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Effects of Mirror Exposure and Brief Mindfulness Interventions in Undergraduate Females with Weight and Shape Concerns

Jessica Abaigeal Esmeier Kinsaul
Louisiana State University and Agricultural and Mechanical College

EFFECTS OF MIRROR EXPOSURE AND BRIEF MINDFULNESS INTERVENTIONS IN UNDERGRADUATE FEMALES WITH WEIGHT AND SHAPE CONCERNS

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Jessica A. E. Kinsaul
B.S., University of Georgia, 2006
M.A., Appalachian State University, 2010
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This work is dedicated to my loving partner and best friend, John E. Trinks, who tolerated much adventure for this process.

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LIST OF ABBREVIATIONS

AAQ-II	Acceptance and Action Questionnaire
AN	anorexia nervosa
ASI	Anxiety Sensitivity Questionnaire
BED	binge eating disorder
BMI	body mass index
BPD	borderline personality disorder
BN	bulimia nervosa
BSQ	Body Shape Questionnaire
CBT	Cognitive Behavioral Therapy
DASS	Depression, Anxiety, and Stress Scales
DERS	Difficulties in Emotion Regulation Scale
EDE-Q	Eating Disorder Examination Questionnaire
EDNOS	eating disorder not otherwise specified
FFMQ	Five Factor Mindfulness Questionnaire
MBCT	Mindfulness Based Cognitive Therapy
MDD	major depressive disorder
ME	Mirror Exposure Group
MME	Mindfulness Meditation + Mirror Exposure Group
NT	No Treatment Control Group
PANAS	Positive and Negative Affect Schedule
SUDS	subjective units of distress
TMS	Toronto Mindfulness Scale

ABSTRACT

Risk of disordered eating is high amongst college women in the U.S., often resulting in negative outcomes with regard to health, social functioning and psychological well-being. Disordered eating is associated with multiple aspects of emotional processing, such as emotion regulation, negative affect, and avoidance. Emotional processing difficulties can be addressed with both exposure techniques and mindfulness, which involves present moment awareness with an attitude of acceptance and non-judgment. Interventions using mirror exposure (standing before a mirror and systematically describing the body) to treat disordered eating and body image, particularly those utilizing aspects of mindfulness, show promise in terms of improving outcomes above and beyond standard therapeutic treatment; however, there is limited research demonstrating this effect. In the present study, undergraduate women (N = 52) who endorsed moderate or greater body shape concern were randomly assigned to one of three conditions: Mirror Exposure alone (ME), a combined Mindfulness Meditation and Mirror Exposure Group (MME), or a no treatment control group (NT). All participants returned after one week to complete follow-up questionnaires. Two mixed repeated-measures analyses of variances (ANOVAs) were conducted to test hypotheses regarding the impact of time and group differences. It was hypothesized that both active groups would demonstrate improvements in disordered eating and body shape concern, across time, and results were consistent with hypotheses. However, there were no significant differences when compared to the NT group, and no significant interactions between group and time. While participants improved across time, the intervention did not exceed the effect of the control group. Therefore, the changes seen may not have been attributable to the intervention, but to other factors.

INTRODUCTION

The lifetime prevalence of eating disorders in the United States is between 1 – 4% for a full criteria diagnosis (Hudson, Hiripi, Pope & Kessler, 2007). Prevalence rates of eating disorders that are significantly impairing but do not meet full criteria (formerly eating disorder not otherwise specified [EDNOS]) are unknown at this time (Fairburn & Bohn, 2005), but are thought to occur with greater frequency than full-criteria eating disorders (Delvin, Alison, Goldfein & Spanos, 2007; Grilo, 2010; Stewart & Williamson, 2007). The prevalence of eating disorders on college campuses is difficult to estimate, due in part to the infrequent utilization of treatment (American Psychiatric Association [APA], 2006; Eisenberg, Nicklett, Roeder, & Kirz, 2011), non-detection on the part of the mental health staff (as many present to treatment with other concerns; Schwitzer, Rodriguez, Thomas, & Salimi, 2001) and the lack of self-recognition that disordered eating is problematic (Eisenberg et al., 2011; Gratwick-Sarll, Mond, & Hay, 2013).

Women are three times more likely to screen positive for an eating disorder than men (Eisenberg et al., 2011), indicating the gendered nature of such disorders. Available estimates suggest that nearly 14% of college women report symptoms of an eating disorder sufficient to be considered at-risk of going on to develop more severe pathology (Eisenberg et al., 2011). More specifically, in a study of 723 undergraduate women, 15% scored in the clinically significant range for shape concern, while 10% scored in the clinically significant range on weight concern. In the same study, 8.4% of women related regular use (i.e., 3 times per week) of dietary restraint and 16.7% reported regular (i.e., at least once per week) subjective binge episodes (Luce, Crowther & Pole, 2008). In a longitudinal study of undergraduate women who were identified as at-risk of an eating disorder, most women continued to exhibit symptoms across a two year span

(Eisenberg et al., 2011), while a second study found that nearly 10% went on to develop a clinical or subclinical eating disorder over the following two years (Taylor et al., 2006).

College women with disordered eating patterns report significant associated problems. For example, female college students who screened positive for an eating disorder according to a brief screening questionnaire also endorsed other mental health and health-related impairments. Positive screens for eating disorders were significantly associated with the use of self-injury, nicotine use, marijuana use, and binge drinking. Additionally, those with positive screens showed significantly higher likelihood of having a co-occurring disorder such as major depression or generalized anxiety disorder (Eisenberg et al., 2011). College students diagnosed with an eating disorder reported significantly higher feelings of ineffectiveness and pressure to succeed academically than their female counterparts without an eating disorder (Schwitzer et al., 2001). Furthermore, concerns about weight and shape have been reported by undergraduate students as interfering with social relationships and academic performance (Hoerr, Bokram, Lugo, Bivins, & Keast, 2002).

In broadly considering treatment for disordered eating, there is a need for better interventions, as indicated by longitudinal research on relapse and remission rates following treatment. For example, one transdiagnostic (i.e., across various eating disorder diagnoses) study of eating disorders employing a large cohort found that only 43% of patients reached full remission status. Additionally, nearly a quarter of patients achieving either partial of full remission relapsed to meet full criteria for an eating disorders within a 30 month span (Helverskov, 2010). Another large review of randomized control trials of eating disorder treatment found remission rates between 24-80%, depending on diagnosis (with anorexia nervosa [AN] having poorest rates of remission; Hay, 2013). The impact and effectiveness of treatment

can also be considered by examining attrition. One comprehensive review of the literature found that between 20-51% of patients drop out of inpatient treatment. The same review found a 29-73% drop out rate from outpatient treatment (Fassino, Piero, Tomba, & Abbate-Daga, 2009). Therefore, it is imperative to identify treatment approaches and intervention strategies to address eating disorders more effectively than current methods.

Eating Disorders and Emotional Processing Theory

Emotional processing has been defined as "the modification of memory structures that underlie emotions" (Foa & Kozak, 1986, p. 20), and is implicated in explanations of the experience of fear. Emotional processing theory proposes the activation of negative schemas by exposure to specific stimuli, resulting in the biased processing of information and emotional content that may otherwise be altered through exposure and habituation. Specifically, two requirements must be met for emotional processing of the feared stimulus to occur. Firstly, the fear must be learned and have created a fear structure in the individual's neural network, and secondly it must be possible to introduce information that challenges the fear response, thereby allowing a corrective experience to occur. The result is a decrease in the initial fear reaction, as new information is integrated into the individual's understanding that is incompatible with the original fear bias (Foa & Kozak, 1986).

Though originally used as a conceptualization for posttraumatic stress disorder, this theory has been applied to eating disorders, where body image related stimuli, food, and disorder-salient information (i.e., perfectionism, ineffectiveness) activates negative schemas and results in negative emotionality and biased attentional processes (Aspen, Darcy, & Lock, 2013; Treat & Viken, 2010; Trentowska, Bender, & Tuschen-Caffier, 2013; Williamson, Stewart, White, & York-Crowe, 2004). Attention biases in women with eating disorders involve a

predilection to focus on information in the environment that reinforces disordered thinking and eating patterns (Aspen et al., 2013). In individuals with eating disorders, emotional processing theory may be conceptualized in the following example: viewing oneself in the mirror would be more likely to produce negative and biased attitudes regarding appearance, and could then result in poor mood or compensatory behavior. It then follows in theory that the learning of such associations creates an increased likelihood that patterns will repeat, and expand to external stressors unrelated to body and eating stimuli (Williamson et al., 2004).

Empirical research has supported these assertions, as women with eating disorders who were exposed to their own image experienced negative emotionality, and this distress lessened over time with prolonged exposure (Hilbert, Tuschen-Caffier, & Vogele, 2002; Tuschen-Caffier, Vögele, Bracht, & Hilbert, 2003; Vocks, Legenbauer, Wachter, Wucherer, & Kosfelder, 2007). Emotional processing biases in eating disorders are further associated with problems with affective functioning (Gilboa-Schechtman, Avnon, Zubery, & Jeczmien, 2006; Zhu, 2012), emotion regulation (Gilboa-Schechtman et al., 2006; Kanakam, 2013), and avoidance (Veenstra & de Jong, 2012). To summarize, emotional processing theory appears to provide an adequate model of processes occurring in eating disorders, and helps explain biases in attention and attitudes that then result in further affective and behavioral difficulties (Williamson et al., 2004). It follows that there are three emotion-related constructs that are important for understanding eating disorders and their treatment, as discussed in the following.

Negative Affect

The first of these constructs is negative affect. Negative affect has been defined as "a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear and nervousness, with low

negative affect being a state of calmness and serenity" (Watson, Clark, & Tellegen, 1988, p. 1063) Negative affect refers to a composite of negative emotionality, capturing a range of unpleasant states that is theorized as stable and dispositional. Negative affect is also associated with perceived stress (Watson et al., 1988). In the emotional processing theory of eating disorders, negative affect interacts with schemas related to shape and eating to increase the likelihood of attentional biases resulting from the presentation of body or eating related stimuli. Additionally, attentional biases may then trigger the activation of negative emotions when experienced, creating a feedback loop driven by negative affect (Williamson et al., 2004).

