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Effect of Attention Retraining on Pathological Eating Behaviors and Body Dissatisfaction

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EFFECT OF ATTENTION RETRAINING ON PATHOLOGICAL EATING BEHAVIORS
AND BODY DISSATISFACTION

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by
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ABSTRACT

Prevalence rates of pathological eating behaviors (PEB) and body dissatisfaction are high among college women, and rates are rising among college men. PEB and body dissatisfaction are also risk factors for the development of clinically significant eating disorders. Further, a lesser studied factor involved in male body dissatisfaction is drive for muscularity. With approximately 70% of college women and 45% of college men experiencing body dissatisfaction, it is important to identify its potential etiological and maintaining risk factors. One such mechanism may be the construct of attentional bias. Research suggests that individuals that engage in PEB or have high levels of body dissatisfaction exhibit an attentional bias toward negative body weight/shape and food cues. Attention retraining has been found to be effective in reducing attentional biases to threat among anxious populations. Therefore, these data suggest that retraining attention away from threatening body stimuli may help reduce body dissatisfaction, PEB, and drive for muscularity. The present study was the first to assess the effect of retraining attention away from threatening body stimuli on these variables in a population of college men and women. It was hypothesized that attention retraining would successfully reduce levels of body dissatisfaction, frequency of PEB, and drive for muscularity compared to a control attention paradigm. Participants were randomly assigned to either an attention retraining group or a control group. Results showed that attention retraining successfully reduced body dissatisfaction but only for women who had engaged in past-month PEB. Further, attention retraining did not reduce drive for muscularity in men.

INTRODUCTION

Pathological eating behaviors (PEB), also termed disordered eating or disordered eating behaviors, are unhealthy and/or problematic behaviors regarding the intake of food (Grigg, Bowman, & Redman, 1996). These behaviors are typically the main characteristics used as diagnostic criteria for eating disorders (American Psychiatric Association, 1994). For example, binge-eating, inappropriate compensatory behaviors (e.g., self-induced vomiting, excessive exercise, misuse of laxatives), restricted eating, and misuse of steroids are considered PEB. Although PEB are generally used to describe eating behaviors that are less severe than diagnosable eating disorders, these behaviors can develop into a clinical disorder if preventive methods are not implemented. In contrast, normal eating has been defined by Beumont, O'Connor, Lennerts, and Touyz (1990) as the ingestion of healthy foods, the intake of a mixed and balanced diet that contains nutrients and calories the body needs, and a positive attitude about food (e.g., no labeling of foods as good or bad, healthy or fattening, which can lead to feelings of guilt, anxiety, and depression). PEB can also be conceptualized as a spectrum of harmful and often ineffective eating behaviors used to attempt body image change or weight loss (Otis, Drinkwater, Johnson, Loucks, & Wilmore, 1997).

Engagement in PEB can be harmful to the nutritional status of the body as it can deny important nutritional components during a critical development period (Polivy & Herman, 1985). Further, when the body loses large amounts of fat, a variety of harmful complications can occur. For example amenorrhea, ketosis, reduced body mass, reduced lean muscle tissue, reduced metabolic rate, fatigue, irritability, insomnia, lack of concentration, and growth failure (Mallick, 1983). Regular usage of PEB can even lead to more difficulty in losing weight due to reductions in basal energy needs (Steen, Oppliger, & Brownell, 1988).

Although engagement in PEB alone is not sufficient for an eating disorder diagnosis, it is considered to be a subclinical eating disorder and may be diagnosed using a residual diagnosis of Other Specified Feeding or Eating Disorder (American Psychiatric Association, 2013). Regardless of whether or not a clinical disorder is present or diagnosed, PEB are widely exhibited by women (Muazzam & Khalid, 2011), especially among college populations (Hesse-Biber, 1989; Mintz & Betz, 1988), and research has found the presence of PEB to be a risk factor for the development of eating disorders (Striegel-Moore, Silberstein, & Rodin, 1986). For example, it has been estimated that for a teenage girl that engages in PEB the risk of developing an eating disorder, such as Anorexia Nervosa, is eight times that of a girl who does not engage in PEB (Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990).

Eating disorders are life-threatening disorders that affect approximately 4% of the adult population, and are two times more prevalent among women than men (Hudson, Hiripi, Pope, & Kessler, 2007). On the other hand, PEB are much more prevalent, and 31% of women exhibit PEB (Reba-Harrelson et al., 2009). Prevalence is even higher among college populations, as researchers have found that 68% of college women have engaged in PEB (Hesse-Biber, 1989; Mintz & Betz, 1988; Muazzam & Khalid, 2011). Although engagement in PEB is less prevalent among men than women, research suggests its prevalence in this population shows a positive trend and is becoming a more common occurrence (Cohane & Pope, 2001). One study comparing college athletes to non-athletes on eating behaviors discovered that 18% of the non-athlete men and 12% of the athlete men reported engaging in PEB (DiPasquale & Petrie, 2013). Even though the research is still nascent in regard to the theoretical understanding of PEB in men, it appears that men differ from women in their motivations for engaging in PEB. For example, research suggests that while women engage in PEB because of a drive toward thinness,

men engage in PEB because of a drive toward muscularity (McCreary & Sasse, 2000). However, research also indicates that although men prefer an overall muscular body, they also avoid becoming fat (Jones & Crawford, 2005). For example, research conducted on adolescent boys suggests that both drive for muscularity and weight-gain concerns make contributions to overall body dissatisfaction in boys (Jones & Crawford, 2005). Therefore, it appears that both men and women are attempting to avoid fatness by engaging in these harmful eating behaviors.

Body Dissatisfaction

Many college men and women also report experiencing body dissatisfaction. Body dissatisfaction is a negative attitude or feeling regarding one's own body that is also commonly assessed when making eating disorder diagnoses. This negative feeling is thought to be a result of the discrepancy between the perceived body weight and shape of the individual and their ideal body weight and shape (Swami, Taylor, & Carvalho, 2011). Body dissatisfaction has been found to be another risk factor for the development and maintenance of eating disorders (Attie & Brooks-Gunn, 1989; Killen et al., 1996). In fact, according to a meta-analytic study conducted by Stice (2002), body dissatisfaction is one of the most consistent and robust risk and maintenance factors for eating disorders. Body dissatisfaction has also been associated with a multitude of other negative experiences, such as marked emotional distress, appearance rumination, unnecessary cosmetic surgery, and steroid use (Ohring, Graber, & Brooks-Gunn, 2002; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999).

Prevalence rates of body dissatisfaction are approximately 70% to 84% in women and 45% in men (Murray & Lewis, 2014; Pruis & Janowsky, 2010). Further, body dissatisfaction does not reduce with age and appears to remain constant (Runfola et al., 2013). Among college populations of women, body dissatisfaction plays an integral role in eating behavior, and 80% of

college women report feeling dissatisfied with their bodies (Rodgers, Salès, & Chabrol, 2010). Further, similar to the rates of PEB among men, body dissatisfaction among college men has also been on the rise in recent years (Burlew & Shurts, 2013; Cohane & Pope, 2001). Given that college women, and more recently college men, appear particularly vulnerable to PEB and body dissatisfaction, it is important to investigate this age cohort as it could have important prevention implications. For instance, identification of factors that may be associated with clinical disorders among college men and women may help with prevention methods aimed specifically at these populations.

It is critical to develop preventive methods aimed specifically at these vulnerable populations (i.e., college men and women) given that eating disorders are life-threatening disorders that can lead to an abundance of medical health problems. For example, eating disorders are associated with substantial functional impairments such as difficulty forming personal relationships, unstable mood, and lower cognitive functioning (Bohn et al., 2008), serious health risks such as gastrointestinal complications, dental problems, self-injurious behavior, and suicide attempts (Ahren-Moonga, Holmgren, von Knorring, & af Klinteberg, 2008; Harwood & Newton, 1995; Zimmerli, Walsh, Guss, Devlin, & Kissileff, 2006), and high comorbidity with mood and anxiety disorders (Buckner, Silgado, & Lewinsohn, 2010; Hudson et al., 2007).

Although the Diagnostic and Statistical Manual of Mental Disorders 5th edition (American Psychiatric Association, 2013) recognizes several distinct eating disorder diagnoses (anorexia nervosa, bulimia nervosa, and binge eating disorder) and a residual eating disorder diagnosis, prevalence rates of the residual diagnosis are much higher than the other eating disorders (Hudson et al., 2007). It is important to note that over three-quarters of patients that

present to treatment for an eating disorder are diagnosed with a residual diagnosis (Machado, Machado, Gonçalves, & Hoek, 2007). Of these residual cases, the majority of them exhibit clinical features of both anorexia and bulimia in a combination different from the prototypical anorexia and bulimia cases. This highlights the notion that the three eating disorders are very much alike and share some of the same risk factors that have been identified through research so far (e.g., presence of PEB, body dissatisfaction, drive for muscularity). Therefore, it is important to target underlying mechanisms that may be influencing the etiology and maintenance of these risk factors, regardless of specific eating disorder diagnosis. One such mechanism is that of attentional biases. Attentional bias is a cognitive construct that is believed to play a role in the etiology and maintenance of PEB and body dissatisfaction.

