009). Smith and Rieger (2006, 2009) propose that hypervigilance toward appearance may exacerbate body image disturbance because of increased rumination regarding one's own appearance associated with the facilitated attention to appearance cues. However, the opposite effect was found by another study (Janelle, Hausenblas, Fallon, & Gardner, 2003) in which women with higher drive for thinness (a unique predictor of body dissatisfaction in women; Wiederman & Pryor, 2000) were less likely to show hypervigilance to body fat cues compared to those with low drive for thinness. However, this may mean that the relationship between drive for thinness (which is correlated with but different from body dissatisfaction) and attentional bias is different from the relationship between body dissatisfaction and attentional bias.

## **Attentional Bias Among Co-Occurring High Social Anxiety and Pathological Eating Behaviors/Body Dissatisfaction**

There are currently no known studies of the role of attentional biases in social anxiety's relationships to PEB or body dissatisfaction. A possible theory regarding the role of attentional processing among women with these co-occurring conditions may be derived from the extant literature on difficulty disengaging attention among those with HSA (Amir, et al., 2003; Buckner, et al., 2010). Given that some individuals with HSA fear their appearance may be under the scrutiny of others (Cash & Labarge, 1996; Hart et al., 2008), they may internalize beliefs regarding being thin to avoid scrutiny. The belief that being thin may help avoid scrutiny from others could place an emphasis on avoiding 'fatness' and being overweight (as found among women with PEB). These HSA women could experience difficulty disengaging attention from appearance cues used as an attempt to compare themselves to those around them and determine whether they adhere to social norms regarding appearance. Difficulty disengaging attention from appearance cues could lead them to rumination regarding their own appearance, thereby increasing state body dissatisfaction and, subsequently, PEB to attempt to control appearance and avoid the potential for further scrutiny. In fact, social comparisons have been found to correlate with PEB in non-treatment seeking young women (Gilbert & Meyer, 2003).

An alternative explanation takes into consideration the affect regulation theory of PEB (Heatherton & Baumeister, 1991). Difficulty disengaging attention from appearance may play a role in PEB vulnerability among HSA women if they engage in PEB to help manage or reduce negative affect. If it is the case that difficulty disengaging attention from appearance increases negative affect because of an increase in rumination about one's body, HSA women may engage in PEB to decrease negative affect. Alleviation of negative affect due to engagement in PEB may then maintain engagement in PEB as a way to cope with negative affect and anxiety.

## **The Current Study**

**Design.** The sample for this study was comprised of undergraduate, non-treatment seeking women. The choice of this sample was based on several factors. First, rates of PEB and body dissatisfaction are higher among women than men (Hudson, Hiripi, Pope, & Kessler, 2007; Pritchard, 2008). Second, rates of HSA are also higher among women than men (Fehm, et al., 2008). Third, undergraduate women are particularly vulnerable to PEB (Heatherton, et al., 1995). Fourth, individuals with diagnosed anxiety disorders do not differ from non-treatment seeking trait anxious individuals in the magnitude of attentional biases to threat (Bar-Haim, et al., 2007). Given that trait anxiety and depression highly co-occur with social anxiety (Endler, Flett, Macrodimitris, Corace, & Kocovski, 2002; Kessler, Chiu, Demler, Merikangas, & Walters, 2005), depression and trait anxiety were included as covariates in statistical analyses.

The present study used a Posner task to measure difficulty disengaging attention from appearance related words. Given that word stimuli and pictorial stimuli when presented alone are both able to produce attentional biases among trait anxious individuals (Bar-Haim, et al., 2007), but using a combination of both types of stimuli does not produce attentional biases (Bar-Haim, et al., 2007), only word stimuli were used in the Posner task.

**Hypotheses.** The present study examined difficulty disengaging attention from appearance words among HSA and LSA women. In line with our proposed theory that women with HSA may exhibit difficulty disengaging attention from appearance words, it was predicted that HSA women would exhibit slower RTs when responding to probes presented opposite to appearance words compared to LSA women. Consistent with our proposed theory that difficulty disengaging attention from appearance words would moderate the relationship between social anxiety and PEB, a moderational effect was predicted such that HSA women with higher

difficulty disengaging attention from appearance words would report higher scores on a measure of global PEB compared to women with HSA and lower difficulty disengaging attention from appearance words and LSA women regardless of level of difficulty disengaging attention from appearance words. The same moderational effect in regards to body dissatisfaction was also predicted.

## METHOD

### Sample and Recruitment Strategy

Participants were recruited from the psychology experiment pool at Louisiana State University (LSU) after the study received approval from the LSU Institutional Review Board (IRB). To determine eligibility, empirically supported clinical cut-off scores based on the *Social Interaction Anxiety Scale* (SIAS) and *Social Phobia Scale* (SPS; Mattick & Clarke, 1998) were used to identify women with clinically meaningful social anxiety and women with normative levels of social anxiety to increase generalizability to individuals with and without SAD. Prior research indicates that one standard deviation above a community sample mean on the SIAS ( $M = 19.9, SD = 14.2$ ) and on the SPS ( $M = 12.5, SD = 11.5$ ) correctly classified 82% and 73% of patients with SAD, respectively (Heimberg, Mueller, Holt, & Hope, 1992). Therefore, women with SIAS and SPS scores greater than or equal to one standard deviation of these means (i.e.,  $\geq 34$  on the SIAS and  $\geq 24$  on the SPS) and women with scores less than or equal to the community means (i.e.,  $\leq 19.9$  on the SIAS and  $\leq 12.5$  on the SPS) were invited to participate. This strategy was used because it allows for comparisons between those with clinically meaningful social anxiety and those with normative levels of social anxiety. Men and participants under the age of 18 were excluded from participating.

Of the 231 undergraduate women that completed an online screening survey, 126 women met clinical cutoff scores as outlined above and were invited to participate. Of these, 105 completed study protocol, 26 of whom were HSA. A randomly selected unmatched group ( $n = 26$ ) was created as the LSA group. The groups did not differ on age, race, ethnicity, year in school, employment status, history of anxiety treatment, or history of ED treatment (see Table 1).

Table 1

Demographic information and means and standard deviations of measures of social anxiety, pathological eating behaviors, body dissatisfaction, depression, and trait anxiety for clinical analogue sample

Variable	HSA ( <i>n</i> = 26)		LSA ( <i>n</i> = 26)		$\chi^2$ or <i>F</i>	<i>p</i>	$\phi$ or <i>d</i>
	%	<i>M</i> ( <i>SD</i> )	%	<i>M</i> ( <i>SD</i> )			
Race (Caucasian)	81.0		77.0		0.12	0.73	0.05
Ethnicity (Non-Hispanic)	96.2		100.0		1.02	0.31	0.14
Employed	57.7		61.5		0.08	0.78	0.04
Year in college (First)	23.1		23.1		0.00	1.00	0.00
History of anxiety treatment	26.9		11.5		1.99	0.16	0.20
History of ED treatment	7.7		0.0		2.08	0.15	0.20
Age		21.77 (4.78)		22.04 (7.03)	0.03	0.87	0.04
Social interaction anxiety		44.65 (10.40)		10.54 (3.88)	245.59	<0.01	4.35
Observational anxiety		35.73 (9.28)		5.62 (3.04)	247.15	<0.01	4.36
Pathological eating behavior		2.63 (1.33)		0.96 (0.85)	28.84	<0.01	1.50

(table continued)

Body dissatisfaction	117.81 (38.11)	62.5 (22.55)	40.55	<0.01	1.77
Depression	11.62 (7.18)	2.62 (3.03)	34.68	<0.01	1.63
Trait anxiety	11.08 (10.00)	1.92 (3.02)	19.99	<0.01	1.24

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Note. Social interaction anxiety measured by the *Social Interaction Anxiety Scale* (Mattick & Clarke, 1998); observational anxiety measured by the *Social Phobia Scale* (Mattick & Clarke, 1998); pathological eating behaviors = global score on *Eating Disorder Examination Questionnaire* (Fairburn & Bèglin, 1994); body dissatisfaction measured by the *Body Shape Questionnaire* (Cooper, Taylor, Cooper, & Fairburn, 1987); depression and trait anxiety measured by the corresponding subscales of the *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995), HSA = high social anxiety group, LSA = low social anxiety group. Characteristics were analyzed using analysis of variance (ANOVA) models for continuous variables and chi squared tests for nominal/categorical variables.