The role of negative affect has been implicated in eating disorder pathology and risk, according to one meta-analysis (Stice, 2002). Moreover, a study utilizing ecological momentary assessment (tracking a certain target in real time over a pre-determined time period using an electronic device [Shiffman, Stone & Hufford, 2008]; EMA) found that women with high levels of problematic eating behaviors engaged in more frequent social comparisons, and such comparisons caused greater increases in negative affect than women with lower eating pathology (Leahey, Crowther, & Ciesla, 2011). Another study using EMA found that negative affect was highly implicated in triggering binge eating episodes (Haedt-Matt & Keel, 2011). Manuel and Wade (2013) found that women diagnosed with AN showed a greater bias in memory for negatively affective words than a healthy control group in a study utilizing a negative affect memory word task (Manuel & Wade, 2013). Joos et al. (2012), using the International Affective Picture System (a set of standardized pictures used as a mood induction procedure [Lang, Bradley, & Cuthbert, 2005]; IAPS) found that patients with an eating disorder reported lower levels of happiness and less anger than a non-clinical control group. Neuroimaging studies have found support for the role of negative affect as well. A review of fMRI studies investigating the

processing of food- and body image-related stimuli in individuals with AN found robust effects of increased activity in areas of the brain related to emotion (e.g., frontal, caudate, insula, temporal and uncus) suggestive of negative emotional arousal associated with body shape and weight stimuli (Zhu, 2012).

There is a strong link between depression, which is associated with negative affect, and eating disorders. Research has identified the link between mood and eating disorders with regard to prevalence (Godart et al., 2007) and genetic factors (Slane, Burt, & Klump, 2010). A review of risk factors found that negative affectivity was a non-specific risk factor for multiple psychiatric problems, including eating and mood disorders (Jacobi, Hayward, de Zwann, Kraemer, & Stewart, 2004). In the above mentioned study using the IAPS, individuals diagnosed with eating disorders were comparable on measures of emotional response to individuals diagnosed with major depressive disorder (MDD; Joos et al., 2012). While negative affect may be a non-specific risk factor, research supports negative affect as a maintenance factor of eating disorders, as disordered eating behaviors may be used to regulate unpleasant emotions (Overton, Selway, Strongman, & Houston, 2005). On the whole, negative affect appears to impact attitudes around disordered eating, and thereby impact behaviors. Such associations may partially explain the link between depression and disordered eating.

Emotion Regulation

Another construct implicated in emotional processing and eating disorders is emotion regulation. Emotion regulation is broadly conceptualized as one's ability to recognize, accept, and understand emotions, as well as the utilization of strategies to adaptively manage and control reactions to emotional stimuli (Gratz & Roemer, 2004). Such processes are highly implicated in the emotional processing theory of eating disorders, as the presence of the emotional reaction is

necessary to disrupt the cycle of fear reinforcement, and individuals must therefore learn to recognize and appropriately respond to associated emotions (Williamson et al., 2004). Aldao and Nolen-Hoeksema (2010) stated that emotion regulation difficulties amongst individuals with eating disordered behaviors are marked by emotional reactivity and poorer response to stressors that then result in avoidance and self-destructive behavior. They found that poor use of emotion regulation strategies was associated with greater disordered eating pathology in a clinical sample of young adults. Prior research has also suggested that food is used to regulate affect by many individuals with problematic eating (Choate, 2010). One study found that women diagnosed with an eating disorder reported using emotional eating to cope more frequently than a non-clinical comparison group (Danner, Evers, Stok, van Elburg, & de Ridder, 2012). The same study also found that individuals with disordered eating reported using adaptive coping skills less often than the non-clinical comparison group (Danner et al, 2012).

Difficulty appropriately managing emotional distress is implicated in disordered eating etiology and maintenance. Difficulty with complex emotion recognition has been identified by behavioral genetic research as an endotype of disordered eating, indicating a potential genetic basis for emotion regulation difficulties (Kanakam, 2013). In a study comparing groups of women diagnosed with MDD, borderline personality disorder (BPD), bulimia nervosa (BN), binge eating disorder (BED) and AN with healthy controls, women with any eating disorder reported greater emotional intensity and more difficulty with regulating emotion than healthy controls (Svaldi, Griepenstroh, Tuschen-Caffier, & Ehring, 2012). Further, women diagnosed with an eating disorder reported decreased acceptance of emotions, less clarity of emotional experience and more self-reported emotion regulation problems than the control group. Interestingly, there were few differences on measures of emotion regulation between the clinical

groups, indicating either a ceiling effect of the measures, or a transdiagnostic difficulty in regulation of emotion (Svaldi et al., 2012). Relatedly, in a study comparing individuals diagnosed with AN to a community control group, women with AN self-reported greater difficulties in regulating emotions than the control group (Manuel & Wade, 2013). In a review of empirical studies examining emotion regulation by Gilboa-Schechtman and colleagues (2006), the authors stated that individuals with eating disorders show deficiencies in emotional processing, and that those diagnosed with eating disorders show less emotional awareness compared to controls. In summary, women with disordered eating have difficulty with the recognition and acceptance of emotional reactions, which are in some part necessary for the correction of emotional processing to take place. Such difficulties with emotion regulation may result in negative responses to emotional stimuli, linking the two previously discussed concepts of emotional processing, negative affect, and emotion regulation. Furthermore, difficulty with emotion regulation has been linked to avoidance as well (Aldao & Nolen-Hoeksema, 2010), which is involved in emotional processing as described below.

Avoidance

The last discussed component of emotional processing and eating disorders is avoidance. Avoidance may play an important role in risk and maintenance factors of eating disorders (MacNeil, Esposito-Smythers, Mehlenbeck, & Weismoore, 2012; Shafran, Fairburn, Paul, Lask, 2004), as avoidance is an important characteristic of the emotional processing occurring in individuals with disordered eating (Rawal, Park, & Williams, 2010). Engaging in avoidance based coping strategies can be defined as emotional detachment, denial of the problem, behavioral attempts to escape or avoid a situation, or avoiding thoughts related to stressors (MacNeil et al., 2012). More specifically, avoidance in those with eating disorders is manifested

behaviorally through refusal to weigh, wearing clothing that does not draw awareness to shape, not looking at photographs, or avoiding mirrors (Fairburn, Cooper, Shafran, Bohn, & Hawker, 2008) and is considered a behavioral manifestation of over-concern regarding weight and shape (Reas, Grilo, Masheb, & Wilson, 2005). Biased emotional processing of information may trigger the use of disordered eating behaviors as a means of avoiding the experience of emotion (Oldershaw et al., 2012). Avoidance is considered problematic, as it reinforces fear and concerns regarding weight and shape without corrective feedback (Fairburn et al., 2008), which is consistent with emotional processing theory (Foa & Kozak, 1986). Research on disordered eating has identified a link between avoidance and over-evaluation of weight and shape (Fairburn et al., 2008), and it has further been identified as a potential method used by individuals lacking confidence in the ability to cope with feared body stimuli (MacNeil et al., 2012).

Research demonstrates that body avoidance is prevalent amongst individuals diagnosed with AN and BN (Rawal et al., 2010; Shafran et al., 2004), as well as individuals diagnosed with BED (Reas et al., 2005), implicating a transdiagnostic process across eating disorders. Further, findings from Shafran et al. (2004) indicate that greater avoidance is associated with greater eating pathology, and women with a history of disordered eating report significantly more avoidance behavior than healthy controls. In a cross-sectional study using a sample of women diagnosed with AN, avoidance behaviors predicted disordered eating symptoms (Rawal et al., 2010). Even in a non-clinical college student sample, the use of avoidant coping styles (i.e., denial, emotional attachment, avoidance of negative affect) was associated with more disordered eating attitudes and behaviors, particularly in women with more self-reported stress (MacNeil et al., 2012). In sum, avoidance may be either cognitive or behavioral, and may impede emotional processing of information.

Mindfulness

Mindfulness refers to a theoretical construct, a personal practice and a psychological state of being (Germer, Siegel, & Fulton, 2005) with roots in the Buddhist contemplative traditions (Grabovac, Lau, & Willett, 2011). Within the past two decades, mindfulness has been studied to examine its potential application in treatment interventions for physical and mental health (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Mindfulness involves "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p. 4), by utilizing awareness of internal as well as external stimuli, and approaching such experiences with attitudinal qualities such as patience, curiosity and compassion (Shapiro, Carlson, Astin, & Freedman, 2006). Operational definitions of the construct emphasize mindfulness as consisting of two meta-cognitive skills: 1) self-regulation of attention and 2) attitudinal openness and acceptance towards the experiences of the present (Bishop et al., 2004).These two aspects are empirically supported as salient features of mindfulness training (Coffey, Hartman, & Fredrickson, 2010).

The regulation of attention has been identified by research as an important factor in the practice of mindfulness (Bishop et al., 2004). Attention is perhaps the most salient feature involved in mindfulness practice, as thoughts and feelings are only as prominent as the attention paid to them (Carmody, 2009). The ability to regulate attention allows a person the ability to experience mental events without becoming emotionally involved or ruminating on particular aspects (Bishop et al., 2004), while recognizing that mental events occur due to habitual reactions and have no true meaning to the self (Grabovac et al., 2011). Regulation of attention in the cognitive sense involves the ability to disengage thoughts from the elaborative processes of the brain, thereby freeing up cognitive space to process other information. Gaining the ability to

regulate one's attention results in the ability to sustain, switch and inhibit attention at will (Bishop et al., 2004). This, by extension, allows the individual to disengage from cognitive processes regarding distress (Carmody, 2009).

The second important component of mindfulness practice is the development of an attitude of nonjudgment and acceptance. The development of an accepting attitude results in reduced need for cognitive strategies designed to reduce negative affect. Additionally, this allows the individual to begin noticing patterns and relationships between thoughts and feelings and how such patterns relate to behavior (Bishop et al., 2004). Alternatively, this process is referred to as "de-centering", which refers to learning to have a different relationship with thoughts, feelings and bodily sensations, even if doing so means welcoming and accepting unpleasant emotional experiences (Segal, Williams, & Teasdale, 2002). This may involve removing labels from thoughts and emotions and experiencing them in a non-conceptual way (Kabat-Zinn, 2002), without experiencing a deep connection to those thoughts and feelings (Shapiro et al., 2006). Some evidence suggests that acceptance of experience is more important than attention in decreasing distress (Coffey et al., 2010).