Attentional Bias among PEB and Body Dissatisfaction

Theories regarding processing of information from cognitive psychology frequently inform theories of clinical syndromes and other topics within the clinical psychology field. For instance, a principle feature of a cognitive theory about anxiety is that individuals that experience anxiety process information they perceive as threatening more rapidly in order to prepare for a fight or flight response (Beck, 1985). Quick processing of perceived threatening information ensures that the individual is able to rapidly detect threat or danger in the environment and increase chances of his or her survivability. This selective processing of information, thus, requires an attentional bias toward threat related stimuli. Therefore, an attentional bias is defined as a change in attention due to the perception of potential threat.

As is evidenced by the research, threat stimuli vary depending on the type of stimuli individuals perceive as threatening based on his or her disorder. For example, within the anxiety disorder research, studies have found that patients with panic disorder experience an attentional

bias toward general threat-related words, while patients with social anxiety experience an attentional bias specifically toward social threat words (Maidenberg, Chen, Craske, & Bohn, 1996). Similar research has been conducted within the eating disorders, PEB, and body dissatisfaction field yielding similar results.

Individuals who engage in PEB and have high levels of body dissatisfaction are thought to have maladaptive attitudes regarding body shape, weight, and food (e.g., overemphasis on the importance of thinness, muscularity, and avoidance of fattening foods). These maladaptive attitudes are thought to produce an attentional bias towards stimuli related to food and body shape and weight (Williamson, Muller, Reas, & Thaw, 1999). It is believed that this attentional bias occurs because of the notion that ‘fatness’ and being overweight is negative and threatening to individuals with body dissatisfaction (Fairburn, Cooper, & Shafran, 2003). Individuals that engage in PEB or exhibit body dissatisfaction may perceive these stimuli as threatening to their ego or self-esteem (Waller, Watkins, Shuck, & McManus, 1996). These attentional biases toward food and body shape and weight can then lead to an increase in internalization of socioculturally mandated standards of appearance. That is, attentional biases may lead to making personally valuable socioculturally mandated standards of what our bodies should look like (e.g., women should be thin and men should be muscular), and it is believed the internalization of these standards of appearance is a risk and maintenance factor for both body dissatisfaction and PEB in men and women (Cash & Brown, 1987; Cramblitt & Pritchard, 2013; Stice & Agras, 1998; van den Berg, Thompson, Obremski-Brandon, & Coover, 2002). Internalization of this socioculturally mandated ideal can then lead to further confirmation of maladaptive attitudes about food, body shape, and weight, which may then lead to engagement in PEB in order to attempt to reach those ideals. For instance, 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) in women. Another theory, based on the affect regulation model of eating disorders (Heatherton & Baumeister, 1991), is that the attentional bias to threatening stimuli increases negative affect, and engagement in PEB is an attempt to reduce or control that negative affect. For instance, research has shown that purging behaviors occur more frequently on days with high levels of negative affect and days in which negative affect increases throughout the day (Crosby et al., 2009). These two theories form the basis of current knowledge regarding the relation between attentional bias and PEB and body dissatisfaction. However, regardless of which theory is “correct”, addressing the attentional bias should successfully disrupt either of these two pathways and potentially prevent PEB and/or body dissatisfaction.

Empirical research on attention seems to support the notion that those with high levels of body dissatisfaction and PEB exhibit an attentional bias to cues related to food and body shape and weight. Consistently, experiments have demonstrated that individuals with body dissatisfaction and PEB exhibit an attentional bias toward food-related words relative to neutral words (Ben-Tovim & Walker, 1991; Ben-Tovim, Walker, Fok, & Yap, 1989; Overduin, Jansen, & Louwse, 1995; Placanica, Faunce, & Job, 2002). Specifically, studies have found that these individuals exhibit attentional biases more toward negative food words (e.g., fattening or high caloric foods such as ‘pizza’) than positive food words (e.g., non-fattening or low caloric foods such as ‘celery’; Shafran, Lee, Cooper, Palmer, & Fairburn, 2007). Similarly, other experiments have found an attentional bias among individuals with body dissatisfaction and PEB for negative body words (e.g., “fat”, “blubber”) relative to neutral words (Jones et al., 2004; Rieger et al., 1998).

Attention Retraining

In order to determine the causal nature of the relationship between attentional bias and behavior, many researchers have begun conducting attention retraining experiments (Amir et al., 2009; Amir, Weber, Beard, Bomyea, & Taylor, 2008; Engel et al., 2006; Schmidt, Richey, Buckner, & Timpano, 2009; Smith & Rieger, 2006, 2009). In attention retraining studies, participants complete computerized tasks that modify their attention either toward or away from specific types of stimuli.

Within the anxiety research, several studies have conducted attention retraining designs in order to explore the link between attention bias and anxiety. For example, MacLeod and colleagues (2002) attempted to modify participants' attention toward general anxiety words in a non-clinical sample. Participants that were trained to attend toward anxiety related words responded more negatively (i.e., higher levels of anxiety and depression) during an experimental stressor task following training compared to participants that were not trained. In order to test whether the opposite effect could be achieved among individuals with elevated levels of anxiety, Amir and colleagues (2008) conducted a similar experiment in which they retrained attention away from threatening social stimuli. Their results suggest that attention retraining away from threat was successful in reducing anxiety and increasing performance during an experimental social challenge task following the attentional retraining. Following this experiment, Amir and colleagues (2009) conducted the same study on a clinical sample of individuals diagnosed with social anxiety disorder. The results of this study were similar to their first study and supported the contention that retraining attention away from threatening stimuli causes reductions in anxiety. Specifically, 50% of participants that were trained to attend away from threatening stimuli no longer met criteria for social anxiety disorder post training, compared to 14% of

participants that were not trained. These reductions in symptoms were maintained through a 4-month follow-up. Other studies have been able to reproduce these results across a variety of different disorders and populations (Schmidt et al., 2009). In fact, a meta-analysis of 12 of these studies demonstrated that attention retraining away from threat stimuli produced significantly greater reductions in anxiety than control training with a medium effect size ($d = 0.61, p < .001$; Hakamata et al., 2010).

To our knowledge, so far no studies have examined attention retraining among college men and drive for muscularity, and only two published studies have examined the effect of attention retraining on body dissatisfaction and PEB among college women. In the earliest, Smith and Rieger (2006) allocated healthy college women to undergo attention retraining either toward negative weight/shape words, toward negative emotion words, or toward neutral words. Participants that were retrained to attend toward negative weight/shape words reported significantly higher levels of body dissatisfaction than participants in either of the other two groups post training. As a follow-up to their initial study, Smith and Rieger (2009) conducted another experiment using four different categories of body/shape and food words. Specifically, they allocated healthy college women to undergo attention retraining either toward positive body shape/weight words (e.g., 'slim'), toward negative shape/weight words (e.g., 'fat'), toward positive food words (e.g., low caloric foods such as 'carrot'), or toward negative food words (e.g., high caloric foods such as 'cake'). They found that retraining attention toward negative body weight/shape words increased body dissatisfaction, retraining attention toward positive weight/shape words had no effect, retraining toward negative food words increased engagement in PEB, and retraining toward positive food words had no effect.

There are several limitations to the above studies that the current study attempted to address. First, both studies used populations of undergraduate women only. Given the rise of body dissatisfaction and PEB among college men, it is important to investigate the effectiveness of attention retraining in men as well. Such data could highlight differences in effectiveness of this tool between men and women. The current study aims to investigate the effect of attention retraining on PEB, body dissatisfaction, and drive for muscularity among both men and women. Second, both studies were successful in increasing body dissatisfaction by retraining attention toward threatening stimuli. However, neither of the studies investigated the effect of retraining attention away from threatening stimuli. Based on the research conducted on anxiety populations, reduction of anxiety was successfully achieved by retraining attention away from threatening stimuli and, therefore, the current study aims to investigate the effect of attention retraining away from threatening stimuli (body shape/weight and food stimuli) on body dissatisfaction, engagement in PEB, and drive for muscularity.