## **Self-Report Measures**

**Social Interaction Anxiety Scale (SIAS)**. The SIAS is a 20-item self-report scale designed to assess social interaction anxiety (Mattick & Clarke, 1998). The items in the SIAS are answered on a 5-point Likert scale ranging from 0 (*Never*) to 4 (*Extremely*) and participants indicate how each statement is descriptive of them in regards to social interactions. This scale has demonstrated high levels of internal consistency across clinical and non-treatment seeking samples (Heimberg, et al., 1992; Mattick & Clarke, 1998; Osman, Gutierrez, Barrios, Kopper, & Chiros, 1998). Test-retest reliability has also been found to be high (Pearson's correlation coefficients range from .86 to .92; Heimberg, et al., 1992; Mattick & Clarke, 1998). Other measures of social anxiety have been shown to highly correlate with the SIAS, suggesting high convergent validity (Heimberg, et al., 1992; Mattick & Clarke, 1998). The SIAS also shows smaller correlations with measures of other constructs (e.g., depression, general anxiety; Mattick & Clarke, 1998), which suggests discriminant validity. In the present sample, the SIAS demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .89$ ) and in our clinical analogue sample ( $\alpha = .90$ ). Scores for the entire sample ranged between 0 and 72, and between 5 and 72 for the clinical analogue sample.

**Social Phobia Scale (SPS)**. The SPS is a 20-item self-report scale designed to assess fears of being observed by others (Mattick & Clarke, 1998). The items in the SPS are answered on a 5-point Likert scale ranging from 0 (*Not At All*) to 4 (*Extremely*) and participants indicate how each statement is descriptive of them in regards to observation fears. This scale has demonstrated high levels of internal consistency across clinical, community, and student samples (Heimberg, et al., 1992; Mattick & Clarke, 1998; Osman, et al., 1998). Test-retest reliability has also been found to be high (Pearson's correlation coefficients range from .66 to .93; Heimberg, et

al., 1992; Mattick & Clarke, 1998). Other measures of social anxiety have been shown to highly correlate with the SPS, suggesting high convergent validity (Heimberg, et al., 1992; Mattick & Clarke, 1998). The SPS also shows smaller correlations with measures of other constructs (e.g., depression, general anxiety; Mattick & Clarke, 1998), which suggests discriminant validity. In the present sample, the SPS demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .95$ ) and in our clinical analogue sample ( $\alpha = .95$ ). Scores for the entire sample ranged between 0 and 58, and between 1 and 58 for the clinical analogue sample.

**Eating Disorder Examination-Questionnaire (EDE-Q4)**. The EDE-Q4 is a 36-item self-report measure that assesses attitudes, feelings, and behaviors related to eating and body image over the past 28 days (Fairburn & Bèglin, 1994). Attitudes, feelings, and behaviors are rated using a 7-point scale ranging from 0 (*No Days*) to 6 (*Every Day*). The EDE-Q4 yields a global score of PEB attitudes which was used as a dependent variable (DV) in some analyses of the current study. The EDE-Q4 also assesses frequency of engagement in PEB by asking participants how many times they engaged in specific PEB in the last 28 days. Frequency scores on the following PEB were used for some analyses in this study: binge-eating, restricted eating, and purging. The EDE-Q4 assesses for binge-eating episodes by asking “over the past four weeks (28 days), have there been any times when you have felt that you have eaten what other people would regard as an unusually large amount of food given the circumstances?” and “during how many of these episodes of overeating did you have a sense of having lost control over your eating?”, restricted eating episodes by asking “on how many days out of the past 28 days have you gone for long periods of time (8 hours or more) without eating anything in order to influence your shape or weight?”, and purging episodes by asking “over the past four weeks have you made yourself sick (vomit) as a means of controlling your shape or weight?”. The

EDE-Q4 has been found to have excellent internal consistency and test-retest reliability (Luce & Crowther, 1999). Similarly, the EDE-Q4 seems to have adequate convergent validity with other measures of PEB and other relevant measures of psychopathology (Hrabosky et al., 2008). In the present sample, the EDE-Q4 global score demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .94$ ) and in our clinical analogue sample ( $\alpha = .95$ ). Score ranges for both the entire sample and clinical analogue sample were the same (0-5.8).

**Body Shape Questionnaire (BSQ)**. The BSQ is a 34-item self-report measure of concerns about body shape and size (Cooper, et al., 1987). Items are answered on a 6-point Likert scale ranging from 1 (*Always*) to 6 (*Never*) and participants indicate how they have been feeling about their appearance over the past 28 days. The BSQ has demonstrated good test-retest reliability (reliability coefficient was .88) and convergent validity with other measures of body image and related constructs in non-treatment seeking samples of college students (Rosen, Jones, Ramirez, & Waxman, 1996). In the present sample, the BSQ demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .97$ ) and in our clinical analogue sample ( $\alpha = .98$ ). Score ranges for both the entire sample and clinical analogue sample were the same (34-192).

**Depression Anxiety Stress Scales (DASS-21)**. The DASS-21 is a 21-item self-report measure in which participants rate the frequency and severity of experiencing anxiety, depression, and stress over the previous week. Frequency and severity are rated using a 4-point scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). The DASS-21 anxiety and depression subscales possess good convergent validity with other measures of depression and trait anxiety, discriminant validity with non-related measures, and high internal consistency in clinical and in non-treatment seeking samples (Antony, Bieling,

Cox, Enns, & Swinson, 1998; Lovibond, 1998). In the present sample, the DASS-Anxiety Subscale demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .90$ ) and in our clinical analogue sample ( $\alpha = .90$ ). Score ranges for the entire sample and clinical analogue sample were the same (0-36). Similarly, the DASS-Depression Subscale demonstrated adequate internal consistency among the entire screening sample ( $\alpha = .95$ ) and in our clinical analogue sample ( $\alpha = .90$ ). Score ranges for the entire sample and clinical analogue sample were the same (0-26).

### **Measure of Attention – Posner Task**

Difficulty disengaging attention was assessed using a Posner Task (Posner, 1988). Thirty appearance-related words and 24 neutral words were used. Appearance-related words used in the current study have been used in past research on attentional biases for women with PEB (Engel, et al., 2006; Tressler, 2009) and our neutral words have been use in past research on attentional biases among HSA individuals (e.g., Hope, Rapee, Heimberg, & Dombeck, 1990). A list of appearance and neutral words can be found in the Appendix.

A fixation cross between two rectangles appeared on the screen for 1,000ms. The fixation cross then disappeared and a target word appeared inside one of the rectangles for 500ms. Time frames chosen for fixation cross and word presentation are consistent with other studies using similar tasks of difficulty disengaging attention (Amir, et al., 2003; Koster, Crombez, Verschuere, Van Damme, & Wiersema, 2006; Maner, et al., 2006). Words were presented in lower case and white against a black background. After the word disappeared, there was a 50ms interval where only the rectangles remained followed by the presentation of a visual probe (an asterisk, “\*”) inside one of the two rectangles. The participant was asked to press the ‘q’ key on the keyboard if the probe appeared on the left rectangle or the ‘p’ key if the probe appeared on

the right rectangle. The use of these keys is consistent with previous research using Posner tasks (Amir, et al., 2003). Presentation of the probe ended when the participant responded by pressing a key, or after a 3,000ms period if the participant failed to respond. The period between a probe and the next fixation cross was 1,500ms. Time frame between visual probe and next fixation was consistent with past research using Posner tasks (Amir, et al., 2003).