Mindfulness is considered a multidimensional construct with various attitudinal elements needed to describe the process of "being mindful" (Baer, Fischer, & Huss, 2005). In the measurement and assessment of mindfulness skills, several facets of mindfulness have been identified through factor analysis of mindfulness measures. In particular, five facets have emerged as specific and discrete entities in self-report measures: "observing," "describing," "acting with awareness," "non-judging," and "nonreactivity". The Five Factor Mindfulness Questionnaire (FFMQ) assesses each of these facets (Baer et al., 2006). Each specific component refers to a particular distinct skill involved in the practice of mindfulness (Baer, Smith, & Allen,

2004), and these facets are considered elements of the practice rather than outcomes of it (Baer et al., 2006). Mindfulness may also be considered as a state-like condition (i.e., in the moment), or a more pervasive trait, representing more stable attitudes and experiences (Sauer et al., 2013).

Mindfulness and Psychological Health

Currently, various forms of psychological interventions involve mindfulness either as a central principle or as a skills component, as mindfulness is a broad skill set (involving attitudinal, attentional and behavioral aspects) that can be used to reduce suffering and improve health and well-being in a variety of realms (Bauer, 2003). Dialectical Behavioral Therapy (DBT; Linehan, 1993) and Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999) are both multi-component treatments with mindfulness as an important element learned. Mindfulness Based Cognitive Therapy (MBCT; Segal et al., 2002) for depression and Mindfulness Based Stress Reduction (MBSR; Kabat-Zinn, 1990) for chronic pain both use mindfulness as the central tenant to treatment. Additionally, mindfulness has been incorporated into treatment for substance use disorders with Mindfulness-Based Relapse Prevention (MBRP; Bowen, Chawla, & Marlatt 2011). Furthermore, Mindfulness-Based Eating Awareness Training (MB-EAT; Kristeller, Baer, & Quillian-Wolvever, 2006) and mindfulness-based body image treatments (Delinsky & Wilson, 2006; Stewart, 2004; Wilson, 1999) have demonstrated preliminary support as being effective mindfulness-based treatments for eating-related problems.

Regarding treatment outcomes, mindfulness interventions are associated with symptom reduction for many disorders. In a meta-analysis, extensive mindfulness training (8-10 sessions) was associated with reductions in anxiety, depressive symptoms and stress across multiple randomized control trials (Bohlmeijer, Prenger, Taal, & Cuijpers, 2010), and such interventions have been shown to improve mental health outcomes in clinical and non-clinical populations

(Fjorback, Arendt, Ornbol, Fink, & Walach, 2011). MBSR, as evaluated by a meta-analysis, is effective in the treatment of chronic health disorders and problems such as pain, cancer, fibromyalgia and coronary disease (Grossman, Nielmann, Schmidt, & Walach, 2004). A meta-analysis of treatment effects across multiple studies with varied diagnoses found medium to large effect sizes in symptom reduction from pre- to post-treatment as a result of mindfulness based interventions (Bauer, 2003; Hamilton, Kitzman, & Guyotte, 2006).

Mindfulness and Psychological Mechanisms

Mindfulness is thought to target various aspects of psychological functioning, and several processes have been identified by research as potential mechanisms of action. Although specific attention is given to key aspects of mindfulness in the following three areas, research has found that many components of mindfulness appear to be mutually influential and heterogeneous processes (Coffey et al., 2010) with several aspects overlapping to impact outcome (Carmody, Baer, Lykins, & Olendzi, 2009).

Negative Affect. Mindfulness may impact the regulation of negative affect by way of reducing the need for strategies designed to reduce unpleasant mood (Bishop et al., 2004) and potentially through desensitizing the individual to aversive responses to negative affect such as judgment (Breslin, Zack, & McMain, 2002). One study found that individuals participating in mindfulness training reported significantly less distress and more positive states of mind from baseline to post-intervention than those in the control group (Jain et al., 2007). Decreases in negative affect and increases in positive affect occurred following a five-day meditation training amongst college students (Tang et al., 2007). Arch and Craske (2006) found that individuals who completed a brief, mindful breathing induction for 15 minutes responded to negatively-valenced images with less negative affect and increased willingness to view further images compared to

control groups, indicating more adaptive coping with regard to negative affect. Further, Davidson and colleagues (2003) found increased activation in the left anterior cortical region of the brain, which is associated with positive affect, following an 8-week mindfulness training using neuroimaging methods.

Emotion regulation. Emotion regulation is an important benefit of mindfulness interventions. Better regulation of emotion allows an individual to disengage from unpleasant emotional states and therefore better cope with negative emotions (Coffey et al., 2010). Mindfulness training is associated with increased awareness of emotion and thought patterns theorized to result in improved emotion regulation (Breslin et al., 2002; Farb, Anderson, & Segal, 2012). A study using EMA in a college sample found that individuals with higher self-reported mindfulness reported reduced emotional lability, and were better able to differentiate their emotions and regulate emotional processes than those reporting lower levels of mindfulness (Hill & Updegraff, 2012). Additionally, in a study utilizing fMRI scans comparing individuals who had completed 8-weeks of mindfulness training to wait-listed controls, Farb and colleagues (2010) found that individuals who had completed mindfulness training demonstrated less neural reactivity to emotion-laden stimuli than controls despite equivalent self-reported sadness. Farb and colleagues stated that such findings indicate the improved ability for internal recovery from low-mood states to regulate emotions in individuals with mindfulness training. A review article of neuroimaging studies and mindfulness found support for increased inhibitory control in areas of the brain involved in emotion regulation following mindfulness training, supporting the claim that mindfulness and emotion regulation may have a significant relationship (Holzel et al., 2011).

Avoidance. Practice in mindfulness is theorized to impact avoidance behaviors and thoughts through increased exposure to thoughts, sensations, and emotions (Bauer, 2003; Shapiro et al., 2006), which then results in the desensitization to adverse responses and by extension may reduce avoidance behavior (Bauer, 2003). A correlational study using a sample of chronic pain outpatients found that mindfulness was a significant factor in the fear-avoidance pattern associated with pain disorders, indicating that mindfulness may play an intervening role between chronic pain and the tendency to react with fear and/or avoidance (Schütze, Rees, Preece, & Schutze, 2010). In a study of treatment effects using a sample of individuals diagnosed with depression, Kumar, Feldman and Hayed (2008) found that increases in self-reported mindfulness were associated with decreased avoidance and rumination following a cognitive intervention augmented with a mindfulness training component. Another study utilizing an 8-week mindfulness training intervention for individuals presenting with depressive symptoms found that increased mindfulness was associated with decreased perception of negative thoughts as bothersome or distressing (Frewen, Evans, Maraj, Dozois & Partridge, 2008), indicating that desensitization of adverse reactions to negative thoughts does occur following a mindfulness intervention. Overall, mindfulness is an approach-based intervention, which counters avoidance and encourages non-avoidant behavior (Breslin et al., 2002).

Mindfulness and Eating Disorders

Researchers and clinicians are beginning to incorporate aspects of mindfulness into eating disorder treatments. Emotional avoidance and maladaptive responses to distress are theorized to perpetuate disordered eating and negative feelings related to appearance (Baer et al., 2005), and are both areas addressed and improved by mindfulness interventions (Bishop et al., 2004). Additionally, mindfulness may aid individuals in gaining greater acceptance of the body

and may increase awareness of unrealistic expectations through various attitudinal components of mindfulness interventions such as non-judgment and non-striving (which involves letting go of attachment to desired outcomes). Lastly, a sense of compassion for the self is cultivated through the practice of mindfulness, as individuals are taught to be curious and open to the present experience (Stewart, 2004). Therefore, mindfulness involves many tenants that theoretically could improve outcomes in those with disorders of eating.

Research supports evidence of a relationship between disordered eating risk factors and mindfulness. A large correlational study of community women found that mindfulness was positively associated with body satisfaction, and negatively associated with body comparisons with other women. The authors suggested that the promotion of non-judgment through mindfulness may be the mechanism that prevents automatic negative thoughts (i.e., body comparisons) from occurring (Dijkstra & Barelds, 2011). Acting with awareness, non-judgment and non-reactivity (all aspects of mindfulness) were found to be associated with decreased eating pathology, even when controlling for symptoms of anxiety and depression in a study of undergraduate women (Lavender, Gratz & Tull, 2001).

Further, there is evidence of transdiagnostic support in the use of mindfulness interventions within eating disorders. Alberts, Thewissen and Raes (2012) found that non-clinical community members reported reductions in emotional eating, fewer body image concerns, and fewer food cravings following an 8-week MBCT intervention. In a sample of individuals seeking treatment for an eating disorder, reductions were found in binge eating, dieting and improved body image, following a 10-week group treatment combining Cognitive Behavioral Therapy (CBT) and mindfulness (Woolhouse, Knowles, & Crafti, 2012). Participants diagnosed with BED showed improvements in perceived level of eating control, awareness of

hunger cues and decreased binge episodes following a six-week mindfulness meditation group intervention (Kristeller & Hallett, 1999). Additionally, in a review of treatment studies utilizing mindfulness to target disordered eating and body image, symptom improvement occurred, indicating positive change following mindfulness treatment (Wanden-Berghe, 2011); however, a limitation cited by the author of the review was that many studies lacked a control group.

Mirror Exposure

Individuals displaying disordered eating behaviors often demonstrate negative reactions when viewing their own bodies. Laberg, Wilson, Eldredge, and Nordby (1991) compared two groups of women, one reporting clinical levels of restrained eating, the other diagnosed with BN, and found that both groups reported significantly lower mood after viewing photographs of their bodies. Additionally, Tuschen-Caffier et al. (2003) found that women diagnosed with BN did not differ from healthy controls in reporting increased negative emotions in response to viewing a video tape of one's own body. Other research has found that when comparing eating disordered and non-clinical groups, both groups demonstrate physiological and self-reported distress at body exposure, although women with disordered eating display greater distress than a comparison group (Vocks et al., 2007). Furthermore, research indicates that women displaying disordered eating symptoms lack a self-serving body image bias (when considering self-serving body image as paying more attention to one's attractive body areas rather than focusing on the negative). Specifically, women with problematic eating were assessed for selective attention when viewing pictures of their own and other women's bodies and compared to healthy controls. Findings suggested that women with problematic eating showed more attentional bias towards parts they themselves deemed as unattractive, where the opposite was found for the healthy controls (Jansen, Nederkoorn, & Mulkens, 2005). Another study found that when shown images of their

own bodies and other women's bodies, women with problematic eating consistently rated other women as thinner, while women without eating disordered symptoms did not (Alleva, Jansen, Martijn, Schepers, & Nederkoorn, 2013).