Current treatments for eating disorders (e.g., Cognitive Behavioral Therapy [CBT]) usually have components that address attention. For example, CBT for eating disorders teaches clients to decrease excessively attending to body image cues (Fairburn et al., 2009). However, these conscious procedures are limited in that they target processes that require effortful control strategies to divert attention from stimuli that may elicit negative affect. Further, research suggests that the emotional reaction to stimuli is implicitly encoded during the first 100–300 ms of perception (Beck & Clark, 1997; Eysenck, 1992). This almost automatic implicit encoding leaves treatment of attentional biases outside of the realm of talk therapies like CBT. However, attention retraining can manipulate these early and automatic attentional biases in order to alter perception of threat before a stress response is even triggered. Further, attention retraining

affords other advantages. It is able to bypass deliberate avoidance, which is very often prevalent among clinical populations, and, due to the computer-based nature of the paradigm, it can be readily disseminated to populations unlikely to attend treatment. For example, it may be beneficial for those with low motivation, with persistent forms of eating pathology that do not respond to traditional talk therapy, and those that are treatment resistant. Further, individuals may see attention retraining as an accessible tool that is easy to use and, therefore, may be a feasible tool for populations that are harder to engage with in typical talk therapies.

Given the dearth of preventative methods for body dissatisfaction and PEB, attention retraining is an important tool to investigate. Further, if this tool is perceived as effective, feasible, and easy-to-use by the participants themselves, it may make it more likely for this method to be disseminated and used by the populations most in need (e.g., college men and women who may be experiencing body dissatisfaction and/or PEB). In order to investigate possible preventative and treatment implications as well as feasibility, this study assessed perceived interest, effectiveness, ease-of-use, and willingness to complete attention retraining among a general population of college men and women.

The Current Study – Aims and Hypotheses

The primary aim of this study was to investigate the effect of retraining attention away from threatening stimuli on body dissatisfaction, PEB, and drive for muscularity among college men and women. In order to investigate this effect, recruited participants were randomly assigned to one of two conditions: attention retraining (away from negative body shape/weight and food words; AR), or a control group (C) in which participants did not engage in attention retraining. The main hypotheses for this study are as follows: 1) Attentional biases toward threatening body stimuli (i.e., body shape/weight and food words) will decrease after attention

retraining compared to control group; 2) attention retraining participants will report greater decreases in body dissatisfaction, PEB, and drive for muscularity than control participants; 3) there will be greater reductions in drive for muscularity in men than women; 4) there will be greater reductions in body dissatisfaction in women than in men, and 5) participants in the attention retraining group will report high levels of interest, effectiveness, ease-of-use, and willingness to complete attention retraining.

The Current Study – Design

The sample for this study was comprised of undergraduate, non-treatment seeking men and women from a large university setting. The choice of this sample was based on several factors. First, rates of PEB and body dissatisfaction are high among women and increasing among men. Second, college men and women are particularly vulnerable to PEB, body dissatisfaction, and drive for muscularity due to the critical time period of development, as well as the new experience of the college setting, which has been found to increase the risk of engaging in PEB and developing body dissatisfaction (Heatherton, Nichols, Mahamedi, & Keel, 1995). Lastly, this is a critical period and population for which preventive methods may be of importance for the elimination of risk factors, such as body dissatisfaction, PEB, and drive for muscularity before the development of potentially dangerous eating disorders.

The present study used several sets of Dot-Probe tasks to both measure and retrain attention. One dot-probe task was used to measure baseline and post-manipulation attentional biases. A second modified dot-probe was used to retrain attention away from threatening stimuli for those in the attention retraining condition. Lastly, a third unmodified dot-probe that did not retrain attention was used with control participants in order to control time in the lab and exposure to the stimuli among both groups.

METHOD

Participants

Participants consisted of 86 undergraduate men and women participating in the psychology experiment pool at Louisiana State University (LSU). Individuals under the age of 18 were asked to not participate in this study. Participants were recruited through LSU's Research Participation System and were invited to participate after signing up through the online service. Out of the 86 participants who signed up through the research system to participate, 15 participants did not attend their appointments. The total number of participants that completed this study was 71. All participants received credit in their psychology courses for participating in this study.

Self-Report Measures

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). The EDE-Q4 yields a frequency of PEB score. Frequency of behaviors is rated using a 7-point scale ranging from *No Days* to *Every Day*. The EDE-Q4 has been found to have excellent internal consistency and test-retest reliability (Luce & Crowther, 1999).

Body Shape Questionnaire (BSQ). The BSQ is a 34-item self-report measure of concerns about body shape and size (Cooper, Taylor, Cooper, & Fairburn, 1987). The items in the BSQ are answered on a 6-point Likert scale ranging from *Always* to *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 and concurrent validity with other measures of body image in non-clinical samples of college students (Rosen, Jones, Ramirez, & Waxman, 1996).

Physical Appearance State and Trait Anxiety Scale (PASTAS). The PASTAS is a 16-item measure of state body dissatisfaction (Reed, Thompson, Brannick, & Sacco, 1991). This measure has been shown to be sensitive to situationally induced body image disturbances. Items in the PASTAS are answered on a 5-point Likert scale ranging from *Not at all* to *Exceptionally* and participants indicate how anxious, tense, or nervous they feel “right now” about their body. Higher scores on the PASTAS indicate higher levels of state body dissatisfaction. The PASTAS has been found to be psychometrically sound, displaying excellent internal consistency and test-retest reliability (Reed et al., 1991). Concurrent validity is also supported by significant correlations with other measures of body dissatisfaction (Reed et al., 1991).

Drive for Muscularity Scale (DMS). The DMS is a 4-item measure of concerns regarding muscularity (McCreary & Sasse, 2000). Items in the DMS are answered on a 5-point Likert scale ranging from *Disagree Completely* to *Agree Completely* and participants indicate how much they agree to statements regarding motivation towards muscularity. Higher scores on the DMS indicate a higher drive for muscularity. This measure has been found to have good reliability, convergent validity, and discriminant validity (McCreary & Sasse, 2000).

Positive and Negative Affect Schedule (PANAS). The PANAS is a 20-item measure of positive and negative mood state (Watson, Clark, & Tellegen, 1988). It is comprised of two subscales (Negative Affect and Positive Affect) and only the Negative Affect subscale will be used in this study. Items are rated on a 5-point Likert scale ranging from *Very slightly or not at all* to *Extremely* and participants indicate the extent to which they have felt this way in the

indicated time frame. Specifically, this study asked participants to complete this measure based on how they feel “right now” in order to assess negative mood before and after attention retraining. This procedure ensures that changes in body dissatisfaction, PEB, and drive for muscularity are not due to increases in mood disturbance following retraining. The PANAS has good test-retest reliability and concurrent validity is supported by significant correlations with distress and dysfunction, depression, and state anxiety measures having higher correlation with the Negative Affect scale than the Positive Affect Scale (Watson et al., 1988).

Feasibility Questionnaire. A questionnaire created for this study was used to assess perceived feasibility of attention retraining. Specifically, participants were asked to rate attention retraining on a scale from 1 to 10 on the following domains: interest, ease-of-use, effectiveness, and willingness to complete attention retraining if they experience difficulties with body dissatisfaction or PEB in the future.

Demographic Questionnaire. This questionnaire consisted of items that assess gender, age, race and ethnicity, relationship status, level of education, and height and weight (self-reported for screening, measured by experimenter during appointment).

Attention Retraining Paradigm

The attention retraining paradigm used in the retraining condition was a modified version of the dot probe paradigm developed by MacLeod, Mathews, and Tata (1986). Each trial of the paradigm began with a fixation cross (+) presented in the center of the monitor for 500 ms. Following the termination of the fixation cross, the computer presented a word pair for 500 ms, with one word appearing above and the other word appearing below the previous location of the fixation cross. All words were presented in lowercase and in white font against a black

background to reduce eye strain. Time frames chosen for fixation cross and word presentation are consistent with other studies using similar tasks (Amir et al., 2009; Amir et al., 2008; Smith & Rieger, 2006, 2009). After presentation of the word stimuli, a probe (either the letter *E* or the letter *F*) appeared in the location of one of the two words. Participants were instructed to decide whether the probe is an E or an F by pressing the corresponding button (left or right) on the mouse. The probe remained onscreen until participant response, when the next trial began. Participants were instructed to respond as quickly as possible, but as accurately as possible. Past research using dot probe paradigms has found the average participant accuracy to be 95% or greater (Amir et al., 2009; Amir et al., 2008). Each target word was presented a total of 4 times, controlling for location and type of probe (i.e., each target word appeared on the top location followed by each type of probe once, and on the bottom location followed by each type of probe once). Participants saw a total of 240 trials. In the attention retraining condition, participants completed a paradigm in which the probe always replaced the non-target word (i.e., neutral words). What this ensured was that the position of the threatening stimuli always predicted the position of the probe (i.e., the probe always appeared opposite to the threat stimuli). Thus, without overt instructions, participants implicitly learned to attend away from threat stimuli in order to increase performance in the task. In the control condition, however, participants completed a paradigm in which the probe replaced both neutral and threat words 50% of the time. Therefore, no attention retraining is actively performed as control participants did not implicitly learn to attend away from threat stimuli.