On 75% of the trials, the visual probe appeared on the opposite side of where the target word was presented (invalid trial). On 18% of the trials, the visual probe appeared on the same side as the target word was presented (valid trial). On the last 7% of the trials, a target word was not presented (no cue trial). Although past research using Posner tasks to assess difficulty disengaging attention among HSA participants usually has presented participants with equal numbers of valid and invalid trials or 75% valid trials (Koster, et al., 2006; Yiend & Mathews, 2001), there is research suggesting that difficulty disengaging attention is involuntary, whereas attentional biases toward stimuli may be a more voluntary action (Olk, Hildebrandt, & Kingstone, 2010). Therefore, research suggests using 75% invalid trials because it may be better able to measure difficulty disengaging attention at an involuntary level (Folk, Remington, & Johnston, 1992; Lien, Ruthruff, Goodin, & Remington, 2008). Specifically, although participants may be learning to voluntarily orient attention toward un-cued locations, slower RTs on invalid trials indicate that they are having difficulty disengaging from the target stimulus above and beyond learning. Therefore only RTs from the invalid cue trials were used in analyses. Valid cue trials were presented to prevent automatic learning that would occur if only invalid cue trials were presented, and no cue trials were presented to prevent interference that may be caused by the fixed cue interval used on the other trials. All words (appearance and neutral) were presented once on each side of the screen as valid trials, and once on each side of the screen as invalid

trials (i.e., each word was presented a total of four times). Before the experimental trials, participants were presented with on-screen instructions of the task and completed 14 practice trials. The entire task, therefore, consisted of 14 practice trials, 205 invalid cue trials, 51 valid cue trials, and 20 no cue trials; totaling 290 trials. All trials (except for the practice trials) were presented randomly for each participant and total time to complete the task was approximately 20 minutes.

### **Procedure**

Interested participants signed up for the study using LSU's Research Participation System and were then e-mailed the link to the screening survey. The first page of the survey described the nature of the screening survey to facilitate informed consent. Participants checked a box to acknowledge that they had read the information about the survey and were willing to participate in the screening survey. They could also check another box if they did not consent to participate in the screening survey at that time. Participants that indicated their desire to complete the screening survey were directed to continue to the survey (those that refused to complete screening survey were instructed to close their browser). The survey was completed on a secure website ([www.surveymonkey.com](http://www.surveymonkey.com)) and thus confidentiality of participants' responses was assured as long as participants closed the browser window (as instructed) when the survey was completed. The screening survey included all study measures and a demographics form. The screening survey was advertised as only available to women over 18 years of age and the demographics form was used to ensure only self-reported women over 18 years of age were invited. Participants received research credit towards their psychology courses as compensation for completing the screening survey. Eligible participants were e-mailed within one week of the

date they completed the screening survey and invited to come to the laboratory to participate in the study.

When eligible participants arrived to the laboratory, a research assistant (blind to social anxiety group status) explained the study and acquired informed written consent. No eligible participant refused participation during her appointment. Next, the participant was seated in front of a computer and completed the Posner task. At the end of the experiment, the research assistant gave participants referrals to mental health service providers in the area and provided the participants with research credits. Total time commitment for the appointment did not exceed half an hour.

### **Data Strategy**

**Data Reduction.** Consistent with prior research (Amir, et al., 2003), RTs less than 50ms and more than 1,500ms were excluded from analyses to control for anticipatory responding and inattention during trials, resulting in the exclusion of 1.6% of trials. Further, RTs for inaccurate trials were also excluded. Inaccurate trials consisted of trials in which the participant was presented with a probe on the right rectangle but the participant pressed the key corresponding to the left rectangle, or vice versa. This procedure resulted in the exclusion of an additional 1% of trials. Next, a mean RT was calculated for each participant for each word type and each trial type. These means are presented separately in Table 2 for HSA and LSA women. In addition, a bias score was calculated for each participant with mean RTs on invalid neutral trials (trials where probe appeared opposite to neutral word) subtracted from mean RTs on invalid appearance trials (trials where probe appeared opposite to appearance word). Lower bias scores indicated higher difficulty disengaging attention from appearance words specifically.

Table 2  
 Mean reaction time and accuracy by word type and trial type for HSA and LSA women

Word Type	HSA <i>M (SD)</i>	LSA <i>M (SD)</i>	HSA Accuracy	LSA Accuracy
Appearance				
Invalid	393 (78)	374 (53)	96	99
Valid	429 (76)	416 (52)	95	99
Neutral				
Invalid	395 (84)	377 (52)	96	99
Valid	429 (83)	415 (52)	95	99
No Cue Word	493 (114)	486 (80)	97	99

Note. HSA = high social anxiety group, LSA = low social anxiety group; accuracy = mean percent correct.

**Data Analytic Approach.** Analyses were conducted using chi-square tests for dichotomous variables and analysis of variance (ANOVA) for continuous dependent variables. Analyses of covariance (ANCOVA) were also conducted with depression and trait anxiety as covariates. Zero-order correlations were conducted to examine relations between variables among the entire sample. Further, hierarchical linear regressions were conducted for all moderational analyses with continuous dependent variables and logistic regressions were conducted for moderational analyses with dichotomous dependent variables. Simple slopes were investigated to probe the nature of significant interactions using the methodology proposed by Holmbeck (2002).

## RESULTS

### Sample Characteristics

Prior studies using the EDE-Q4 to measure PEB have utilized a cut-off score of  $\geq 4$  as a marker of clinical significance (Carter, Stewart, & Fairburn, 2001; Luce, Crowther, & Pole, 2008; Mond, Hay, Rodgers, & Owen, 2006). Using this cut-off, 5.4% of women from the entire sample, 15.4% of HSA women, and 0% of LSA women scored in the clinically significant range on the Global score. In regards to the four subscales, 6.5% of women from the entire sample, 15.4% of HSA women, and 0% of LSA women scored in the clinically significant range on the Restraint subscale. On the Eating Concern subscale, 1.0% of women from the entire sample, 3.8% of HSA women, and 0% of LSA women scored in the clinically significant range. On the Shape Concern subscale, 21.5% of women from the entire sample, 46.2% of HSA women, and 3.8% of LSA women scored in the clinically significant range. On the Weight Concern subscale, 12.9% of women from the entire sample, 34.6% of HSA women, and 3.8% of LSA women scored in the clinically significant range.

To examine group differences on continuous measures of social anxiety, trait anxiety, depression, PEB, and body dissatisfaction, one-way ANOVA models were conducted for continuous variables. Means and standard deviations of measures of social anxiety, trait anxiety, depression, global PEB scores, and body dissatisfaction by social anxiety group status are presented in Table 1. Women in the HSA group evinced significantly higher social interaction anxiety, observational anxiety, trait anxiety, and depression compared to the LSA group. The magnitudes of these effects were large (Cohen, 1992). Importantly, mean scores obtained on social anxiety measures in the HSA group were consistent with those found among pre-treatment SAD patients (Weeks et al., 2005). HSA women also reported significantly higher global PEB

scores and body dissatisfaction than LSA women. The magnitudes of these effects were large (Cohen, 1992).

### **Relations Between Difficulty Disengaging Attention, Social Anxiety, Trait Anxiety, Depression, Pathological Eating Behaviors, and Body Dissatisfaction**

Zero-order correlations (in addition to means and standard deviations) of difficulty disengaging attention, trait anxiety, depression, global PEB attitudes, and body dissatisfaction are presented in Table 3. Depression, trait anxiety, PEB and body dissatisfaction were all positively correlated to each other. Contrary to expectation, neither PEB nor body dissatisfaction were significantly correlated with difficulty disengaging attention from appearance words.

### **Difficulty Disengaging Attention from Appearance by Social Anxiety Group Status**

To test the hypothesis that difficulty disengaging attention from appearance words would be higher among HSA women than among LSA women, an ANOVA was conducted with social anxiety group status as the independent variable (IV) and bias scores for appearance words as the DV. There was no significant difference between HSA and LSA women on difficulty disengaging attention from appearance words  $F(1, 48) = .096, p = .758, d = .11$ . To test the hypothesis that difficult disengaging attention from appearance words would be higher among HSA women than LSA women after controlling for depression and trait anxiety, a one-way ANCOVA was conducted with social anxiety group status as the IV, bias scores for appearance words as the DV, and depression and trait anxiety as covariates. Difficulty disengaging attention from appearance words was not significantly different between HSA and LSA women,  $F(1, 50) = .164, p = .687, d = .11$ .

Table 3

Summary of zero-order correlations and means and standard deviations of depression, trait anxiety, body dissatisfaction, pathological eating behaviors, and difficulty disengaging attention from appearance words

Variable	1	2	3	4	5	<i>M</i>	<i>SD</i>
1. Depression	-	.78*	.66*	.61*	.05	7.12	7.10
2. Trait anxiety	-	-	.60*	.53*	-.04	6.50	8.65
3. Body dissatisfaction	-	-	-	.94*	.10	90.15	41.73
4. Pathological eating behaviors	-	-	-	-	.05	1.80	1.40
5. Difficulty disengaging attention	-	-	-	-	-	-5.33	19.70

Note. Social interaction anxiety measured by the *Social Interaction Anxiety Scale* (Mattick & Clarke, 1998); observational anxiety measured by the *Social Phobia Scale* (Mattick & Clarke, 1998); depression and trait anxiety measured by the corresponding subscales of the *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995); body dissatisfaction measured by the *Body Shape Questionnaire* (Cooper, et al., 1987); pathological eating behaviors = global score on *Eating Disorder Examination Questionnaire* (Fairburn & Bèglin, 1994); difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word.