Mirror exposure exercises that provide the individual with the opportunity to use mirrors in a different manner may provide a useful skill in decreasing the distress often associated with mirror use (Probst, Pieters, Vancampfort, & Vanderlinden, 2008). Mirror exposure is based on previous "mirror confrontation" techniques developed as part of a cognitive behavioral intervention intended to utilize exposure and desensitization, consistent with expected outcomes when eating disorders are conceptualized as emotional processing disorders (Trentowska, Svaldi, & Tuschen-Caffier, 2013). Specifically, mirror exposure involves the participant standing before a mirror and providing a systematic description of the body. Participants describe each body part with little input from the clinician directing the exercise. This particular type of intervention addresses body image, an important predictor of disordered eating (Stice, 2002), and provides a potential alternative or supplemental treatment, as traditional forms of eating disorder treatment demonstrate considerable remission rates (Hay, 2013) and dropout rates (Fassino et al., 2009). A meta-analysis of eating disorder treatment found that interventions that targeted body dissatisfaction and those that alter maladaptive behaviors were most favorable in improving eating disorder symptoms (Stice & Shaw, 2004), and mirror exposure targets both.

Mirror exposure has demonstrated effectiveness in studies employing groups reporting disordered eating compared with healthy controls. Hilbert and colleagues (2002) used a cognitive-behaviorally based protocol for mirror exposure with participants diagnosed with BED and normal controls. Participants wore a white leotard and the exposures lasted approximately 23 minutes. Both groups showed improvements in self-esteem, and reductions in negative thoughts

following treatment, with individuals in the BED groups experiencing greater relief of negative cognitions than controls. More recently, Trentowska et al. (2013) compared women diagnosed with BN to a healthy control group using four sessions of mirror exposure. Women diagnosed with BN showed significant reductions in distress and negative emotions from session to session, while controls did not change significantly over the same timeframe. Therefore mirror exposure can be effective at reducing symptoms in eating pathology when compared with healthy controls, and may also be impactful at reducing symptoms in individuals not currently experiencing problematic eating or body image.

To date, mirror exposure shows promise as a form of treatment for disordered eating, as evidenced by research on clinical samples. Key et al. (2002) examined the impact of mirror exposure when added to treatment as usual in a sample of women considered in recovery and previously diagnosed with AN. Over the course of 8 weeks, those who participated in the mirror exposures demonstrated significant improvements in body satisfaction, reductions in disordered eating symptoms and increased social activity, whereas those in the treatment as usual group showed no significant changes on these variables post-treatment. A pilot study by Jansen and colleagues (2008) found that mirror exposure decreased anxiety, improved self-esteem and improved body satisfaction amongst obese adolescents who were enrolled in a treatment facility for obesity across six exposure sessions. Hilbert and Tuschen-Caffier (2004) found that amongst women diagnosed with BED, CBT augmented with mirror exposure was equally effective in reducing eating related symptoms when compared to a more standard form of CBT. Trentowska and colleagues (2014) examined women diagnosed with EDNOS and BN using an intervention design focused primarily on mirror exposure. Following 4-5 sessions of mirror exposure, all participants experienced a significant reduction in body dissatisfaction, and women diagnosed

with EDNOS demonstrated reductions in disordered eating symptoms (while women diagnosed with BN did not demonstrate these reductions).

Lastly, a study by Moreno-Dominguez and colleagues (2012) examined the use of instructions in a mirror exposure activity with a sample of non-clinical undergraduate women endorsing moderate body dissatisfaction. Participants received five mirror exposure sessions lasting 40 minutes each, and participants wore beige underwear during the activity. Participants were instructed to describe themselves precisely (guided condition per manualized instruction [Tuschen-Caffier & Florin, 2002]), look at themselves freely while describing what they are looking at without attempting to relieve the discomfort associated with the activity (pure mirror exposure condition), or describe themselves without the use of a mirror (imagery condition). Both conditions employing the use of a mirror showed reductions in self-reported feelings of body dissatisfaction, with the pure exposure condition demonstrating greater gains. Researchers suggested that the results in the pure exposure group were greater, as there was less cognitive interference in the emotional processing of discomfort during the activity (Moreno-Dominguez et al., 2012). These findings demonstrate the usefulness in mirror exposure as a means of addressing eating disorder and body image-related problems in individuals with a diagnosed eating disorder and those with body shape concerns.

Mirror Exposure and Mindfulness

Wilson (1999) developed a modification to mirror exposure for eating disorders by using mindfulness-based instructions to orient the individual to the present moment without judgment while participating in the mirror exposure activity. To enhance mirror exposure as a mindfulness-based intervention, participants are guided beforehand in adopting a mindful frame where the focus is on the present reality. Because mindfulness involves cultivating the present moment, it

focuses the individual on acceptance without desire to change and to focus on the task at hand without drifting into distraction. Therefore, mindful mirror exposure is thought to utilize habituation and neutralization of unpleasant stimuli (one's reflection), and to decrease emotional reactivity related to bodily appearance (Hilbert & Tuschen-Caffier, 2004; Stewart, 2004). Additionally, the adapted form of mirror exposure has been conducted using a variety of mindfulness-based inductions, such as psychoeducation on principles of acceptance, the mindful eating of a raisin, and/or various meditations (Cash, 2008; Wilson, 1999), though these particular inductions are lacking empirical support for outcome.

Delinsky and Wilson (2006) compared three sessions of standard supportive therapy to three sessions of mirror exposure treatment with mindfulness instructions in a sample of undergraduate women. Mindfulness-based instructions included an emphasis on non-judgmental language and focus on the present emotional experience. Those participating in mirror exposures demonstrated significant improvements on measures of body checking, self-esteem, body image avoidance, depression, and cognitions about dieting compared to the standard treatment group. Dissatisfaction with body parts was the only measured construct that did not differ between groups following treatment. Hildebrandt, Loeb, Troupe, and Delinsky (2012) utilized a randomized control trial to evaluate mirror exposure therapy as compared to non-directive therapy amongst individuals diagnosed with an eating disorder. Participants were administered 5 sessions of treatment based on the protocol established by Delinsky and Wilson (2006). Both treatments demonstrated improvements in body satisfaction and disordered eating symptoms, although treatment utilizing mirror exposure was superior. For instance, those in the Mirror Exposure Group showed the largest reductions in body checking, with moderate to large effect sizes for changes in disordered eating symptoms, weight concerns, body related worry, restraint

and eating rituals. Hildebrandt and colleagues summarized that this study demonstrated support of the use of nonjudgmental (i.e., mindfulness-based) descriptions in the use of mirror exposure.

Prior research has examined the manipulation of instructions in mirror exposure exercises. Luethcke, McDaniel and Becker (2011) used a non-clinical undergraduate female sample and compared participants who were either given neutral instructions, mindfulness instructions or cognitive dissonance instructions (i.e., saying something nice about one's appearance) during the mirror exposure task. Participants in the mindfulness instructions condition also completed a brief breathing meditation prior to participation. After one mirror exposure session, all conditions showed decreases on eating disorder risk factors and improvement in body avoidance and checking, supporting the use of mirror exposure in addressing eating and body image concerns, with no significant differences between groups receiving different instructions (Luethcke et al., 2011). These findings indicate that results immediately following the intervention were not impacted by the types of instructions given, nor by the use of a breathing exercise. While findings amongst non-clinical samples indicate that mindfulness instructions may not be an active mechanism of change in non-clinical samples (Luethcke et al., 2011), there is support for their usage in clinical samples (Hildebrandt et al., 2012).

The attentional and attitudinal aspects of mindfulness (i.e., present moment focus and an attitude of non-judgment) are developed by practicing meditation (Bauer, 2003). Thus, it would follow that mirror exposure activities attempting to enhance state or trait mindfulness may benefit from inclusion of meditation training. However, there is little evidence of meditation being used in mindfulness based mirror exposure to increase the impact of mindfulness skills amongst participants endorsing problematic eating, as instructions encouraging non-judgment

and attention to the present are deemed sufficient to consider these mindfulness-based. Prior training in a meditation that focuses solely on present moment awareness and openness could provide a more solid foundation for the use of mindfulness skills in an exercise that is thought to provoke negative affect such as mirror exposure. Further psychoeducation on mindfulness as a concept could provide a sufficient framework for increasing susceptibility to mindfulness skills.

As described above, Luethcke and colleagues (2011) utilized a brief meditation amongst non-clinical college students, and while improvements were found at outcome, the mindfulness group did not significantly differ from comparison groups. A study by Adams et al. (2013) with undergraduate female smokers found that a brief mindfulness meditation induction increased state mindfulness and decreased negative affect and body dissatisfaction after viewing themselves in the mirror over the course of a body image challenge, supporting the usage of mindfulness meditation in such treatment. Both Luethcke et al. (2011) and Adams et al. (2013) utilized a one-session mirror activity with a mindfulness induction, however, both samples were not reporting body image or eating concerns.

Summary

Eating disorders are deleterious in college students, in that they commonly co-occur with other disorders (Eisenberg et al., 2011; Schwitzer et al., 2001), and impact social and academic functioning (Hoerr et al., 2002) as well as health (APA, 2006). Subclinical symptoms of disordered eating are persistent (Eisenberg et al., 2011), and can develop into a clinical disorder (Taylor et al., 2006). Eating disorders have been identified as disorders that alter emotional processing and thus impact the way information is processed in a biased and negative manner (Aspen et al., 2013; Treat & Viken, 2010; Trentowska et al., 2013). Difficulties with negative affect, emotion regulation, and avoidance (Gilboa-Schechtman et al., 2006; Veenstra & de Jong,

2012) are implicated in the development and maintenance of eating disorders in various ways. It is not well understood how these components interact with one another, if at all, but research supports the idea that interventions addressing each of these components individually may result in decreased symptomatology.

Individuals with disordered eating may benefit from a targeted intervention that addresses such cognitive-emotional difficulties as discussed above and that result in better coping methods. Mindfulness techniques involve the cultivation of attention, the development of tolerance to unpleasant experiences, while developing an attitude of nonjudgment (Bishop et al., 2004). These techniques are considered useful in addressing disordered eating (Stewart, 2004), which is characterized by judgmental evaluations of weight and shape, avoidance of appearance and rumination regarding weight and shape related thoughts (Fairburn, 2008). Cognitive interventions have shown some success in addressing disordered eating behaviors in randomized control trials (Fairburn et al., 2009). We do not yet know how mindfulness interventions may compare on their own or in combination with existing cognitive approaches to address disordered eating behaviors. Utilizing mindfulness in addressing eating disorder symptoms is supported by prior research (Delinsky & Wilson, 2006; Kristeller & Hallett, 1999; Kristeller et al., 2006; Wanden-Berghe, 2011; Woolhouse, et al., 2012), although specific mechanisms as to how mindfulness impacts symptoms remain unknown.