Attention Retraining Stimuli

The stimuli used in this study was selected from words utilized in prior attentional bias and attention retraining studies in the PEB and body dissatisfaction literature (Engel et al., 2006;

Smith & Rieger, 2006, 2009). The set of target words included a total of 45 negative body shape/weight words and 45 negative food words. These words were chosen because past research has demonstrated that individuals with high body dissatisfaction and/or PEB exhibit an attentional bias towards these words. A list of all target words can be found in Appendices A and B. Target words were matched with neutral words based on length and frequency of use to create a total of 90 target–neutral pairs. 30 pairs (15 from each type of stimuli) were used in a dot-probe that assessed attentional bias pre- and post-attention retraining in order to verify that attention retraining induction was effective. The remaining 60 word pairs comprised the entire set of attention retraining stimuli (or control stimuli for those in the control condition).

Procedure

Before any data collection began, the study was first approved by the LSU Institutional Review Board (IRB). Participants enrolled into the study by signing up for specific time slots in the Research Participant System. When participants arrived to their scheduled visit, they were randomly assigned to one of the two conditions using a random assignment program (Urn Randomization Program; Stout, Wirtz, Carbonari, & Del Boca, 1994). Gender, age, and self-reported Body Mass Index (BMI) were controlled during the random assignment process to ensure equal distribution of these factors among the two condition groups.

Each participant came in to the laboratory where a research assistant explained the study and acquired informed consent. Next, the participant completed all baseline measures which included: EDE-Q4, BSQ, PASTAS, PANAS, DMS, and demographics form. After completion of baseline measures, participants then sat in front of the computer and completed the assessment dot probe task to assess for pre-intervention attentional biases. Following the attentional bias assessment, participants in the attention retraining condition completed the attention retraining

paradigm, and control participants completed the control paradigm. Following this, the state measures (i.e., PANAS and PASTAS) were completed one more time by all participants before they were dismissed. At the end of the first session the participant was scheduled to return one week from that day for a second session. Total time commitment for the first appointment did not exceed one hour.

During the second session, participants again completed either the attention retraining paradigm or control paradigm. Afterwards, all participants completed the assessment dot probe task one more time to assess for post-manipulation attentional biases. Lastly, all measures were completed again in addition to the feasibility form, and height and weight was measured in the lab by the research assistant. At the end of the second session, the research assistant debriefed the participants and provided a form with referrals to mental health service providers in the area and then gave them research credits for their participation. Total time commitment for this appointment did not exceed one hour.

Data Reduction

Prior to data analysis, attentional bias data was first reduced. Consistent with prior research, response times from inaccurate trials were excluded from analyses (Amir et al., 2009; Amir et al., 2008). Inaccurate trials are those in which the participant pressed the button corresponding to the incorrect position of the probe. In past research, this procedure usually eliminates about 1% of the trials (Amir et al., 2009; Amir et al., 2008). In our study, less than 1% of trials were eliminated this way. Further, response times less than 50 ms or greater than 1,500 ms were considered outliers and also excluded from analyses. This procedure usually eliminates about another 1% of the trials, according to previous research (Amir et al., 2009; Amir et al., 2008). Again, less than 1% of trials were eliminated in our study using this procedure. An

attentional bias score was calculated for each participant at pre and post-manipulation. This score was created by subtracting the mean reaction time when the probe replaced threat stimuli from the mean reaction time when the probe replaced neutral stimuli (Bradley, Mogg, Falla, & Hamilton, 1998). Positive values indicate attentional bias toward threat and negative values indicate attentional bias away from threat (zero = no bias).

RESULTS

Sample Characteristics and Group Differences

To examine group differences at baseline, prior to any attentional manipulation, on variables such as age, gender, race, ethnicity, attentional bias, body mass index (BMI), PEB, body dissatisfaction, and drive for muscularity, one-way ANOVA models were conducted for continuous variables and Chi-square tests were conducted for dichotomous variables.

Demographic information, means and standard deviations of attentional bias, BMI, PEB, body dissatisfaction, and drive for muscularity by condition group are presented in Table 1. There were no statistically significant differences in any of these variables between participants in the attention retraining condition and participants in the control condition at baseline.

Regarding differences by gender, Table 2 presents demographic information, means and standard deviations of attentional bias, BMI, PEB, body dissatisfaction, and drive for muscularity by gender. As expected, women evidenced significantly higher levels of PEB and body dissatisfaction, whereas men exhibited significantly higher levels of drive for muscularity at baseline. Further, the magnitudes of these effects suggested moderate to high practical significance (Cohen, 1992). Men and women did not differ on attentional biases toward body threat cues at baseline.

Given that the majority of past research on PEB and attention found a significant relationship between attentional bias and PEB in samples of individuals that currently engage in PEB (Jones-Chesters, Monsell, & Cooper, 1998; Rieger et al., 1998) we further explored attentional biases among those that reported recently engaging in PEB. These analyses revealed differences among individuals that engage in PEB compared to those that do not engage in PEB.

Table 1.

Demographic information, means, and standard deviations of measures of body mass index, pathological eating behaviors, body dissatisfaction, drive for muscularity, and attentional bias at baseline by condition group

Variable	AR (<i>n</i> = 33)		C (<i>n</i> = 38)		χ^2 or <i>F</i>	<i>p</i>	<i>d</i>
	%	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)			
Gender (Female)	72.7		76.3		0.12	0.73	
Race (Caucasian)	69.7		63.2		0.67	0.88	
Ethnicity (Non-Hispanic)	97.0		97.4		0.01	0.92	
Age		20.58 (1.46)		20.66 (1.32)	0.06	0.80	0.05
Body Mass Index		26.20 (6.12)		24.96 (5.81)	0.71	0.40	0.21
Pathological eating behavior		1.26 (0.86)		1.17 (0.77)	0.17	0.68	0.11
Body dissatisfaction		68.90 (27.92)		71.37 (25.94)	0.15	0.70	0.09
Drive for muscularity		2.26 (0.80)		2.35 (0.91)	0.22	0.64	0.11
Attentional bias		0.01 (33.44)		-3.63 (21.36)	0.28	0.60	0.13

Note. AR = attention retraining group, C = control group. Differences were analyzed utilizing analysis of variance (ANOVA) models for continuous variables and chi-square tests for dichotomous/categorical variables.

Table 2.

Demographic information, means, and standard deviations of measures of body mass index, pathological eating behaviors, body dissatisfaction, drive for muscularity, and attentional bias at baseline by gender

Variable	Female (<i>n</i> = 53)		Male (<i>n</i> = 18)		χ^2 or <i>F</i>	<i>p</i>	<i>d</i>
	%	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)			
Race (Caucasian)	66.0		66.7		7.48	0.06	
Ethnicity (Non-Hispanic)	98.1		94.4		0.66	0.45	
Age		20.49 (1.31)		21.00 (1.53)	1.86	0.18	0.35
Body Mass Index		25.75 (6.17)		24.85 (5.38)	0.30	0.59	0.16
Pathological eating behavior		1.36 (0.82)		0.77 (0.58)	7.85	<0.01	0.83
Body dissatisfaction		73.94 (25.69)		59.28 (27.37)	4.24	0.04	0.55
Drive for muscularity		2.14 (0.83)		2.79 (0.78)	8.48	<0.01	0.81
Attentional bias		-2.42 (28.87)		0.28 (25.15)	0.11	0.74	0.11

Note. Differences were analyzed utilizing analysis of variance (ANOVA) models for continuous variables and chi-square tests for dichotomous/categorical variables.

For example, results of a one-way ANOVA reveal that there is a significant difference in attentional bias at baseline between participants that had engaged in PEB at least once in the past 28 days ($n = 30$) compared to participants that had not engaged in PEB in the past 28 days ($n = 36$), $F(1, 64) = 4.91$, $p = 0.03$, $d = 0.54$, $\eta^2 = 0.07$. The magnitude of this effect was within the moderate range and the variance accounted for by PEB engagement on attention bias was 7%. Contrary to expectations, participants that had engaged in PEB exhibited a moderate attentional bias away from threat cues ($M = -9.91$, $SD = 31.41$), while participants that had not engaged in PEB exhibited a slight attentional bias toward threat ($M = 4.94$, $SD = 22.92$).