\*  $p < .01$

### **Moderational Role of Difficulty Disengaging Attention Between Social Anxiety Group Status and Pathological Eating Behaviors Global Scores**

To test the hypothesis that difficulty disengaging attention from appearance words would moderate the relationship between social anxiety group status and PEB global scores, a hierarchical linear regression was conducted using the method proposed by Baron and Kenny (1986). For this hierarchical linear regression, the DV was EDE-Q global scores and all continuous variables were centered to reduce multicollinearity (Aiken & West, 1991). The IVs were social anxiety group status, bias scores, and the social anxiety group status X bias scores interaction. The main effects of social anxiety group status and bias scores were entered into Step 1, and the social anxiety group status X bias scores interaction term was entered into Step 2. This model ensures that any observed effects for the interaction in Step 2 cannot be attributed to shared variance with the variables entered into Step 1 (Cohen & Cohen, 1983). Neither the main effects of social anxiety group status or bias scores, nor the social anxiety group status X bias scores interaction was significantly related to EDE-Q scores (Table 4)<sup>1</sup>. The magnitude of the interaction effect was small (Cohen, 1992). In this model, Step 1 accounted for 36.6% of the variance and Step 2 accounted for 0.2% of the variance.

### **Moderational Role of Difficulty Disengaging Attention Between Social Anxiety Group Status and Body Dissatisfaction**

To test the hypothesis that difficulty disengaging attention from appearance words would moderate the relationship between social anxiety group status and body dissatisfaction, a second hierarchical linear regression was conducted. For this model, the DV was BSQ scores and the IVs were social anxiety group status, bias scores on appearance words, and the social anxiety group status X bias scores interaction. The main effects of social anxiety group status and bias scores were entered into Step 1, and the social anxiety group status X bias scores interaction term

Table 4  
 Hierarchical Linear Regression Analyses to test Moderational Role of Difficulty Disengaging Attention between Social Anxiety Group Status and Pathological Eating Behaviors and Body Dissatisfaction (HSA n = 26; LSA n = 26)

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$	$f^2$
Dependent Variable: Pathological Eating Behavior Scores							
Step 1	.366	14.15	49			<.001	
Social Anxiety Group				1.660	5.30	<.001	.575
Difficulty Disengaging Attention				.001	.14	.893	.001
Step 2	.002	9.30	48			.390	
Social Anxiety Group X Difficulty Disengaging Attention				.006	.34	.734	.004
Dependent Variable: Body Dissatisfaction							
Step 1	.452	20.20	49			<.001	
Social Anxiety Group				55.010	6.28	<.001	.817
Difficulty Disengaging Attention				.135	.60	.551	.014

(table continued)

Step 2	.005	13.48	48				<.001
Social Anxiety Group X				.317	.70	.490	.019
Difficulty Disengaging Attention							

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Note. Social anxiety group = Social anxiety group status (high vs. low social anxiety group); pathological eating behavior scores = global score on *Eating Disorder Examination Questionnaire* (Fairburn & Bèglin, 1994); body dissatisfaction measured by *Body Shape Questionnaire* (Cooper, et al., 1987); Difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word; HSA = high social anxiety group; LSA = low social anxiety group.

was entered into Step 2. Neither the main effects of social anxiety group status or bias scores, nor the social anxiety group status X bias scores interaction was significantly related to BSQ scores (Table 4)<sup>1</sup>. The magnitude of the interaction effect was small (Cohen, 1992). In this model, Step 1 accounted for 45.2% of the variance and Step 2 accounted for 0.5% of the variance.

### **Exploratory Analyses – Moderational Role of Difficulty Disengaging Attention Between Social Anxiety Group Status and Frequency of Pathological Eating Behaviors Among Women That Had Engaged in Past-Month Pathological Eating Behaviors**

Given that the majority of past research on PEB and attention found a significant relationship between attentional bias and PEB in samples of women that currently engage in PEB (Jones-Chesters, et al., 1998; Rieger, et al., 1998), we conducted exploratory analyses among HSA women that had engaged in past-month PEB (HSA  $n = 17$ ). We compared this group to a randomly selected unmatched group of LSA women that had engaged in past-month PEB (LSA  $n = 17$ ). The moderational role of difficulty disengaging attention in the relationship between social anxiety group status and number of PEB was tested using this subset of our sample. It was hypothesized that difficulty disengaging attention from appearance would moderate the relationship between social anxiety group status and number of PEB. For this hierarchical linear regression model, the DV was number of PEB (i.e., number of binge-eating, purging, and restricted eating episodes) and continuous terms were centered to reduce multicollinearity (Aiken & West, 1991). To examine effects above and beyond trait anxiety and depression, these variables were entered as covariates into Step 1. The main effects of social anxiety group status and bias scores were entered into Step 2 and the social anxiety group status X bias scores interaction term was entered into Step 3. The interaction was significant (Table 5). The magnitude of this interaction was in the medium range (Cohen, 1992). In this model, Step 1 accounted for 5.6% of the variance, Step 2 accounted for 9.5%, and Step 3 accounted for 11.4%.

Table 5

Hierarchical Linear Regression Analyses to test Moderational role of Difficulty Disengaging Attention between Social Anxiety Group Status and Number of any Pathological Eating Behaviors among Women that Engaged in Past-Month PEB (HSA n = 17; LSA n = 17)

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$	$f^2$
Dependent Variable: Number of any Pathological Eating Behaviors							
Step 1	.056	0.913	31			.412	
Trait Anxiety				.116	.493	.626	0.01
Depression				.141	.599	.553	0.01
Step 2	.095	1.284	29			.299	
Social Anxiety Group				-.311	-1.291	.207	0.07
Difficulty Disengaging Attention				-.223	-1.277	.212	0.06
Step 3	.114	2.010	28			.108	
Social Anxiety Group X Difficulty Disengaging Attention				.555	2.079	.047	0.14

Note. Trait anxiety and depression measured by corresponding subscales of *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995); Social Anxiety Group = Social anxiety group status (high vs. low social anxiety group); Difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word; HSA = high social anxiety group; LSA = low social anxiety group.

The regression equations for number of PEB among HSA and LSA women based on difficulty disengaging attention were graphed using one standard deviation above the mean of difficulty disengaging attention. As can be seen in Figure 1, higher difficulty disengaging attention from appearance words in the LSA group appears associated with higher number of PEB relative to lower difficulty disengaging attention from appearance words in the LSA group or HSA group regardless of difficulty disengaging attention. To probe the nature of the interaction, the simple slopes were investigated using the methodology proposed by Holmbeck (2002). The simple slope of the moderator variable was significant for the LSA group ( $t = -2.505, p = .018$ ), but not for the HSA group ( $t = .307, p = .761$ ). The simple slope of social anxiety was not significant for either higher difficulty disengaging attention, ( $t = 1.567, p = .127$ ), or for lower difficulty disengaging attention, ( $t = -.367, p = .135$ ). In other words, among LSA women that had engaged in past-month PEB, higher difficulty disengaging attention was associated with higher number of PEB. However, among HSA women that had engaged in past-month PEB, difficulty disengaging attention was not associated with number of PEB. Further, for all women regardless of level of difficulty disengaging attention, social anxiety status was not associated with number of PEB.

### **Exploratory Analyses – Relationship Between Social Anxiety Group Status and Likelihood to Have Engaged in Specific Pathological Eating Behaviors**

Given past research suggests that HSA may be related to binge-eating and purging but not restricted eating (e.g., Iwasaki, Matsunaga, Kiriike, Tanaka, & Matsui, 2000), it is possible that HSA women do not engage in *all* PEB more than LSA women. We therefore conducted follow-up analyses on specific PEB. We first conducted follow-up analyses to examine whether HSA women were more likely (yes or no) to engage in binge-eating and purging (but not in restricted eating) compared to LSA women.