Mindfulness has been theoretically proposed as being compatible with cognitive behavioral interventions (Hamilton et al., 2006), and the beneficial effects of mirror exposure exercises utilizing mindfulness instructions in addressing eating concerns adds further credence to this claim (Delinsky & Wilson, 2006; Hildebrandt et al., 2012). Mirror exposure can be conceptualized as a cognitive-behavioral intervention (Trentowska et al., 2013), and when

augmented by mindfulness-based instructions it may be considered a combined treatment. Although mindfulness based mirror exposure may be done using a variety of methods to increase mindfulness skills (i.e., mindful eating activity, meditation), the majority of research has focused on manipulations of instructions prior to the mirror exposure (Delinsky & Wilson, 2006; Luethcke et al., 2011). Luethcke et al. (2011) was unique in utilizing a brief meditation to augment mindfulness based mirror exposure. While this study demonstrated reductions in symptomatology, there were no significant differences between those receiving the mindfulness induction and those who did not in a non-clinical sample.

There are established differences amongst samples reporting weight and shape concerns and those not reporting such concerns in terms of response to mindfulness based mirror exposure (Luethcke et al., 2011; Hildebrandt et al., 2013; Moreno-Dominguez et al., 2012). While meditation has been used to induce state mindfulness amongst non-clinical groups, this enhancement has not been utilized in groups reporting weight and shape concerns during mindfulness based mirror exposure. As mindfulness is enriched through the practice of meditation (Bauer, 2003), this enhancement may provide a useful tool in one's ability to utilize mindfulness-based instructions during a mirror exposure activity. Additionally, understanding how mindfulness based mirror exposure is enhanced through a meditation induction could better be clarified through comparison groups who only receive a mirror exposure intervention.

Lastly, this study has implications on a broader level as well. Mindfulness as a psychological intervention is considered part of the third wave of cognitive behavioral interventions, and while much research is being done in this area, it is important to determine the effectiveness of such interventions through further research (Hayes, Follette, & Linehan, 2004). Mirror exposure has a tradition of success as a CBT intervention (Hilbert et al., 2002; Hilbert et

al., 2004; Jansen et al., 2008; Key et al., 2002; Moreno et al., 2011; Trentowska et al., 2013), and recent additions of mindfulness have less breadth of research support (Delinsky et al., 2006; Hildebrandt et al., 2012; Luethcke et al., 2011). As mindfulness based mirror exposure is being promoted (Cash, 2008; Stewart, 2004; Wilson, 1999), it is important to understand the benefit (if any) of the addition of mindfulness. Furthermore, treatments for eating disorders have demonstrated marginal success in terms of remission (Hay, 2013; Helverskov, 2010) and drop-out rates (Fassino et al., 2009), and finding alternative and effective interventions might permit better outcomes for treatment. Additionally, mirror exposure addresses body satisfaction which is the most robust predictor of disordered eating (Stice, 2002), and therefore this intervention could potentially serve as a preventative of more extensive eating problems. Further, meta-analysis of treatment and prevention has stated that treatments targeting body dissatisfaction are superior in terms of improving outcomes (Stice & Shaw, 2004).

Purpose of Present Study

The specific aim of the present study is to examine whether a combined brief mindfulness meditation and a mirror exposure exercise produces greater decreases in body- related concern and disordered eating after one week than receiving mirror exposure alone in a sample of women endorsing moderate or greater weight and shape concerns. It is expected that both active treatment groups will experience a significant decrease in eating symptoms and body concern, and that the group receiving the mindfulness-based mirror exposure will experience relief of body image related and eating symptoms above and beyond those observed in the mirror exposure alone group.

Hypotheses

In examining the effects of a combined manipulation compared to single manipulation group on body shape concern and disordered eating, the following hypotheses were tested:

- Hypothesis 1: the active treatment conditions (ME and MME) would demonstrate significant improvements across time (from baseline to one week follow up) on body related concerns and disordered eating when compared to the NT group.
- Hypothesis 2: Participants in the active treatment conditions would improve across time (from baseline to one week follow up) on measures of disordered eating, and body related concern.
- Hypothesis 3: Participants in the MME Condition group would report significantly decreased levels of disordered eating pathology, and body-related worry at the one-week follow up compared to decreases in the ME group.

METHOD

Participants

Eligibility was determined by reporting significant weight and shape concerns consistent with risk of an eating disorder. The criterion for the present study required participants to score 4 or greater on 2 of 4 items on the Eating Disorder Examination Questionnaire (Fairburn, 2008) assessing dissatisfaction with weight/shape and importance of weight/shape. This procedure was utilized in Delinsky and Wilson (2006), and assesses over-emphasis on weight/shape which is a diagnostic feature of eating disorders, and dissatisfaction with weight and shape, which is indicative of eating disorder pathology (Stice, Marti, & Durant, 2011). Eligibility was determined through initial online screening. Those eligible for further participation were contacted via email and offered the opportunity to participate in the manipulation phase. Most participants received experimental credits in exchange for participation (85%), while the remaining participants elected to receive monetary compensation in exchange for participation. Further inclusion criteria were (1) being 18 years of age or older (no upper bound was set on age), and (2) being female. Participants were treated in accordance with American Psychological Associations ethical guidelines (2002) and procedures were approved by the Institutional Review Board of Louisiana State University on April 23rd, 2014.

Four hundred and twenty-three participants were screened for eligibility. Of those participants, 190 (45%) were deemed eligible based on study criteria. Participants were able to opt out of further participation by choosing not to supply an email address, and 57 participants chose to opt out (24 of those were eligible participants [42% of total opt outs]). Of the eligible participants who supplied an email address, 160 were offered the opportunity for further participation (six participants took the survey and at the end of data collection, were eligible, and

were not contacted due to sufficient sampling). Of the eligible participants contacted, fifty-four completed the first session including the manipulation, and two did not complete the follow-up session of the study (see Figure 2).

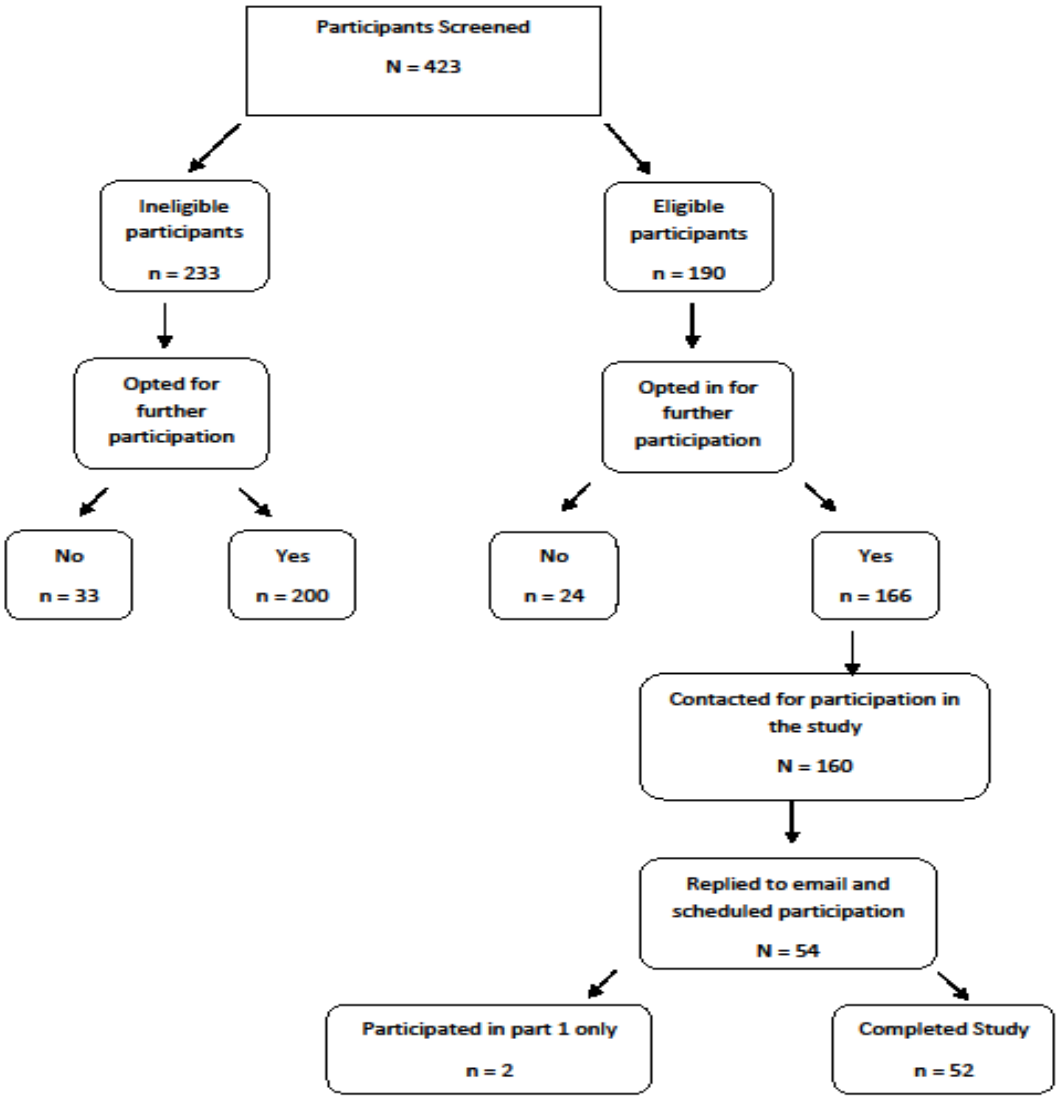

Figure 1. Participant selection procedures.