Correlations between Attentional Bias at Baseline and Pathological Eating Behaviors, Body Dissatisfaction, and Drive for Muscularity

Zero-order correlations (in addition to means and standard deviations) of baseline scores of attentional bias, PEB, body dissatisfaction, and drive for muscularity are presented in Table 3 for women and Table 4 for men. As expected, PEB and body dissatisfaction were positively correlated for both men and women. Surprisingly, PEB and body dissatisfaction were not correlated with drive for muscularity in either men or women. Further, contrary to expectation, attentional bias at baseline was not significantly correlated with PEB, body dissatisfaction, or drive for muscularity for either men or women.

Differences in Attentional Bias following Attention Retraining

To test the hypothesis that attentional biases toward threatening body stimuli would be lower for participants in the attention retraining condition compared to participants in the control condition post manipulation, a one-way ANOVA was conducted with condition group (AR or C) as the independent variable (IV) and attention bias scores at post as the dependent variable (DV).

Table 3.

Summary of zero-order correlations and means and standard deviations of pathological eating behaviors, body dissatisfaction, drive for muscularity, and attentional bias towards body shape and food cues at baseline among women

Variable	1	2	3	4	M	SD
1. Pathological eating behaviors	-	.81*	.15	.00	1.36	0.82
2. Body dissatisfaction	-	-	.25	-.13	73.94	25.69
3. Drive for muscularity	-	-	-	-.20	2.14	0.83
4. Attentional bias	-	-	-	-	-2.42	28.87

* $p < .01$

Table 4.

Summary of zero-order correlations and means and standard deviations of pathological eating behaviors, body dissatisfaction, drive for muscularity, and attentional bias towards body shape and food cues at baseline among men

Variable	1	2	3	4	M	SD
1. Pathological eating behaviors	-	.84*	.14	-.28	0.77	0.58
2. Body dissatisfaction	-	-	.09	.11	59.28	27.37
3. Drive for muscularity	-	-	-	.11	2.80	0.78
4. Attentional bias	-	-	-	-	0.28	25.15

* $p < .01$

There was no significant difference between participants in the two conditions on attentional bias toward body threat cues, $F(1, 62) = 1.82, p = 0.18, d = 0.34, \eta^2 = 0.03$. It is important to note, however, that the variance accounted for by condition group on attentional bias at post (3%) is approximately 7.5 times higher than the variance accounted for by condition group on attentional bias prior to attention retraining (0.4%).

Due to the noteworthy increase in variance, and the difference in attentional bias scores at baseline among participants that had engaged in PEB compared to those that had not engaged in PEB, exploratory analyses were conducted in order to further explore the change of attentional bias in the current sample. For example, to investigate attentional biases toward threat stimuli at post manipulation among participants that had engaged in PEB, a one-way ANOVA was conducted with condition group (AR or C) as the independent variable (IV) and attention bias scores at post as the dependent variable (DV) only for participants that had engaged in PEB at least once in the past 28 days. There was a nonsignificant trend between participants in the two conditions on attentional bias toward body threat cues for those that had engaged in PEB, $F(1, 28) = 3.49, p = 0.07, d = 0.68, \eta^2 = 0.11$. The magnitude of this effect suggested moderate to high practical significance (Cohen, 1992). Further, the variance accounted for by condition group on attentional bias at post-manipulation among participants that had engaged in PEB was 11%. The direction of the attentional bias for the control group was away from threat cues ($M = -11.18, SD = 20.71$), while for participants in the attention retraining group the direction was toward threat ($M = 3.52, SD = 22.35$). Figure 1 depicts attentional bias at baseline and post-manipulation for participants that engaged in PEB in the past 28 days by condition group.

Differences in PEB, Body Dissatisfaction, and Drive for Muscularity Following Attention Retraining

To test the hypothesis that PEB, body dissatisfaction, and drive for muscularity scores would be lower for participants in the attention retraining condition compared to participants in the control condition at post manipulation, a Multivariate Analysis of Variance (MANOVA) was conducted with condition group (AR or C) as the IV and PEB, body dissatisfaction, and drive for muscularity scores at post as the DVs. There were no significant differences between

participants in the two conditions on PEB $F(1, 64) = 0.30, p = 0.59, d = 0.13, \eta^2 = 0.001$, body dissatisfaction $F(1, 64) = 0.02, p = 0.88, d = 0.04, \eta^2 = 0.00$, or drive for muscularity $F(1, 64) = 0.02, p = 0.90, d = 0.03, \eta^2 = 0.00$ at post manipulation.

A second MANOVA was conducted in order to investigate differences in PEB, body dissatisfaction, and drive for muscularity scores at post manipulation between the two conditions among participants that had engaged in PEB in the past 28 days. This MANOVA also resulted in no significant differences in scores on PEB $F(1, 29) = 0.01, p = 0.90, d = 0.04, \eta^2 = 0.00$, body dissatisfaction $F(1, 29) = 0.02, p = 0.90, d = 0.04, \eta^2 = 0.00$, or drive for muscularity $F(1, 29) = 0.20, p = 0.66, d = 0.17, \eta^2 = 0.00$ at post manipulation.

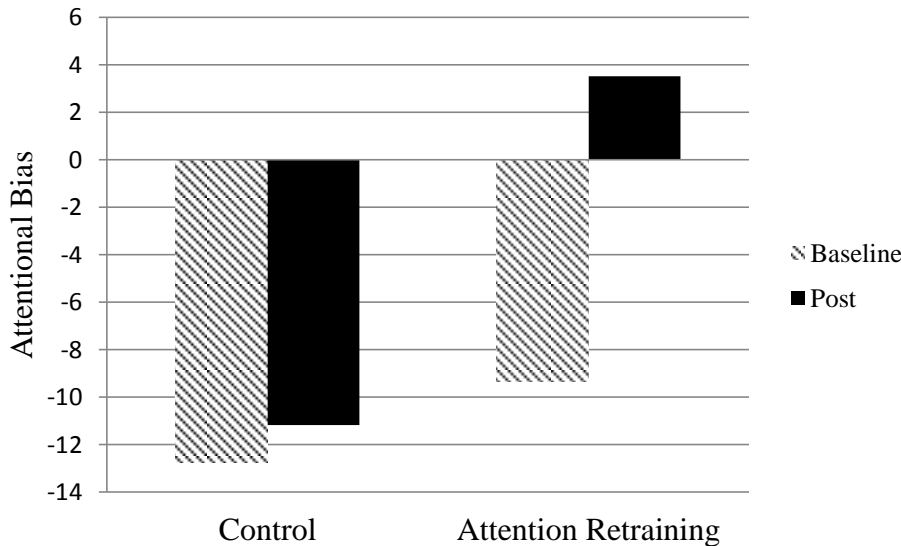


Figure 1. Attentional bias at baseline and post-manipulation for individuals in the Control and Attention Retraining groups that engaged in pathological eating behaviors at least once in the past 28 days. *Note:* Negative scores on Attentional Bias = attentional bias away from threat stimuli, positive scores on Attentional Bias = attentional bias toward threat stimuli, and scores closer to 0 = no attentional bias

Differences in PEB, Body Dissatisfaction, and Drive for Muscularity Following Attention Retraining by Gender

To test the hypothesis that PEB and body dissatisfaction scores would be lower for women compared to men following attention retraining, but not following control condition, a MANOVA was conducted with condition group (AR or C) and gender as the IVs and PEB and body dissatisfaction scores at post as the DVs. The results of this MANOVA revealed a significant main effect of gender ($p = .003$) in relation to PEB and body dissatisfaction scores and no significant main effect of condition in relation to PEB and body dissatisfaction ($p = .85$). Further, the interaction between gender and condition was nonsignificant ($p = .11$).

Due to the documented influence that BMI has on attentional biases (Gao et al., 2013), it is important to understand the relationship between attentional bias and PEB and body dissatisfaction beyond the influence of BMI. Therefore, in order to investigate these effects after controlling for BMI, a Multivariate Analysis of Covariance (MANCOVA) was conducted with condition group (AR or C) and gender as the IVs, PEB and body dissatisfaction scores at post as the DVs, and BMI as a covariate. The results of this MANCOVA revealed significant main effects of gender ($p < .01$) and BMI ($p < .001$) in relation to PEB and body dissatisfaction scores and no significant main effect of condition in relation to PEB and body dissatisfaction ($p = .90$). However, the interaction between condition and gender was significant (Roy's largest root = 0.18, $F = 5.37$, $p < 0.01$).

As shown in Figure 2, univariate testing indicated this interaction to be significant ($F(1, 60) = 1.99$, $p = 0.05$, $\eta^2 = 0.3$) such that attention retraining appeared to affect body dissatisfaction scores of women and men differently. Specifically, attention retraining, compared to control, appeared to decrease BSQ scores for women but increase them for men.