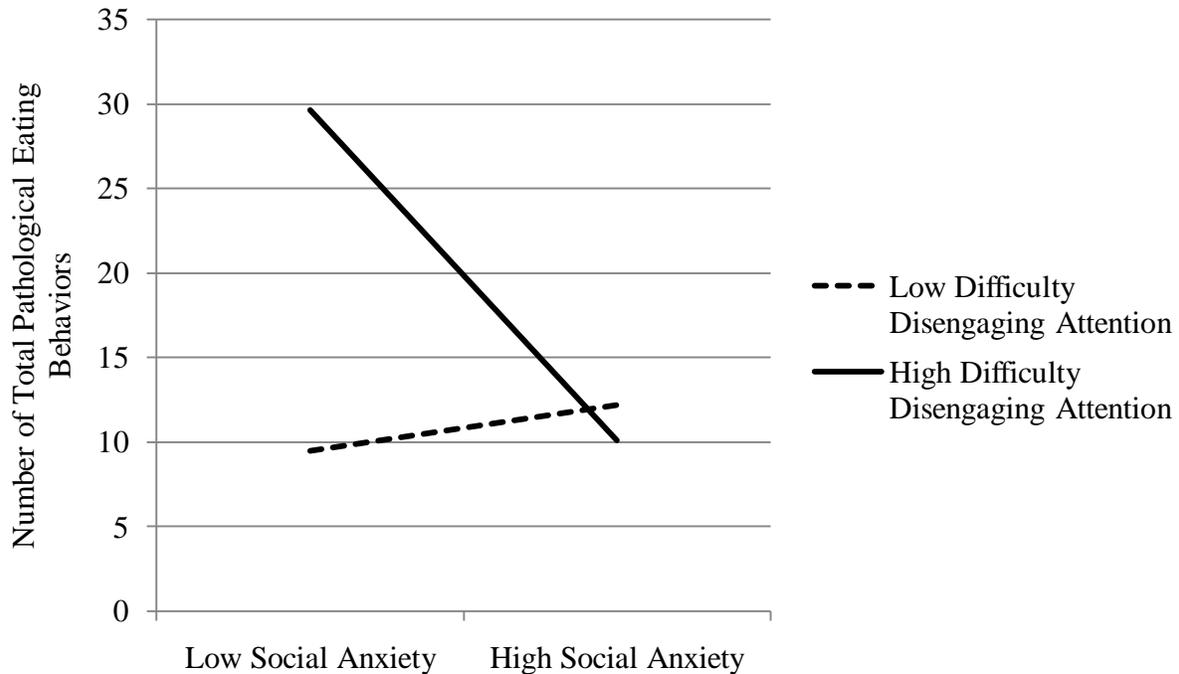


Figure 1. Interaction of number of total pathological eating behaviors among women in the high ( $n = 17$ ) and low ( $n = 17$ ) social anxiety groups that engaged in pathological eating behaviors at least once in the past 28 days based on level of difficulty disengaging attention from appearance words.

Three chi-square analyses were conducted with engagement in binge-eating (yes or no), engagement in purging (yes or no), and engagement in restricted eating (yes or no) as dichotomous DVs. Social anxiety group status was the IV for all three chi-square analyses. Consistent with exploratory hypothesis, HSA women were significantly more likely to engage in binge-eating,  $\chi^2(1, N = 52) = 10.83, p = .001, \phi = 0.46$ , than LSA women. However, contrary to expectation, HSA women were also more likely to engage in restricted eating,  $\chi^2(1, N = 52) = 5.44, p = .020, \phi = 0.32$ , than LSA women, but were not significantly more likely to engage in purging,  $\chi^2(1, N = 52) = .35, p = .552, \phi = 0.08$ . The effect of social anxiety group status on engagement in binge-eating and restricted eating was medium, and small for purging (Cohen, 1992).

### **Exploratory Analyses – Relationship Between Social Anxiety Group Status and Frequency of Specific Pathological Eating Behaviors**

Given that rates of ED are higher among women with SAD than women without SAD (Godart, et al., 2000), it would be expected that among women who engage in PEB, HSA women engage in more frequent PEB than LSA women. Therefore, it was hypothesized that HSA women would engage in a greater number of binge-eating, purging, and restricted eating episodes compared to LSA women. For these analyses, we used the subset of women (HSA  $n = 17$ , LSA  $n = 17$ ) that had engaged in past-month PEB to investigate engagement frequency only among women that had actually engaged in PEB.

Three one-way ANOVAs were conducted with total number of binge-eating episodes as the DV for the first ANOVA, total number of purging episodes as the DV for the second ANOVA, and total number of restricted eating episodes as the DV for the third ANOVA. Social anxiety group status was the IV for all three ANOVAs. Contrary to expectations, HSA women did not engage in more episodes of binge-eating,  $F(1, 33) = 2.389, p = .132, d = .53$ , purging  $F(1, 33) = 1.712, p = .200, d = .45$ , or restricted eating,  $F(1, 33) = .000, p = 1.000, d = .00$ , than LSA women. The effect of social anxiety status on number of binge-eating and purging episodes was medium and small for restricted eating episodes (Cohen, 1992).

### **Exploratory Analyses – Relationship Between Difficulty Disengaging Attention From Appearance Words and Specific Pathological Eating Behaviors**

There is evidence suggesting that attentional bias toward appearance cues correlates with binge-eating and purging behaviors, but not restricting, among those that engage in PEB (Perpiñá, Hemsley, Treasure, & De Silva, 1993; Perpiñá, Leonard, Treasure, Bond, & Baños, 1998). Therefore, we examined whether: (1) difficulty disengaging attention from appearance words would be associated with likelihood (yes or no) of engaging in binge-eating and purging

behaviors; and (2) difficulty disengaging attention from appearance words would also be associated with frequency of binge-eating and purging episodes. The sample for these analyses was women that had engaged in past-month PEB (HSA  $n = 17$ , LSA  $n = 17$ ) to investigate engagement frequency only among women that had actually engaged in PEB.

Logistic regressions were conducted with engagement in binge-eating (yes or no), engagement in purging (yes or no), and engagement in restricted eating (yes or no) as dichotomous DVs. Difficulty disengaging attention from appearance words was the IV in all regression models. Engagement in purging was significantly related to difficulty disengaging attention,  $b = -.112$ ,  $S.E. = .052$ ,  $p = .031$ ,  $R^2_N = .198$ , but this effect was small (Cohen, 1992). Difficulty disengaging attention was not significantly related to engagement in binge-eating,  $b = .007$ ,  $S.E. = .017$ ,  $p = .680$ ,  $R^2_N = .005$ , or engagement in restricted eating,  $b = -.005$ ,  $S.E. = .015$ ,  $p = .719$ ,  $R^2_N = .003$ .

Next, a series of linear regressions were conducted with number of binge-eating episodes, number of purging episodes, and number of restricted eating episodes as DVs. Difficulty disengaging attention was the IV in all regression models. Difficulty disengaging attention was only significantly related to number of purging episodes (Table 6), although the magnitude of this effect was small (Cohen, 1992).

### **Exploratory Analyses – Moderational Role of Difficulty Disengaging Attention Between Social Anxiety Group Status and Likelihood to Have Engaged in Specific Pathological Eating Behaviors**

Given the statistically significant relationships between social anxiety group status and likelihood of engagement in binge-eating and restricted eating, but not purging, we next tested whether difficulty disengaging attention from appearance words would moderate the relationships between social anxiety group status and engagement in binge-eating (yes or no) and

Table 6  
 Regression Analyses for Difficulty Disengaging Attention Predicting Number of Pathological Eating Behaviors  
 among Women that Engaged in Past-Month PEB (HSA n = 17; LSA n = 17)

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$	$f^2$
Dependent Variable: Number of Binge-eating Episodes							
Step 1	.016	.534	33			.470	
Difficulty Disengaging Attention				-.128	-.730	.470	0.02
Dependent Variable: Number of Purging Episodes							
Step 1	.107	3.832	33			.059	
Difficulty Disengaging Attention				-.327	-1.958	.059	0.12
Dependent Variable: Number of Restricted Eating Episodes							
Step 1	.008	.273	33			.605	
Difficulty Disengaging Attention				-.092	-.523	.605	0.01

Note. Difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word; HSA = high social anxiety group; LSA = low social anxiety group.

restricted eating (yes or no). It was hypothesized that difficulty disengaging attention would moderate the relationships between social anxiety group status and binge-eating and restricted eating such that HSA women that exhibited higher levels of difficulty disengaging attention would also demonstrate higher likelihood of binge-eating and restricted eating compared to HSA women with lower difficulty disengaging attention and LSA women regardless of level of difficulty disengaging attention. Hierarchical logistic regressions were conducted with engagement in binge-eating (yes or no) as the DV in one regression and engagement in restricted eating (yes or no) as the DV in another regression. Continuous terms were centered to reduce multicollinearity (Aiken & West, 1991). To examine effects above and beyond trait anxiety and depression, these variables were entered as covariates into Step 1, the main effects of social anxiety group status and bias scores were entered into Step 2, and the social anxiety group status X bias scores interaction term was entered into Step 3.