Of the 52 female college students who participated in both parts of the study, 81% identified as Caucasian, 9% as African American, 8% as Hispanic/Latino, and 2% identified as "Other." Participants had an average age of 19.76 (*SD* = 2.06), average height of 63.80 inches (*SD* = 2.74), average weight of 148.75 lbs (*SD* = 28.40), and the average body mass index (BMI) of the sample was 25.69 (*SD* = 4.38), which is within the overweight range. The majority of participants were college freshmen (38.50%). Participants were randomly assigned to condition (MME = 22, ME = 19, and NT = 11). According to power analyses, the final sample size was sufficient to detect large effect sizes with a power of .80 (calculation made with G*power; Faul, Erdfelder Lang & Buchner, 2007) for within and between-groups analyses for the active conditions (proposed group sizes were 18 participants in each active treatment condition and 9 participants in the no treatment control). Woods et al. found support for unequal sample sizes when comparing more than two treatments, with the placebo group decreased for the purposes of efficiency (1998). Effect size estimate based on effect size of *d* = 1.06 found in Moreno et al. (2012).

Participants generally completed participation within 7 days, although the range of days between baseline and follow up were 6 – 14 in the present study, due to university holidays or missed appointments. The majority (75%) of participants completed the study in a 7-day span.

Measures

Demographics Questionnaire (developed by experimenter). This measure assessed basic information (i.e., age, race, ethnicity, academic year, relationship status, sexual orientation, and religious identification). Participants were also asked to report weight and height in order to calculate body mass index (BMI). Further, participants were asked about having a regular meditation practice.

Acceptance and Action Questionnaire II (AAQ-II; Bond et al., 2011). The AAQ-II is a 10-item measure assessing self-reported acceptance, psychological inflexibility and experiential avoidance. Participants respond to each question using a rating scale ranging from 1 ("never true") to 7 ("always true"). Scores are summed and range from 10 – 70, with higher scores indicating greater psychological inflexibility. The AAQ-II has a reported alpha coefficient .84, indicating acceptable reliability (Bond et al., 2011), and the Cronbach's alpha for the present study was .88. In the present study, the AAQ-II is used to measure experiential avoidance as part of a manipulation check.

Anxiety Sensitivity Index (ASI-3; Taylor et al., 2007). The ASI-3 is an 18-item measure assessing self-reported fear of sensations associated with arousal often found in individuals with anxiety symptoms, and is comprised for three subscales: Physical Concerns (6 items), Cognitive Concerns (6 items), and Social Concerns (6 items). Participants respond to each question using a likert scale from 0 ("very little") to 4 ("very much"). Scores are summed and range from 0-72 with higher scores indicating greater fearfulness to sensations. The ASI-3 has acceptable estimates of reliability as demonstrated by coefficient alphas ranging from .79-.86 on Physical Concerns subscale, .79-.91 on Cognitive Concerns subscale and .73-.86 on Social Concerns subscale. The overall Cronbach's alpha for the present study was .90. In the present study, the ASI-3 is used to assess sensitivity to anxiety as anxiety is often comorbid with eating disorders (APA, 2006).

Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper & Fairburn, 1987). The BSQ is a 34-item questionnaire assessing concerns about body shape. Participants respond to each item using a 6-point rating scale with 1 being "never" and 6 being "always." Scores are summed and range from 34 - 204. BSQ scores less than 81 indicate little to no concern regarding

body shape, scores between 81–110 suggest slight worry, scores between 111-140 indicate moderate worry, and scores higher than 140 indicate extreme worry about body shape (Cooper & Taylor, 1988). The BSQ has satisfactory concurrent and discriminant validity (Cooper et al., 1987), and excellent internal consistency r = .97 (Pook, Tuschen-Caffier, & Brahler, 2008), and the Cronbach's alpha for the present study was .97. In the present study, the BSQ is used as an outcome measure at follow-up of body shape concern.

Depression Anxiety Stress Scales-21 (DASS-21; Lovibond, S. H., & Lovibond, P. F., 1995). The DASS-21 is a 21-item measure to assess for anxiety, stress and depressive symptoms over the past week, with each subscale (i.e., depression, anxiety and stress) comprising 7 questions. Participants respond to each item 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"). Items are summed, multiplied by 2 and range from 0-42 on each subscale, with higher scores indicative of greater psychopathology. The DASS-21 has adequate internal consistency (depression: α = .829; anxiety: α .77; stress: α = .87; Norton, 2007), and the Cronbach's alpha for the present study was .90. In the present study, the DASS is used to assess syndromes frequently co-occurring with disordered eating (APA, 2006).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS is a 36-item comprehensive assessment of emotion dysregulation. Participants respond to each item using a 5 point rating scale with 1 being "almost never" and 5 being "almost always." For the total score, items are summed and range from 36-180, with higher scores indicating more difficulty regulating emotions. The DERS has demonstrated good test-retest reliability and construct validity in a college student sample. Reported internal consistency of the measure is .93 (Gratz & Roemer, 2004), and in the present study, the Cronbach's alpha was calculated at .94. In

the present study, the DERS total score is used to measure emotion regulation ability and strategies as part of a manipulation check

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn, 2008). The EDE-Q is a 28-item self-report questionnaire assessing frequency of disordered eating attitudes and behaviors with four subscales: Restraint (five items), Eating Concern (5 items), Shape Concern (eight items), and Weight Concern (five items). Participants respond to each question on 7-point scale with 0 being "Not at all" or "no days" and 6 being "markedly" or "every day." Scores on each subscale are averaged and range from 0 – 7. Higher scores are associated with more frequent disordered thoughts or behaviors. Internal consistency ratings range from 0.70 and 0.93 (Berg, Peterson, Frazier, & Crow, 2012), and the Cronbach's alpha for the present study was .90. Participants were eligible for the present study if they endorsed a score of 4 or greater (indicating moderate or greater concern) on 2 of the following 4 items: "Has your weight influenced how you think about [judge] yourself as a person?" "Has your shape influenced how you think about [judge] yourself as a person?" "How dissatisfied have you been with your weight?" "How dissatisfied have you been with your shape?" In the present study, the EDE-Q was used to assess eligibility and as a measure of disordered eating pathology.

Five Factor Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The FFMQ is a 39-item measure to assess self-reported use of mindfulness strategies using five subscales: Observing (eight items), Describing (eight items), Acting with Awareness (eight items), Non-Judging (eight items), and Non-Reacting (seven items). Participants respond to statements asking about specific use of skills associated with mindfulness using a five point scale with 1 being "never or very rarely true" and 5 being "very often or always true." Scores for each subscale are summed and range from 7 – 40. Higher scores are associated with more frequent use of

mindfulness skills. The FFMQ has reported Cronbach's alphas ranging from 0.86 to 0.93 indicating high internal reliability (Christopher, Neuser, Michael & Baitmangalkar, 2012) and the Cronbach's alpha for the present study was .84. In the present study, the FFMQ is used to measure self-reported trait mindfulness.

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item self-report measure of emotion, yielding a positive and negative factor. Participants rate a list of emotions (i.e., ashamed, jittery, hostile) using a 5 point rating scale ranging from 1 (very slightly or not at all) to 5 (extremely). This measure has good internal consistency reliability (r = .85) and excellent discriminant validity (Watson et al., 1988), and Cronbach's alpha in the present study was calculated at .85 for negative affect and .87 for positive affect. In the present study, the PANAS is used to measure negative affect for the present moment, and was assessed both at pre- and post-manipulation and follow up.

The Toronto Mindfulness Scale (TMS; Lau et al., 2006). The TMS is a brief 13-item assessment of state mindfulness. The TMS is composed of two subscales, Curiosity (7 items) and Decentering (8 items). This measure is unique in that it measures mindfulness as a state that may vary within individuals across particular moments of time. Coefficient alpha for the two factors are .93 and .91 respectively, indicating excellent reliability, and the measure is reported as having good discriminate validity (Lau et al., 2006). In the present study, the Cronbach's alpha was .82 (Curiosity) and .79 (Decentering). This measure is used to assess pre- and post-manipulation changes in mindfulness as part of a manipulation check.

Manipulation

Mindfulness meditation procedure. Participants were brought to a quiet therapy room and sat at a table, then were presented with study materials. Participants were introduced to the

concept of mindfulness with a brief explanation of the main focuses of mindfulness and the usefulness of such practices in improving health and wellbeing. Information regarding the importance of mindfulness was adapted from a script provided by the authors of the Luethcke et al. study (2011). Participants also reviewed a brief handout on mindfulness (Linehan, 1993). Participants then listened to a 10 minute guided meditation recording alone. The mindfulness instructions provided in the recording were adapted from Kabat-Zinn (1994). The recording encouraged the participant to focus on the breath, experiencing the present moment, and emphasizes an attitude of acceptance and non-judgment. This recording was used by Adams et al., (2013) and Vinci et al. (2014) and was replicated for use in the present study. Use of the recording in both the Adams et al. and Vinci et al. studies was associated with increases in state mindfulness compared to individuals who did to listen to the tape. Wording of mindfulness instructions are provided in Appendix A.

Mirror exposure procedure. Participants were asked to participate in a brief mirror activity, and guided to a mirror within the therapy room. The purpose and instructions of the procedure were described, and trained research assistants demonstrated aspects of the procedure. Participants were then instructed to stand before the mirror alone and follow a list of body parts posted on the wall, generating two statements about each part (in the mindfulness-based mirror exposure condition, participants were instructed to use non-judgmental statements). If participants could not generate a response, the research assistant encouraged them to reference a list of examples posted beside the mirror. A screen separated research assistants from participants during the procedure for additional privacy. Procedures of the mirror exposure were adapted from previous work (Luethcke et al., 2011; Moreno et al., 2012). Before beginning the procedure and after receiving the instructions, participants were asked to change into a black

bathing suit (one piece in black, provided by the researchers) behind the privacy screen. In order to determine the effectiveness of mirror exposure as a fear-provoking stimuli (according to the emotional processing theory), research assistants asked participants for their subjective units of distress levels ("on a scale of 0 – 100 with 0 being perfectly comfortable and 100 being completely distressed, how distressed do you feel?") at the beginning, middle (as determined by progressing to the median item of the list of body parts) and end of the procedure. This procedure was utilized in Hildebrandt et al. (2012) to determine reactions to mirror exposure. In the combined mindfulness based mirror exposure condition, research assistants interrupted participants if a participant made two comments deemed as judgmental. Exposures lasted between approximately five and twenty minutes in duration. In the mirror exposure condition, following post-manipulation questionnaires, participants were also asked to review a handout packet on healthy eating provided by the examiner. This was utilized to equate groups with one another on time spent in the manipulation.