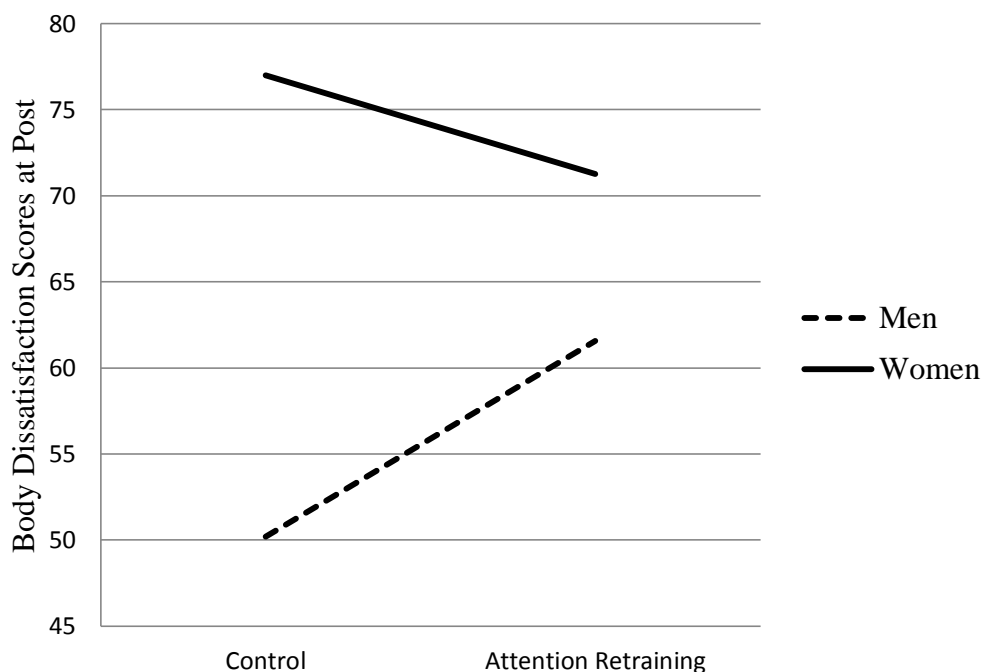


Figure 2. Interaction of body dissatisfaction among individuals in the Control and Attention Retraining groups after controlling for Body Mass Index based on gender

To test the hypothesis that drive for muscularity scores would be lower for men compared to women following attention retraining, but not following control condition, an ANOVA was conducted with condition group (AR or C) and gender as the IVs and drive for muscularity scores at post as the DV. The results of this ANOVA revealed a significant main effect of gender ($p = .024$) in relation to drive for muscularity scores and no significant main effect of condition in relation to drive for muscularity ($p = .89$). Further, the interaction between gender and condition was nonsignificant ($p = .77$).

In order to investigate these effects after controlling for BMI, an analysis of covariance (ANCOVA) was conducted with condition group (AR or C) and gender as the IVs, drive for muscularity scores at post as the DV, and BMI as a covariate. The results of this ANCOVA revealed a significant main effect of gender ($p = .036$) in relation to drive for muscularity scores

and no significant main effect of condition ($p = .93$) or BMI ($p = .29$) in relation to drive for muscularity. Further, the interaction between gender and condition was nonsignificant ($p = .97$).

Interest, Ease, Willingness, and Feasibility Variables

In order to investigate differences in ratings of interest, ease, willingness, and feasibility variables by gender and condition, a MANOVA was conducted with condition group (AR or C) and gender as the IVs, and interest, ease, willingness, and feasibility scores as the DVs. The results of this MANOVA revealed a significant main effect of gender ($p < .01$) in relation to these scores and no significant main effect of condition ($p = .89$). However, the interaction between condition and gender was significant (Roy's largest root = 0.19, $F = 2.68$, $p < 0.05$).

Univariate testing indicated a statistically significant difference on willingness ratings between men and women $F(1, 61) = 10.04$, $p < 0.001$, $d = 0.86$, $\eta^2 = 0.14$. Specifically, women rated their willingness ($M = 2.45$, $SD = 0.80$) to complete this task again if they ever experience problems with body weight or eating behaviors higher than men ($M = 1.72$, $SD = 0.89$). Further, testing indicated a trend towards significance for ratings on interest between men and women, $F(1, 61) = 3.65$, $p = 0.06$, $d = 0.53$, $\eta^2 = 0.06$. Again, women rated their interest ($M = 2.21$, $SD = 0.88$) in completing this task again if they ever experience problems with body weight or eating behaviors higher than men ($M = 1.78$, $SD = 0.73$). Lastly, univariate testing indicated the interaction between gender and condition to be significant ($F(1, 61) = 7.98$, $p < 0.01$, $\eta^2 = 0.12$) such that scores on ease of use of the task were lower for men after attention retraining ($M = 3.33$, $SD = 0.50$) compared to women after attention retraining ($M = 3.90$, $SD = 0.31$), women after control condition ($M = 3.67$, $SD = 0.48$), and men after control condition ($M = 3.78$, $SD = 0.44$).

DISCUSSION

This is the first experimental study to examine the effect of a brief attention retraining paradigm on pathological eating behaviors and attitudes about body weight and shape (i.e., body dissatisfaction and drive for muscularity) on a population of college men and women. Further, we aimed to test whether attention retraining would differentially affect men and women on eating attitudes and behaviors. This study serves as the first known test of the effects of attention retraining on a non-clinical sample of both men and women.

Consistent with prior work (Buchanan, Bluestein, Nappa, Woods, & Depatie, 2013; Lokken, Ferraro, Kirchner, & Bowling, 2003; Tiggemann, 1992) we found that women demonstrated significantly greater global PEB scores and body dissatisfaction scores than men. Further, men demonstrated higher drive for muscularity scores than women, also consistent with past work (Kyrejto, Mosewich, Kowalski, Mack, & Crocker, 2008). These results replicate prior work and provide evidence that the current sample is a typical representation of college men and women as found in past research. Surprisingly, participant's attentional bias at baseline was not correlated with scores on PEB, body dissatisfaction, or drive for muscularity. This finding is somewhat counter to prior work finding these constructs to be related to attentional biases (Jones-Chesters et al., 1998; Rieger et al., 1998; Smith & Rieger, 2006, 2009) in women. Methodological differences may account for these seemingly disparate findings. For example, 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 attentional biases toward body threat cues are related to PEB only among women

that engage in PEB and/or exhibit high levels of body dissatisfaction, which was a small portion of our current sample.

Data from the current study, however, also extend current knowledge on the relationship between attentional biases and body dissatisfaction for men. To date, there are no known studies investigating attentional biases to body threat cues and their relationship to body dissatisfaction and drive for muscularity. In fact, only one study (Griffiths, Angus, Murray, & Touyz, 2014) has investigated the effect of attentional biases in men and found that an attentional bias toward rejecting faces predicted muscularity dissatisfaction. Given the different stimuli used in the current study, the results from this study provide support for the contention that attentional biases for body threat cues for non-treatment seeking men are not related to being dissatisfied with one's body or drive for muscularity. Combined, past research and results from the current study suggest that men's concern with their appearance, and how their appearance may be negatively evaluated by others, has a greater effect on muscularity dissatisfaction than does food or body cues that do not possess an evaluative component.

The Nature of Attentional Bias in Current Sample

Unsurprisingly, the overall sample in this study did not exhibit an attentional bias towards body threat cues. Given that our sample was a mixed group of non-treatment seeking participants with differing levels of PEB engagement, it is not surprising that the overall sample had no distinguishable attentional bias towards the cues utilized in this study. Somewhat more surprising was the result that attentional bias was not correlated with PEB, body dissatisfaction, or drive for muscularity. A reason for this lack of correlation could be that attention has no relationship with these factors at subclinical levels. Given the vast majority of attention research has been done with participants that exhibited higher levels of PEB, body dissatisfaction, or drive for

muscularity, this may be new evidence for the contention that attentional biases only play a role at higher levels of pathological eating or body image.

The subset of participants that had engaged in PEB in the past 28, on the other hand, did evidence an attentional bias in relation to the body threat cues. Contrary to expectations, the attentional bias was opposite the direction we predicted. That is to say, participants that had recently engaged in PEB exhibited higher attentional bias toward neutral stimuli (i.e., away from body threat cues) than participants who had not engaged in PEB.

That PEB participants exhibited higher attentional bias towards neutral stimuli compared to non-PEB participants may mean one of a number of theories. This result may suggest that participants that had engaged in PEB exhibited an *attentional avoidance* of threat cues compared to participants that had not engaged in PEB instead of the expected attentional bias towards threat. Past work (Engel et al., 2006) has provided evidence of attentional avoidance among individuals with eating pathology. The results from a dot-probe task, as the one utilized in the current study, would show attentional avoidance of threat as an attentional bias towards neutral stimuli.