None of the interactions were significant (Table 7). In the binge-eating model, Step 1 accounted for 27.9% of the variance, Step 2 accounted for 2.3%, and Step 3 accounted for 4.9%. In the purging model, Step 1 accounted for 4.5% of the variance, Step 2 accounted for 12.9%, and Step 3 accounted for 4.9%. In the restricted eating model, Step 1 accounted for 15.7% of the variance, Step 2 accounted for 1.7%, and Step 3 accounted for 0.4%.

### **Exploratory Analyses – Moderational Role of Difficulty Disengaging Attention Between Social Anxiety Group Status and Frequency of Specific Pathological Eating Behaviors Among Women that Engaged in Past-Month Pathological Eating Behaviors**

Next, it was examined whether difficulty disengaging attention from appearance words moderated the relationship between social anxiety group status and number of binge-eating, purging, and restricted eating episodes among women that had engaged in past-month PEB (HSA  $n = 17$ , LSA  $n = 17$ ) to investigate if difficulty disengaging attention only plays a role

Table 7

Hierarchical Logistic Regression Analyses to test Moderational Role of Difficulty Disengaging Attention between Social Anxiety Group Status and Engagement in Specific Pathological Eating Behaviors (HSA n = 26; LSA n = 26)

Predictor	<i>B(SE)</i>	Wald Statistic	95% CI	<i>p</i>	$R^2_N$
Dependent Variable: Engagement in Binge-Eating (yes or no)					
Step 1					.179
Trait Anxiety	0.06 (0.07)	0.78	[0.93, 1.20]	0.38	
Depression	0.15 (0.09)	3.28	[0.99, 1.38]	0.07	
Step 2					.209
Social Anxiety Group	1.51 (1.29)	1.40	[0.36, 57.21]	0.24	
Difficulty Disengaging Attention	0.01 (0.02)	0.05	[0.96, 1.05]	0.83	
Step 3					.282
Social Anxiety Group X Difficulty Disengaging Attention	0.20 (0.17)	1.44	[0.88, 1.68]	0.23	
Dependent Variable: Engagement in Restricted Eating (yes or no)					
Step 1					.047
Trait Anxiety	-0.04 (0.06)	0.42	[0.87, 1.08]	0.52	
Depression	0.16 (0.07)	4.97	[1.02, 1.35]	0.03	
Step 2					.058
Social Anxiety Group	0.68 (0.82)	0.69	[0.40, 9.75]	0.41	

(table continued)

Difficulty Disengaging Attention	-0.01 (0.02)	0.53	[0.96, 1.02]	0.47	
Step 3					.061
Social Anxiety Group X					
Difficulty Disengaging Attention	-0.02 (0.04)	0.24	[0.92, 1.06]	0.63	
Dependent Variable: Engagement in Purging (yes or no)					
Step 1					.126
Trait Anxiety	0.12 (0.10)	1.56	[0.93, 1.36]	0.21	
Depression	-0.07 (0.14)	0.25	[0.71, 1.23]	0.62	
Step 2					.489
Social Anxiety Group	0.41 (1.84)	0.05	[0.04, 55.62]	0.82	
Difficulty Disengaging Attention	-0.13 (0.07)	2.91	[0.76, 1.02]	0.09	
Step 3					.500
Social Anxiety Group X					
Difficulty Disengaging Attention	0.08 (0.17)	0.22	[0.77, 1.52]	0.64	

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Note. Trait anxiety and depression measured by corresponding subscales of *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995); Social Anxiety Group = Social anxiety group status (high vs. low social anxiety group); Difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word; HSA = high social anxiety group; LSA = low social anxiety group.

among women that had actually engaged in PEB. Given the statistically significant relationships between social anxiety group status and likelihood of engagement in binge-eating and restricted eating, but not purging, it was hypothesized that difficulty disengaging attention would moderate the relationships between social anxiety group status and binge-eating and restricted eating episodes. Three hierarchical linear regressions were conducted with number of binge-eating episodes as the DV in the first regression, number of purge episodes as the DV in the second regression, and number of restricted eating episodes as the DV in the third regression.

All continuous variables were centered. To examine effects above and beyond trait anxiety and depression, those two variables were entered into Step 1, the main effects of social anxiety group status and bias scores were entered into Step 2, and the social anxiety group status X bias scores interaction term was entered into Step 3. None of these interactions were significant (Table 8)<sup>2</sup>. The magnitude of the effect for purging episodes was in the small-to-medium range, whereas the rest were small (Cohen, 1992). In the binge-eating model, Step 1 accounted for 15.8% of the variance, Step 2 accounted for 1.3%, and Step 3 accounted for 3.3%. In the purging model, Step 1 accounted for 3.1% of the variance, Step 2 accounted for 12.7%, and Step 3 accounted for 5.2%. In the restricted eating model, Step 1 accounted for 3.5% of the variance, Step 2 accounted for 2.3%, and Step 3 accounted for 0.3%.

Table 8  
 Hierarchical Linear Regression Analyses to test Moderational Role of Difficulty Disengaging Attention between Social Anxiety Group Status and Number of Specific Pathological Eating Behaviors among Women that Engaged in Past-Month PEB (HSA n = 17; LSA n = 17)

Predictor	$\Delta R^2$	$F_{inc}$	$df$	$\beta$	$t$	$p$	$f^2$
Dependent Variable: Number of Binge Eating Episodes							
Step 1	.158	2.919	49			.069	
Trait Anxiety				.216	.969	.340	0.03
Depression				.219	.985	.332	0.03
Step 2	.013	1.499	47			.228	
Social Anxiety Group				.005	.023	.982	0.00
Difficulty Disengaging Attention				-.115	-.670	.508	0.02
Step 3	.033	1.440	46			.241	
Social Anxiety Group X Difficulty Disengaging Attention				.300	1.080	.289	0.05

(table continued)

Dependent Variable: Number of Purge Episodes

Step 1	.031	.491	49		.617	
Trait Anxiety				.031	.130	.897 0.00
Depression				-.195	-.814	.422 0.02
Step 2	.127	1.358	47		.273	
Social Anxiety Group				-.214	-.892	.380 0.03
Difficulty Disengaging Attention				-.331	-1.909	.066
Step 3	.052	1.491	46		.225	
Social Anxiety Group X Difficulty Disengaging Attention				.377	1.363	.184 0.13

Dependent Variable: Number of Restricted Eating Episodes

Step 1	.035	.558	49		.578	
Trait Anxiety				.183	.766	.450 0.02
Depression				.005	.022	.982 0.00

(table continued)

Step 2	.023	.442	47			.777	
Social Anxiety Group				-.185	-.731	.471	0.02
Difficulty Disengaging Attention				-.077	-.420	.678	0.01
Step 3	.003	.358	46			.873	
Social Anxiety Group X				-.084	-.279	.782	0.00
Difficulty Disengaging Attention							

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Note. Trait anxiety and depression measured by corresponding subscales of *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995); Social Anxiety Group = Social anxiety group status (high vs. low social anxiety group); Difficulty disengaging attention = reaction time on appearance trials where the probe appears opposite of appearance word minus reaction time on neutral trials where the probe appears opposite of neutral word; HSA = high social anxiety group; LSA = low social anxiety group.

### END NOTES

<sup>1</sup>Analyses were re-run with trait anxiety and depression entered into Step 1, main effects into Step 2, and interaction into Step 3. The interaction was also not significant.