No treatment control. Participants were directed to a quiet therapy, and were provided with a puzzle book and a pencil. They were left alone and instructed to work through as many word searches, sudokus or crossword puzzles as time allowed. Participants spent approximately 30 minutes, and this time was selected to match the active conditions. Participants then took post-questionnaires after the time has elapsed.

Procedures

Participants registered for the study on the Psychology Department's Research Participation System (SONA; a secure database) for those receiving experimental credits. Participants not receiving research credit were recruited through flyer and online advertisements (see Appendix B for recruitment flyer). All participants completed the screening questionnaires

(a demographics questionnaire and the EDE-Q) on SurveyMonkey, and eligible participants were emailed an invitation for further participation. Eligibility was determined based on EDE-Q scores of 4 or higher on selected items. Eligible participants interested in further participation replied to the invitation email and were scheduled for the manipulation stage.

In the manipulation phase of the study, participants arrived at the on-campus clinic and were greeted by a research assistant. All research assistants were undergraduate and graduate student females, and all were trained and observed running participants by another graduate level clinician on the study. Additionally, research assistants were asked to adhere to a scripted protocol detailing procedures.

Participants were taken to a private room, and provided with a detailed consent form. Research assistants reviewed consent with potential participant, and addressed any questions. Participants were randomly assigned to one of three conditions: Mirror Exposure (ME), Mindfulness Meditation + Mirror Exposure (MME) or No Treatment Control (NT). The experiment was divided into five phases.

Phase 1: Pre-manipulation questionnaires. Participants completed all study questionnaires, (excepting the EDE-Q and demographic questionnaire which were administered at the screening) in a private therapy room in a standardized order.

Phase 2: Manipulation. Participants in MME condition were provided with basic information about mindfulness and listened to a 10-minute audio recording of a guided meditation as described above. Participants in the ME group were not instructed in mindfulness and did not listen to the guided meditation. Instead, participants in the ME group reviewed an informational sheet on sleep hygiene and time management to equate for time and attention. Participants in the MME and the ME conditions then completed the mirror exposure activity as

described above (participants in the MME group receiving prompts to utilize skills learned in the mindfulness meditation such as present moment focus and de-emphasizing judgment). Participants were asked for subjective units of distress (SUDS) at three time points during the mirror exposure (before, in the middle, and at the end). Following the mirror exposure, participants in the ME condition reviewed a handout on healthy eating to again equate the time spent in each condition. Participants in the NT condition were left alone in the therapy room with a puzzle book for a span of time equal to the active treatment conditions.

Phase 3: Post-manipulation questionnaires. Participants then completed the PANAS, AAQ-II and TMS, to examine state changes following manipulation. In each condition, participants spent approximately 60-75 minutes in this session.

Phase 4: Follow-up and debriefing. All participants were scheduled 1 - 2 weeks later to complete the same questionnaires as in session one, with the addition of the screening measure (see Table 1 for explanation of time points of measures administered). Follow ups were

Table 1. Measures Administered and Time Points of Administration.

Measure	Pre	Post	Follow-up (1 week)
AAQ-II	X	X	X
ASI	X		X
BSQ	X		X
DASS	X		X
DERS	X		X
EDE-Q	X (screen)		X
FFMQ	X		X
PANAS	X	X	X
TMS	X	X	X

scheduled for one week after initial participation; however if school holidays or schedules interfered, participants could complete up to two weeks later). Participants were debriefed about the study and asked not to talk about the study with other participants. Participants were

rewarded research credit or given monetary compensation ($20) for their participation. All participants received a printed sheet with referrals for psychological services in the community. Participants spent approximately 30 minutes in this session.

RESULTS

Baseline Differences Assessed

In order to address differences between eligible participants who opted for further participation in the study and those who chose no further participation, four one-way analyses of variance (ANOVAs) were conducted examining global EDE-Q scores and demographics. There were no significant differences between eligible participants who chose further participation (M = 4.03, SD = 1.21), and individuals who opted out of further participation (M = 3.89, SD = 0.97) on global scores of disordered eating, or other demographic factors (i.e., age, BMI, weight). Exploratory analyses were conducted to compare those participants who participated in the study with those who did not. A one-way ANOVA was conducted and found that those who participated in the study had a significantly higher global score on the EDE-Q (M = 3.24, SD = 1.17) than those who did not participate (M = 1.85, SD = 1.29; F [1, 394] = 54.31, $p < .001$).

To determine significant differences between groups at baseline for participants involved in the manipulation stage of the study, ANOVAs were conducted for age, BMI, disordered eating symptoms (EDE-Q), body shape concern (BSQ), anxiety sensitivity (ASI), baseline state mindfulness (TMS), trait mindfulness (FFMQ), depression (DASS-D), anxiety (DASS-A), and stress (DASS-S; see Table 2 for means for each group at baseline) . A Bonferroni correction was utilized in this analyses to control for the family-wise error rate, thus reducing significance in these comparisons to .005. Groups did not significantly differ on age, BMI, disordered eating, body shape concern, state or trait mindfulness, depressive symptoms, self-reported stress, or anxiety sensitivity (see Table 3 for details). There were no significant differences between groups receiving the mirror exposure manipulation on SUDS (when SUDS scores were averaged). There were significant differences between all groups on measured anxiety, such that

the ME group endorsed symptoms in the severe range, the MME group endorsed symptoms in the mild range, and the NT group endorsed symptoms in the normal range (Lovibond & Lovidbond, 1995).

Table 2. Means (with standard deviations in parentheses) for each group on baseline measures.

Measure	Mirror Exposure	Mindfulness Mirror Exposure	No Treatment
Age	19.28 (1.56)	20.09 (2.41)	19.91 (2.02)
BMI	25.25 (4.94)	25.80 (3.77)	26.31 (4.74)
EDE-Q	3.47 (1.19)	3.43 (1.08)	2.93 (0.94)
BSQ (original)	131.95 (31.42)	133.81 (37.03)	104.00 (31.99)
BSQ (final)	135.06 (31.51)	133.81 (37.03)	109.50 (28.14)
TMS	29.26 (8.61)	26.31 (7.45)	27.72 (5.04)
FFMQ	111.05 (12.30)	114.52 (18.89)	121.82 (14.18)
SUDS (averaged)	36.15 (25.00)	29.73 (22.64)	Not applicable
DASS-A_a	9.00 (4.17)	5.00 (4.06)	2.72 (1.95)
DASS-D_b	8.11 (4.68)	5.55 (4.32)	4.18 (3.73)
DASS-S	10.83 (3.71)	8.81 (5.53)	7.00 (3.31)
ASI_c	30.47 (13.12)	27.19 (14.51)	16.18 (8.95)

Note. Subscript describes significant difference between groups. $_a$ ME group significantly differed from other two groups. $_b$ ME and NT groups differed significantly. $_C$ NT group significantly differed from other two groups.

Table 3. Results of One-Way ANOVA testing differences between groups at baseline and post.

Baseline Measure	*F*	*p*	η^2
Age	0.80	.454	0.03
BMI	0.20	.823	0.01
EDE-Q	1.01	.373	0.04
BSQ	2.19	.123	0.09
TMS-D	0.49	.613	0.02
TMS-C	0.78	.463	0.03
FFMQ	1.64	.205	0.06
SUDS (averaged)	0.75	.393	0.02
DASS-A	9.75	.001***	0.28
DASS-D	3.29	.046	0.12
DASS-S	2.56	.088	0.10
ASI	4.46	.017	0.15
AAQ	3.40	.041	0.12
PANAS-PA	0.03	.974	0.01
PANAS-NA	0.99	.996	0.04
DERS	1.48	.237	0.06

Table 3 continued. Results of One-Way ANOVA testing differences between groups at baseline and post.

Post Measure	*F*	*p*	η^2
TMS-C	0.66	.519	.030
TMS-D	1.65	.203	.063
AAQ	3.21	.049*	.116
PANAS-PA	0.80	.457	.032
PANAS-NA	3.77	.030*	.133
DERS [a]	3.04	.057	.110

Note. [a] The DERS was measured at baseline and follow-up, not immediately post intervention. Due to multiple comparisons, a Bonferroni correction was applied such that significance is marketed at $p < .003$.

Regarding body shape concern, one of the primary outcome measures, there were no statistically significant differences between groups. Participants in the no treatment control condition on average scored in the "slight worry" range of the BSQ, while active treatment conditions scored in the "moderate worry" range, indicating that the no treatment control condition endorsed less severe body-related worry. It was discovered that three participants (two from the ME group and one from the NT group) failed to complete the back half of the BSQ measure at follow up (due to copier malfunction), and as a result, these three participants were excluded from main analyses involving the BSQ (these participants were include in other analyses not involving this measure).

Further, in order to assess the level of pathology within our sample, means were compared to reported normative data for disordered eating and body shape concern. Scores on all subscales of the EDE-Q in the present study were at least one standard deviation higher than a community sample (Fairburn & Beglin, 1994). Comparisons were made with normative data on undergraduate women (demonstrating means significantly higher than community samples), and the current sample was at least one standard deviation higher than the norms of college women

on global measure of eating disorder pathology, shape concern and weight concern (Luce et al., 2008). Additionally, in the present study, the overall means of participants with regard to body shape concern were well within the moderate concern range (Cooper & Taylor, 1988).

Manipulation Checks

Subjective units of distress (SUDS) were measured at three time points during the procedure, and were used in part to determine self-reported distress in response to the mirror exposure procedure. In general, participants demonstrated increases in SUDS across the procedure. See Table 4 for descriptive data on each SUDS time point.

Table 4. Subjective Units of Distress (SUDS) descriptive data

Descriptive	SUDS 1	SUDS 2	SUDS 3
Mean	27.66 (25.27)	35.73 (24.67)	34.73 (25.28)
Median	20.00	25.00	30.00
Mode	10.00	20.00; 25.00	10.00; 15.00; 30.00
Minimum	1.00	1.00	1.00
Maximum	85.00	90.00	90.00
25^{th} Percentile	10.00	20.00	15.00
75^{th} Percentile	45.00	52.50	50.00

Note. SUDS 1 = Subjective units of distress measured at the beginning of the mirror exposure procedure; SUDS 2 = Subjective units of distress measured in the middle of the mirror exposure procedure; SUDS 3 = Subjective units of distress measured at the end of the mirror exposure procedure.

A manipulation check was conducted regarding changes in self-reported mindfulness immediately following manipulation using a paired t-test for each group individually, followed by two one-way ANOVAS at each time point to determine significant differences between groups. This method was selected over a repeated measures ANOVA, as it allows for more direct examination of changes across times specific to each group in order to determine whether the manipulations worked as planned (see Table 5 for descriptive statistics on manipulation checks).