A second theory is that these participants exhibited *vigilance-avoidance*. There is evidence suggesting individuals with eating disorders exhibit vigilance-avoidance of food cues. For instance, Boon, Vogelzang, and Jansen (2000) found that participants 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 possible for vigilance-avoidance to also appear as an attentional bias towards neutral cues in the current dot-probe task. The reason for that is that the initial vigilance to threat is of a much shorter duration than the avoidance of the threat (Mogg, Bradley, Miles, & Dixon, 2004) and, therefore, participants in a dot-probe exhibit faster reaction times to neutral cues.

A third theory is that these participants evidenced *difficulty disengaging attention* from threat. Difficulty disengaging attention has been described as the prolonged allocation of attention to potential threat after it has been seen and processed (Fox, Russo, Bowles, & Dutton, 2001). In essence, difficulty disengaging attention begins with vigilance-avoidance (i.e., an initial allocation of attention followed by avoidance) that is then followed by switching attention back and forth between threat and other stimuli. Recent studies on attention that have utilized more precise methodology (e.g., eye-tracking paradigms) to measure attentional biases have shown that difficulty disengaging attention from threat is common among individuals with fear based disorders (Amir, Elias, Klumpp, & Przeworski, 2003; Buckner, Maner, & Schmidt, 2010). However, there is as of yet no known study investigating difficulty disengaging attention among individuals that engage in PEB or with eating disorders. In the current study, difficulty disengaging attention from body threat cues could not be assessed because it requires presentation of pairs of neutral cues in order to compare reaction times on threat-neutral pair presentations to reaction times on neutral-neutral pair presentations.

The reason for the disparate finding on attentional bias in the current study may be due to sample differences. Work that has utilized samples of individuals with diagnosed eating

disorders has overwhelmingly found an attentional bias toward body threat cues (Ben-Tovim & Walker, 1991; Ben-Tovim et al., 1989; Jones-Chesters et al., 1998; Overduin et al., 1995; Placanica et al., 2002; Rieger et al., 1998; Shafran et al., 2007; Stormark & Torkildsen, 2004; Walker, Ben-Tovim, Paddick, & McNamara, 1995). Yet, it is possible that attentional biases develop or evolve throughout the lifetime of an eating disorder. That is to say, at the beginning stages or subclinical levels of eating disorders attentional biases may be different than at later stages of the disorders. Our current sample of non-treatment seeking participants exhibited low levels of PEB and, therefore, would be considered to be at subclinical or beginning stages of a possible eating disorder. Future research should investigate the development of attentional biases throughout the life span of an eating disorder, as it may be that the type of attentional bias implicated in the etiology of an eating disorder is different from the attentional bias that maintains an eating disorder.

Differences in Attentional Bias following Attention Retraining

Results from the current study show that the attention retraining paradigm had a significant and observable effect on the attention bias of participants that engage in PEB. Specifically, among participants that engage in PEB, those in the attention retraining condition exhibited a shift from a significant avoidance of threat cues to a slight attention bias toward threat post-manipulation. On the other hand, participants in the control condition did not exhibit changes to their attention bias. These results provide support for the use of attention retraining paradigms for the purpose of changing individual's attentional biases. More importantly, these results suggest that attention retraining effectively works on individuals that engage in PEB regardless of gender. There are currently no known studies investigating the ability to retraining

attention of men that engage in PEB and, thus, this study is the first to provide evidence that attention retraining is an effective way to manipulate attentional biases in men.

The nature of the change in attention bias is less clear. Given that participants initially evidenced an attentional bias away from body threat cues, it is unknown exactly how retraining attention away from these cues can cause a shift in the opposite direction. However, it is theoretically possible that, were these participants experiencing difficulty disengaging attention at baseline, retraining attention away from threat cues would result in the current findings. Specifically, it is possible that the attention retraining paradigm may have facilitated participant's difficulty disengaging attention from threat (i.e., helped participants attend equally to neutral and threat cues without the need to switch attention between the two cues) and resulted in a change in bias at post-manipulation. More research is needed regarding the effect of attention retraining on difficulty disengaging attention, as this study was designed to retrain attention for individuals with attentional biases toward threat. However, regardless of the nature of the change in attentional bias, results show that our attention retraining paradigm was successful in manipulating attentional biases in the subset of participants that had engaged in PEB.

Differences in PEB, Body Dissatisfaction, and Drive for Muscularity Following Attention Retraining

Overall, we found no evidence of differences in PEB, body dissatisfaction, and drive for muscularity for the entire sample post-manipulation. Although contrary to our hypothesis, this provides some evidence for future study. Specifically, healthy non-treatment seeking participants overall may not be reactive to an attention retraining paradigm on these variables. Although this is counter to past work (Smith & Rieger, 2009) that found changes to eating attitudes following

attention retraining towards and away from threat cues for a non-clinical sample, our sample is the first one to include men. It is possible that the inclusion of men, who reported lower scores on PEB and body dissatisfaction than women, caused the difference in results.

When investigating differences in PEB, body dissatisfaction, and drive for muscularity post attention manipulation by gender, we did find significant differences. Specifically, women in the attention retraining paradigm reported lower scores on body dissatisfaction than women in the control condition. This result suggests that for women, retraining their attention away from body threat cues reduces their body dissatisfaction. This result may appear inconsistent with a prior study (Engel et al., 2006) that found retraining attention away from body threat cues for healthy women did not affect body dissatisfaction scores compared to retraining attention towards body threat cues. However, the main difference between that study and the current study is that the former did not include a control group (i.e., a group that did not engage in attentional manipulation). Therefore, that study could not conclude that attention retraining truly had no effect on body dissatisfaction.

Our finding has both theoretical and clinical implications. Theoretically, we found a link between attention bias, attention retraining, and body dissatisfaction. Our results provide support to the contention that women with high levels of body dissatisfaction may engage in PEB in order to avoid the potential negative affect associated with the body threat cues. Further, we found that reducing the attentional bias to that threat reduces the link between the attentional bias and the experience of body dissatisfaction. The next step would be to investigate whether reductions in body dissatisfaction are subsequently followed by reductions in engagement in PEB. Unfortunately, we did not find a link between attention retraining and reduction in engagement in PEB for these women. It is possible that the small reductions in body dissatisfaction

found in our study were not enough to affect engagement in PEB. Further, given the low number of PEB reported as well as the small period of time between baseline and post measures (i.e., one week), there is a possibility that our methodological choices and sample caused the lack of findings for PEB engagement. Future research should investigate the relationship between reductions in body dissatisfaction following attention retraining and reductions in engagement in PEB with participants who report higher PEB and/or body dissatisfaction.

Our finding also has clinical implications. Specifically, women that engage in PEB and exhibit an attentional bias in relation to body threat cues may benefit from treatment shown to reduce both attentional biases and PEB (e.g., Cognitive Behavioral Therapy; Shafran, Lee, Cooper, Palmer, & Fairburn, 2008). Further, it is possible that utilizing an attention retraining paradigm as an adjunct to an empirically validated treatment may be of benefit for these individuals in order to help reduce body dissatisfaction. Additionally, college women at the highest risk for developing eating disorders may benefit from attention retraining in order to reduce their body dissatisfaction and potentially prevent the onset of eating disorders.

An interesting result from this study was that men's scores on body dissatisfaction appeared to increase for those in the attention retraining condition compared to those in the control condition. However, it is important to note that the sample size for these analyses (i.e., men that reported engagement in PEB) was small ($n = 8$). Therefore, effects of attention retraining on body dissatisfaction in men should be investigated in larger samples before further considering the following conclusions and implications. If this result is not spurious, then the question arises as to why attention retraining away from body threat cues would increase men's body dissatisfaction when the opposite is the case for women. One possible interpretation of this result is that the differential experience of body dissatisfaction between men and women may

have resulted in this finding. For example, research has shown that men experience body dissatisfaction differently from women. Specifically, a study found that men are more likely to report experiencing body dissatisfaction as an interpersonal event in which triggers of body dissatisfaction include social comparisons (Adams, Turner, & Bucks, 2005). Men in that study described comparing themselves both to peers and media ideals in order to *reduce* the distress created by body dissatisfaction. If that is the case, it is possible that the men in the present study had increases in body dissatisfaction due to removing the possibility of social comparisons when made to attend away from body cues. Further, in the same study above, men reported that avoidance of appearance related stimuli maintained pre-occupation and triggered further distress. It is possible that avoidance of body threat cues differentially affects men and women, which may be implicated in this finding. Given that the vast majority of research on attentional biases in the PEB literature has been conducted with female participants, future research should investigate whether men experience different attentional biases than women, and if attentional biases affect men's eating attitudes and behaviors differently as well.