<sup>2</sup>Analyses were re-run without trait anxiety and depression as covariates. The interactions were also not significant.

## DISCUSSION

The purpose of this study was to explore differences in difficulty disengaging attention from appearance words among women with higher and lower levels of trait social anxiety. Further, we aimed to test whether difficulty disengaging attention from appearance words was related to PEB and/or body dissatisfaction among HSA women. This study serves as the first known test of difficulty disengaging attention from appearance words among HSA and LSA women.

### **The Relationship Between Social Anxiety and Pathological Eating Behaviors/Body Dissatisfaction**

Consistent with prior work (McLean, et al., 2007; Silgado, Timpano, Buckner, & Schmidt, 2010; Wonderlich-Tierney & Vander Wal, 2010), we found that women with HSA demonstrated significantly greater global PEB scores and body dissatisfaction than LSA women. Data from the current study also extend knowledge on the relationship between social anxiety and PEB because our data suggest that HSA women were more likely to engage in binge-eating and restricted eating than LSA women. Our finding is somewhat consistent with past work that found SAD to be related to anorexia nervosa (AN) binge-purge type and BN purging type but not AN restricted type or BN non-purging type (Hinrichsen, et al., 2003; Iwasaki, et al., 2000). Our finding is inconsistent with that research in that HSA women in our study were not more likely to engage in purging than LSA women, which the literature suggests would be the case. The reason for seemingly disparate results may be due to sample differences. Women with SAD and ED may be more likely to purge, whereas women with HSA that engage in PEB may be more likely to restrict their eating. This is consistent with research that found levels of social anxiety correlate with restricted eating among non-treatment seeking women (non-HSA, non-ED), but with bulimic symptoms among ED patients (Hinrichsen, et al., 2003). However, our finding is

consistent with past research suggesting HSA women are more likely to engage in PEB than LSA women (Wonderlich-Tierney & Vander Wal, 2010).

HSA women may be more likely to engage in binge-eating and restricted eating than LSA women because HSA women tend to have poorer coping skills (Hinrichsen, et al., 2003; Wonderlich-Tierney & Vander Wal, 2010). In fact, Wonderlich-Tierney and colleagues (2010) posited that elevated state social anxiety may lead to negative emotional responses (emotion-oriented coping), which can lead to PEB as an affect regulation strategy (Heatherton & Baumeister, 1991). In support of their hypothesis, Wonderlich et al. found that poor coping skills mediated the relationship between social anxiety and PEB. Therefore, it may be that HSA women have pathological problems with food intake (i.e., binge-eating or restricted eating) because they do not utilize healthier coping strategies to deal with state social anxiety. This is consistent with theory that suggests HSA individuals have pathological problems with substance use because they tend to use substances as a coping strategy rather than using healthier coping strategies to deal with state anxiety (e.g., Buckner, et al., 2007).

### **The Relationship Between Difficulty Disengaging Attention from Appearance Words and Pathological Eating Behaviors/Body Dissatisfaction**

Contrary to prior work (Jansen, et al., 2005; Shafran, et al., 2007), difficulty disengaging attention from appearance words was not related to either global PEB scores or body dissatisfaction. This finding is somewhat counter to prior work finding these constructs to be related to other types of attentional biases (Jones-Chesters, et al., 1998; Rieger, et al., 1998; Smith & Rieger, 2006, 2009). Methodological differences may account for these seemingly disparate findings. First, other studies did not assess the relations between PEB/body dissatisfaction and difficulty disengaging attention, but instead assessed hypervigilance or avoidance (Jones-Chesters, et al., 1998; Rieger, et al., 1998; Smith & Rieger, 2006, 2009).

Therefore, one possibility is that PEB and body dissatisfaction are only related to hypervigilance and/or avoidance of appearance cues, but not difficulty disengaging attention. Second, we did not recruit participants based on engagement in PEB or body dissatisfaction like previous studies have done (Jones-Chesters, et al., 1998; Rieger, et al., 1998; Smith & Rieger, 2006, 2009) and instead used a mixed sample of women that had and had not engaged in PEB. Therefore, it is possible that difficulty disengaging attention from appearance words is related to PEB only among women that engage in PEB and/or exhibit high levels of body dissatisfaction.

Exploratory follow-up analyses were conducted to investigate the relationship between difficulty disengaging attention and PEB among our subset of women that had engaged in past-month PEB. We found a significant relationship between difficulty disengaging attention from appearance words and specific PEB (i.e., purging). Although the size of the effect was small, the finding is somewhat consistent with prior research showing a positive correlation between attentional biases to socially evaluative cues (e.g., words such as “failure” and “ugly”) and frequency of binge-eating and purging (McManus, Waller, & Chadwick, 1996). The question arises as to what may account for a specific relationship between difficulty disengaging attention from appearance words and purging behaviors. One possibility is that difficulty disengaging attention from appearance increases cognitive distortions and rumination regarding one’s own body appearance (e.g., “My thighs are too big and they are disgusting” or “I wish my stomach was flatter so that people would like me more”). Negative cognitive distortions like these lead to increased state body dissatisfaction (Jones, et al., 2004) which in turn may increase negative affect. As per the affect regulation theory of PEB (Heatherton & Baumeister, 1991), engaging in purging may then be an attempt to dissociate oneself from awareness by narrowing attention to what is immediately around and, therefore, reduce negative affect. Further, purging may also be an immediate attempt to change (perceived) negative appearance and try to increase positive

mood, which would be another attempt at regulating affect. This theory is in line with past research finding that women with increased state body dissatisfaction are more likely to engage in purging than binge-eating behaviors (Rieder & Ruderman, 2001).

### **Difficulty Disengaging Attention From Appearance Words and Social Anxiety Group Status**

Contrary to our hypothesis, HSA women did not exhibit higher levels of difficulty disengaging attention from appearance words than LSA women. This finding seems in contrast to prior work finding evidence for difficulty disengaging attention among HSA individuals (Amir, et al., 2003; Buckner, et al., 2010). Specifically, HSA individuals exhibited difficulty disengaging attention from social threat cues (e.g., disgust faces, social threat words such as “boring”) which authors concluded may be due to HSA individuals appraising these cues as threatening. We therefore hypothesized that if HSA women find appearance cues to be threatening, they would also exhibit difficulty disengaging attention from appearance cues. However, given that HSA women in our study did not exhibit more difficulty disengaging attention from appearance words than LSA women, it may be that HSA women did not find our appearance stimuli threatening.

Prior work suggests that only women with higher body dissatisfaction exhibit attentional bias towards appearance cues, and then only to appearance cues that are both negative in nature and concern aspects of their own appearance with which they are dissatisfied (Jansen, et al., 2005; Roefs, et al., 2008). Therefore, it may be that only those HSA women with higher body dissatisfaction would demonstrate difficulty disengaging attention from appearance cues. Further, HSA women with higher body dissatisfaction may not exhibit difficulty disengaging attention from appearance-related cues in general, but may only demonstrate difficulty disengaging attention from negative appearance cues specifically related to themselves.

## **Moderational Role of Difficulty Disengaging Attention From Appearance Words**

Contrary to our hypothesis, difficulty disengaging attention did not moderate the relationships between social anxiety group status and global PEB scores and body dissatisfaction. It is certainly possible that our non-significant findings reflect that difficulty disengaging attention from threat does not moderate the relations between social anxiety group status and PEB or body dissatisfaction. However, in regards to PEB, it may be that by using the EDE-Q global score, which also captures cognitions and attitudes regarding eating in addition to PEB, we did not quite get at the relationship between attentional bias and PEB.

Exploratory follow-up analyses were conducted to test whether difficulty disengaging attention moderated the relationship between social anxiety group status and the frequency of PEB (i.e., number of binge-eating, purging, and restricted eating behaviors) among the subset of women that had engaged in past-month PEB. This interaction was significant but, surprisingly, the nature of the interaction was contrary to what we expected. Specifically, women with LSA and higher difficulty disengaging attention from appearance words reported the highest number of past-month PEB compared to LSA women with lower difficulty disengaging attention from appearance words and HSA women regardless of level of difficulty disengaging attention.