Contrary to hypothesis, results showed no differences in drive for muscularity between men and women following attention retraining. This may have important theoretical implications. Specifically, this may be an indication that drive for muscularity does not moderate the relationship between attention bias and PEB the same way that body dissatisfaction does for women. In essence, drive for muscularity may have a different etiological factor that has yet to be discovered. Additionally, drive for muscularity may affect PEB in a different way than body dissatisfaction does for women. Considering there are currently no known studies investigating the link between attentional biases and drive for muscularity in men, the results of this study provide some early evidence regarding the differences in etiology and/or maintenance between

drive for muscularity in men and body dissatisfaction in women, and their respective relations to attentional biases.

Interest, Ease, Willingness, and Feasibility Variables

The present study provided interesting findings regarding interest, ease, willingness, and feasibility variables from participants of attention retraining paradigms. Currently, there are no known studies investigating participant's perceptions of these types of interventions. Although studies have shown the beneficial effects of attention retraining in clinical populations (Amir et al., 2008; Schmidt et al., 2009), there is as of yet no evidence that participants of these paradigms would find these interventions useful or interesting. The results from this study provide some early evidence that men and women potentially perceive these types of interventions differently. Specifically, our results indicate that women rated interest and willingness to use this program when experiencing body image issues or problems with eating behaviors higher than men. A possible interpretation of these results is that women are more aware than men of the possibility of experiencing body image or eating difficulties and, therefore, they are already primed with the idea that interventions for body image difficulties would be of interest to them. However, it is also possible that women in our study experienced the difference in body dissatisfaction that resulted from this paradigm, which may have elicited a higher score on interest and willingness compared to men, who did not experience differences in body dissatisfaction. Given the established link between attendance/adherence to therapy and benefits gained (Delgadillo et al., 2014), future research should directly and/or experimentally investigate the relationship between interest and willingness to participate in attention retraining programs in response to benefits gained through such interventions.

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 men and women and so replication with clinical populations is needed. However, it is important to note that the majority of individuals with PEB or eating disorders (approximately 72%) 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 other individuals with these conditions. Second, the current sample was comprised of only undergraduate students. Although the current sample was selected given the vulnerability of undergraduates to PEB (Heatherton et al., 1995), future work is necessary to determine whether observed effects generalize to other at-risk populations (e.g., non-students, athletes, gay men). Third, we did not recruit individuals that engaged in PEB. Although we examined a subset sample of participants that had engaged in past-month PEB, future research would benefit from recruiting participants that engage in PEB, and that engage in PEB more frequently than the current sample in order to test study hypotheses. Fourth, the present study was limited by a small sample size. Some of the non-significant findings had medium effect sizes which suggest larger samples are needed to investigate relationships between attentional bias, attention retraining, PEB, body dissatisfaction, and drive for muscularity.

There were also several limitations regarding the ways in which attention was assessed at baseline and post-manipulation. First, the present study relied on a single measure of attention (dot-probe task) with one type of stimuli (words). Research has shown that utilizing pictorial stimuli may elicit different results (Stormark & Torkildsen, 2004; Walker et al., 1995). Further, some research has shown that ruminating about one's own appearance is positively correlated

with levels of PEB (Maner et al., 2006) and that utilizing stimuli that concerns the participant's own appearance (i.e., pictures of the participant's own body) provides more accurate information regarding attentional biases (Jansen, Nederkoorn, & Mulkens, 2005; Roefs et al., 2008). Furthermore, the attention retraining task utilized in this study similarly used only one type of stimuli (words). Research in attention retraining among anxiety populations that resulted in symptom reductions used pictorial stimuli (Amir et al., 2009; Schmidt et al., 2009). Thus, additional research is needed with other attention methodology (e.g., eye-tracking) and other stimuli modalities (e.g., pictorial, participant's own body). Second, stimuli utilized in this study were taken from past research on attentional biases in women. There are currently no known studies investigating specific appearance stimuli that elicit attentional biases in men. Therefore, additional research is needed to determine whether there are specific stimuli that would be better suited for the study of attentional biases, PEB, body dissatisfaction, and drive for muscularity in men.

CONCLUSION

In conclusion, this study was the first to examine whether attention retraining affects PEB, body dissatisfaction, and drive for muscularity for both men and women. Results from our study suggest that attention retraining does successfully reduce body dissatisfaction but only for women who have engaged in past-month PEB. Further, attention retraining did not reduce drive for muscularity in men. This could mean that attention retraining is not a viable intervention option for men and further research is necessary to determine ways of reducing drive for muscularity in men. Further, data on perceived interest, effectiveness, ease-of-use, and willingness to complete attention retraining showed that women are more interested and willing to complete this type of paradigm were they to experience body image issues or eating pathology. These data speak to the feasibility of use of attention retraining paradigms for female college populations. Future research is necessary to determine dissemination strategies in order to reach these at-risk populations. Specifically, disseminating effective attention retraining paradigms in college campuses could provide a possible preventative method to reduce rates of eating disorders for individuals at a vulnerable stage. Given the fatal and dangerous nature of eating disorders, it is of clinical concern to focus on methods aimed at the reduction of these risk factors during a critical period of the development of these disorders.

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APPENDIX A: NEGATIVE BODY WEIGHT/SHAPE WORDS

Potbellied	Flabby
Blubber	Vast
Rotund	Broad
Beefy	Round
Thickset	Fleshy
Weighty	Tubby
Lard	Chubby
Overfed	Heavy
Stout	Stuffed
Dense	Obese
Hefty	Gigantic
Portly	Enormous
Burly	Fat
Immense	Chunky
Fatty	Huge
Bulky	Plump
Saggy	Inflated
Stumpy	Large
Bloated	Meaty
Overweight	Oversized
Unfit	Big
Unshapely	Massive
Humungous	

APPENDIX B: NEGATIVE FOOD WORDS

Chocolate	Ice-cream
Cookie	Milkshake
Donut	Cake
Jelly beans	Pastries
Candy	Potato chips
Gumdrops	Apple pie
Beer	Sugar
Pudding	Bacon
Cola	Cream
Blue cheese	Liquor
Butter	Waffles
Mayonnaise	Pancakes
Honey	Peanuts
Whole milk	Pizza
Wine	Cream cheese
Frankfurter	Walnuts
Peanut butter	Almonds
Cheese	Rolls
Ham	Pork
Margarine	Spaghetti
Beef	Macaroni
Muffin	Beans
Lamb	

APPENDIX C: IRB APPROVAL

ACTION ON PROTOCOL APPROVAL REQUEST



Institutional Review Board
Dr. Dennis Landin, Chair
130 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.5983
irb@lsu.edu | lsu.edu/irb

TO: Amy Copeland
Psychology

FROM: Dennis Landin
Chair, Institutional Review Board

DATE: August 25, 2014
RE: IRB# 3517

TITLE: Effect of Attention Retraining on Pathological Eating Behaviors and Body Dissatisfaction

New Protocol/Modification/Continuation: New Protocol

Review type: Full Expedited Review date: 8/25/2014

Risk Factor: Minimal Uncertain Greater Than Minimal

Approved Disapproved

Approval Date: 8/25/2014 Approval Expiration Date: 8/24/2015

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 128

LSU Proposal Number (if applicable): _____

Protocol Matches Scope of Work in Grant proposal: (if applicable) _____

By: Dennis Landin, Chairman *Dennis Landin*

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is **CONDITIONAL** on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at <http://www.lsu.edu/irb>*

VITA

Jose Silgado was born in Spain where he lived until he was 11 years old. He relocated to the United States with his parents and sisters in order to have a more financially stable and better future. Jose was initially interested in mathematics, computer engineering, and information technology and, thus, attended a computer magnet high school and later received a Bachelor's degree in mathematics. However, Jose realized the potential benefit to society of conducting psychological research and, thus, also completed a Bachelor's degree in psychology. As an undergraduate, Jose volunteered countless hours at a crisis hotline, which solidified his interest in the mental health field. Although Jose was initially interested in the research of eating disorders, he has shifted gears in the last few years. Specifically, Jose is interested in practicing and conducting research with Hispanic and Spanish-speaking populations and working in integrated fields alongside other health practitioners. To that end, Jose will begin a postdoctoral position in Connecticut working in an integrated primary care clinic providing mental health services to Spanish-speaking populations and looking at outcome data to develop potential programs for these populations. Outside of academia, Jose is an avid board game hobbyist. Specifically, he currently has a collection of over 100 board games which continues to expand. Further, Jose is a nature lover who enjoys hiking, mountain biking, and camping. He also likes to remain active and completed his first half-marathon a week before defending this dissertation.