However, given our findings that HSA women reported higher scores on global PEB and were more likely to engage in specific PEB than LSA women, the finding that LSA women with high difficulty disengaging attention engaged in more PEB than HSA women seems contradictory. Similarly, this finding seems inconsistent with past research that found HSA to be related to PEB more so than LSA (McLean, et al., 2007; Silgado, et al., 2010; Wonderlich-Tierney & Vander Wal, 2010). Further, given the large number of analyses conducted, it is likely the results from these analyses were observed by chance. We also question the clinical significance of this effect given the small effect size ( $f^2 = 0.14$ ). Therefore, moderational effects

of difficulty disengaging attention from appearance on the relations between social anxiety and PEB should be investigated in larger samples before further considering the below conclusions and implications.

If these moderational effects were not spurious, then the question arises as to why LSA women with higher levels of difficulty disengaging attention engaged in more PEB than HSA women regardless of levels of difficulty disengaging attention. One possible interpretation of this finding is that LSA women may engage in PEB to manage negative affect related to a variety of situations (e.g., failure to meet unrealistically high personal standards; Heatherton & Baumeister, 1991) and therefore engage in PEB more frequently than HSA women, especially if they have difficulty disengaging attention from appearance cues. On the other hand, HSA women may be more likely to only engage in PEB specifically to manage state social anxiety related to their involvement in social situations (or in anticipation of social situations) or due to fear of negative evaluation if others perceive their body or weight to be inconsistent with social norms (Bulik, Beidel, Duchmann, & Weltzin, 1991). Therefore, HSA women may engage in PEB less frequently than LSA women as it is believed HSA individuals limit their involvement in social situations due to their elevated trait social anxiety (American Psychiatric Association, 1994).

These moderational findings may have clinical implications. Specifically, LSA women that engage in PEB and exhibit high levels of difficulty disengaging attention from appearance may benefit from treatment shown to reduce both attentional bias and PEB (e.g., Cognitive Behavioral Therapy; Shafran, Lee, Cooper, Palmer, & Fairburn, 2008). In regards to women presenting with co-occurring HSA and PEB, clinicians may want to be cognizant of the possibility that attentional bias may not be a maintaining factor for the co-occurrence of HSA and PEB, and that other factors (e.g., body dissatisfaction, perfectionism) may be more promising targets for assessment and treatment (Fairburn, et al., 2003).

We also tested whether difficult disengaging attention would moderate the relationships between social anxiety and specific PEB. Contrary to expectation, difficulty disengaging attention did not moderate the relationships between social anxiety group status and either likelihood of engagement in specific PEB or number of specific PEB (neither in the entire sample nor in subset of sample with women that had engaged in PEB). Although HSA women were more likely to engage in binge-eating and restricted eating than LSA women, difficulty disengaging attention did not affect likelihood or number of PEB among HSA women. This appears consistent with our prior hypothesis that HSA women may only exhibit difficulty disengaging attention from negative appearance cues related to themselves and difficulty disengaging from these negative cues specifically may increase vulnerability to specific PEB.

### **Limitations and Future Research**

The present study should be considered in light of limitations that suggest additional areas for future work. First, the sample was comprised of non-treatment seeking women and so replication with clinical populations is needed. However, it is important to note that women who do not seek treatment for ED report higher levels of social anxiety than those that seek treatment (Goodwin & Fitzgibbon, 2002). Further, the majority of those with SAD and ED (80% and 72%, respectively) report not seeking treatment for their psychological symptoms (Cachelin & Striegel-Moore, 2006; Erwin, Turk, Heimberg, Fresco, & Hantula, 2004; Grant et al., 2005). Thus, data from the current study may be generalizable to the majority of women with these conditions. Second, the current sample was comprised of only undergraduate women. Although the current sample was selected given the vulnerability of undergraduate women to PEB (Heatherton, et al., 1995), future work is necessary to determine whether observed effects generalize to other at-risk populations (e.g., athletes, gay men). Third, we did not recruit women that engaged in PEB. Although we examined a subset sample of women that had engaged in

past-month PEB, future research would benefit from recruiting women that engage in PEB, and that engage in PEB more frequently to test study hypotheses. Fourth, the current study relied on cross-sectional data and, thus, causality cannot be determined. Future longitudinal and experimental work is needed to investigate temporal relations between social anxiety, PEB, body dissatisfaction, and difficulty disengaging attention.

Fifth, the present study was limited by a small sample size. Some of the non-significant findings had medium effect sizes (e.g., the relationship between social anxiety group status and number of binge-eating episodes) which suggest larger samples are needed to investigate relationships between social anxiety, PEB, body dissatisfaction, and difficulty disengaging attention. Sixth, a large number of analyses were conducted which may have increased our probability for Type I error. If results are considered after applying Bonferroni corrections to control for Type I error, only a few significant findings remain: differences in scores of continuous measures of social anxiety, global PEB, body dissatisfaction, depression, and trait anxiety between HSA and LSA women; and the finding that HSA women were more likely to engage in binge-eating behaviors than LSA women.

There were also several limitations regarding the ways in which attention was assessed. First, the present study relied on a single measure of attention (Posner task) with one type of stimuli (words). Thus, additional research is needed with other attention methodology (e.g., eye-tracking) and other stimuli modalities (e.g., pictorial). Second, stimuli used in the Posner task were general appearance words, including those with positive, negative, and neutral connotations. Given findings regarding PEB/body dissatisfaction and specificity of valence of appearance cues (Jansen, et al., 2005; Roefs, et al., 2008), future research on difficulty disengaging attention among HSA women may want to investigate difficulty disengaging attention from negative appearance words or, more specifically, negative cues regarding the

participant's own body (e.g., pictures of participants' own stomachs or thighs). Third, due to the over-representation of invalid trials, it is possible that cue words may have directed attention to the non-cued location. Future research should use a Posner task with equal presentations of valid and invalid trials. Further, such research may benefit from including a memory test administered after the Posner task that includes words presented versus not presented in the Posner task. This can help assess whether participants are truly attending to and reading the words on the screen during the task.

## CONCLUSION

In conclusion, findings suggest that HSA women did not exhibit more difficulty disengaging attention from appearance words than LSA women and difficulty disengaging attention did not moderate the relationships between social anxiety group status and either global PEB scores or body dissatisfaction. Although findings suggest that HSA women were more likely to engage in binge-eating and restricted eating (but not purging) compared to LSA women, HSA women did not engage in more episodes of binge-eating or restricted eating than LSA women. Further, difficulty disengaging attention from appearance words was significantly related to likelihood and number of purging behaviors (but not binge-eating or restricted eating). Exploratory analyses with a subset of our sample suggest that LSA women that exhibited greater difficulty disengaging attention from appearance reported the highest number of PEB.

Future work in this area may consider investigating possible mechanisms for the HSA and binge-eating/restricted eating links, as well as the relationship between difficulty disengaging attention from appearance and purging. Also, further work may consider investigating difficulty disengaging attention specifically from negative appearance cues related to participants (e.g., pictorial stimuli of areas of their own bodies with which they are dissatisfied) among HSA women. Experimental research may also be used to investigate attentional retraining among LSA women that engage in PEB and the effect of changes in state social anxiety on actual eating behaviors. Future work could have an impact on the prevention, evaluation, and treatment of PEB, HSA, body dissatisfaction, and their co-occurrence.

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## APPENDIX: APPEARANCE AND NEUTRAL WORDS

### Appearance Words:

Blubber	Buttocks	Plump
Obese	Overweight	Thighs
Waist	Hips	Legs
Arms	Fat	Belly
Flabby	Chubby	Chunky
Ugly	Thick	Breasts
Unattractive	Hefty	Fatty
Stout	Fleshy	Bloated
Gigantic	Figure	Stomach
Bulky	Heavy	Shape

### Neutral Words:

Home	Metric	Network
Upward	Defied	Another
Through	Because	Chair
Between	Something	Always
Furniture	Made	Portion
Obsidian	Insert	Over
Time	Water	Leaning
Rayon	Reported	Thought

## VITA

Jose Silgado is a current third year graduate student in the clinical psychology doctorate program at Louisiana State University. Jose graduated with a bachelor's degree in psychology and mathematics from Florida State University. His current research interests include etiological and maintenance factors of eating disorders, the co-occurrence of anxiety (specifically social anxiety) and eating disorders, pathological eating behaviors, and body image dissatisfaction. Jose is also interested in investigating mechanisms underlying the relationship between social anxiety and pathological eating behaviors. Jose's research goals also include finding factors that increase eating disorder treatment outcome and motivation.