Table 5. Results of manipulations checks by group changes baseline to post

Mirror Exposure						
Measure	*t* value	*p* value	Baseline *M(SD)*	Post *M(SD)*	Effect size (*d*)	Change
TMS-D	2.82	.010**	13.42 (4.59)	16.26 (5.74)	0.51	+2.84
TMS-C	-1.17	.256	15.84 (4.74)	17.00 (5.60	-0.20	+1.16
PANAS-NA	-0.57	.577	19.84 (5.96)	20.95 (8.36)	-0.17	+1.11
PANAS-PA	2.39	.028*	25.44 (9.36)	22.66 (9.71)	0.46	-2.78
AAQ	-1.79	.089	38.31 (9.83)	40.84 (10.70)	-0.24	+2.53
DERS	-0.35	.728	103.10 (20.32)	104.53 (21.31)[a]	-0.07	+1.43
Mindfulness Mirror Exposure						
Measure	*t* value	*p* value	Baseline *M(SD)*	Post *M(SD)*	Effect size (*d*)	Change
TMS-D	-4.97	.001***	12.27 (3.34)	17.27 (4.49)	-1.04	+5.00
TMS-C	-1.50	.147	14.04 (5.17)	16.18 (5.28)	-0.35	+2.14
PANAS-NA	1.73	.097	20.50 (8.73)	17.54 (8.41)	0.41	-2.96
PANAS-PA	0.37	.715	26.36 (5.68)	25.77 (7.71)	0.08	-0.59
AAQ	-3.43	.002**	44.09 (12.67)	48.59 (13.01)	-0.65	+4.50
DERS	0.46	.647	94.09 (27.34)	92.13 (24.61)[a]	0.07	-1.96
No Treatment						
Measure	*t* value	*p* value	Baseline *M(SD)*	Post *M(SD)*	Effect size (*d*)	Change
TMS-D	-2.19	.053	12.45 (3.23)	14.00 (3.87)	-0.81	+1.55
TMS-C	0.42	.686	15.27 (3.23)	14.72 (4.19	0.14	-0.55
PANAS-NA	3.46	.006**	16.81 (5.47)	13.00 (3.52)	1.01	-3.81
PANAS-PA	-0.71	.028	25.72 (9.71)	26.36 (10.26)	-0.12	+0.60
AAQ	-1.07	.307	49.27 (10.95)	50.73 (11.09)	-0.28	+1.46
DERS	0.28	.787	87.60 (23.74)	86.50 (21.13)[a]	0.05	-1.10

[a] Note. The DERS was measured at baseline and follow-up, not immediately post intervention.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Paired sample t-tests were conducted on the dependent variables of state mindfulness (TMS), affect (PANAS), experiential avoidance (AAQ), and emotion regulation (DERS). For the ME group, investigating subscales of the TMS for the ME group, Curiosity (TMS-C) did not significantly change from pre to post manipulation, while Decentering (TMS-D) significantly

increased from pre to post. Participants showed significant change from pre to post manipulation on positive affect as measured by the PANAS (PA), indicating a decrease in positive emotion. Participants did not show significant changes from pre to post manipulation on measures of negative affect (PANAS-NA), experiential avoidance, or emotion regulation.

For the MME group, the TMS subscale of Curiosity did not significantly change from pre to post, while Decentering increased significantly from pre to post. Participants showed significant change from pre to post manipulation on experiential avoidance, indicating increased avoidance. Participants did not show significant differences from pre to post manipulation on measures of negative affect, positive affect, or emotion regulation.

For the NT group, participants showed significant change from pre to post test on negative affect as measured by the PANAS, indicating a decrease in negative affect. Participants did not show significant differences from pre to post test on measures of mindfulness, positive affect, experiential avoidance, or emotion regulation.

A one-way ANOVA was conducted using baseline scores to detect significant differences between groups. There were no other significant differences between groups at baseline on measured mindfulness, emotion regulation, positive or negative affect, or experiential avoidance (see Table 4).

A one-way ANOVA was conducted for post scores to detect significant differences between groups. Groups differed significantly at post-manipulation (measured immediately following manipulation) on self-reported negative affect, with the NT group reporting significantly less negative affect than the other active conditions. Groups differed significantly post-manipulation on measured experiential avoidance, with the Mirror Exposure group endorsing less experiential avoidance than the other conditions. There were no other significant

differences between groups at post-manipulation on measured mindfulness, emotion regulation, or positive affect (see Table 3).

Primary Analyses

To test Hypotheses 1 and 2 that the active treatment conditions (ME and MME) would demonstrate significant improvements on body related concerns and disordered eating across time compared to the NT, two separate mixed repeated-measures ANOVA was conducted with all participants. The independent variables (IVs) were Group (MME, ME, NT) and Time (baseline, follow-up), and the dependent variables (DV) were EDE-Q and BSQ scores. Hypotheses were partially supported through theses analyses for both DVs. Significant differences were found across time for EDE-Q scores, indicating that scores on average decreased across time (see Table 6 for mean differences between groups pre and post manipulation on measured outcome variables). There were no significant differences between groups, and no significant interaction between time and group on EDE-Q scores, meaning that the hypotheses were only partially supported. For the BSQ scores, significant differences were found across time, indicating that scores on average decreased. Again, there were no significant differences between groups, and no significant interaction on BSQ scores, again indicating that the hypotheses were only partially supported. These results indicate that all groups reported significant decreases in body shape concern and disordered eating across time, but that there were no differences between groups (even within a group which received no active component of treatment).

Table 6. Changes in outcome variable scores from baseline to follow-up by group.

EDE-Q			
Group	Baseline *M(SD)*	Follow-Up *M(SD)*	Change
ME	3.46 (1.19)	2.87 (1.19)	-0.59
MME	3.44 (1.08)	3.00 (1.15)	-0.44
NT	2.92 (0.94)	2.29 (0.99	-0.63
BSQ			
Group	Baseline *M(SD)*	Follow-Up *M(SD)*	Change
ME	135.05 (31.51)	126.64 (33.71)	-8.41
MME	133.81 (37.03)	122.00 (34.95)	-11.81
NT	109.50 (28.14)	102.90 (32.46)	-6.6

and Time (baseline, follow-up), and the DVs were EDE-Q and BSQ scores. Consistent with findings above, Hypothesis 3 was not supported for either DV. Significant differences were found across time, for EDE-Q scores, indicating that scores on average decreased across time. There were no significant differences between groups, and no significant interaction between group and time for EDE-Q scores. For the BSQ scores, significant differences were found across time, indicating that scores on average decreased. There were no significant differences between groups, and no significant interaction between group and time for BSQ scores. These findings indicate that our hypothesis was not supported. This again indicates that both groups performed equally well in reducing body shape concern and self-reported disordered eating across time (see Table 7 for results of ANOVAs).

Table 7. Mixed repeated-measures ANOVA results predicting outcome variables.

DV = BSQ			
All participants included	$n = 49$		
Effect (df)	F	p	η^2
Time (1, 46)	10.80	.002**	.190
Group (2, 46)	2.02	.144	.002
Interaction (2, 46)	0.34	.713	.012
Active manipulation group	$n = 39$		
Effect (df)	F	p	η^2
Time (1, 37)	11.66	.002**	.238
Group (2, 37)	0.07	.786	.001
Interaction (2, 37)	0.33	.569	.007
DV = EDE-Q			
All participants included	$n = 52$		
Effect (df)	F	p	η^2
Time (1,49)	16.66	.001***	.251
Group (2,49)	1.47	.239	.006
Interaction (2,49)	0.23	.797	.057
Active intervention groups	$n = 41$		
Effect (df)	F	p	η^2
Time (1, 39)	12.35	.001***	.238
Group (2, 39)	0.02	.879	.001
Interaction (2, 39)	0.31	.579	.006

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. BSQ = Body Shape Questionnaire; EDE-Q = Eating Disorder Examination Questionnaire.

Post-hoc Exploratory Analyses

While no formal hypotheses were made regarding mediation, exploratory analyses were conducted to test whether any differences occurred between groups on mediator variables, thus indicating an alternative causal influence in outcome. In order to further evaluate any differences between groups, mediation analyses were utilized using pre-determined mediator variables: anxiety sensitivity (ASI) and SUDS ratings to determine the potential causal influence of these constructs on the observed outcomes. For the purpose of these analyses, the participants' three SUDS ratings (subjective units of distress taken at three time points during the mirror exposure)

were averaged. For these analyses, the NT group was not examined (the NT group did not receive mirror exposure and therefore was not asked SUDS ratings). Meditation was conducted with planned multiple regression to assess each component of the proposed mediation model, and analyses followed the Preacher and Hayes (2004) Sobel method of testing mediation: Step One demonstrates the relationship between the causal variable and the outcome (in this case, baseline and follow up scores on disordered eating and body shape concern, respectively); Step Two demonstrates the relationship between the causal variable and the mediator (for these analyses, the mediators are SUDS and ASI); Step Three demonstrates the relationship between the mediator (SUDS and ASI respectively) and the outcome variable (body shape concern and disordered eating, respectively); Step Four determines the nature of the relationship between the causal and outcome variable when controlling for the mediator variable. For the present study, the 95% confidence interval of the indirect effect was examined using a 5000 bootstrap resamples. Eight separate sets of regression analyses were conducted for each of the two predictors (disordered eating and body shape concern) and each of the two pre-determined mediator variables (SUDS and anxiety sensitivity).

Mediation analyses for EDE-Q as the outcome for each group. ASI as mediator for ME. Within the Mirror Exposure (ME) Group, analyses were run to determine whether ASI at follow-up significantly mediated the relationship between baseline EDE-Q scores and follow-up EDE-Q scores using a series of multiple regression analyses, as described above, to test each proposed step of mediation. Step One found that baseline EDE-Q scores predicted EDE-Q scores at follow up. Step Two found that EDE-Q baseline scores did not significantly predict ASI at follow up. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicated that

anxiety sensitivity did not mediate the relationship between disordered eating scores at baseline and follow up for participants in the Mirror Exposure Group (see Table 8).

Table 8. Anxiety sensitivity as a mediator disordered eating baseline to follow up.

Mirror Exposure Group	*n* = 18		
	β	*t*	*p*
Step One	0.546	2.55	.022*
Step Two	0.517	1.76	.098
Step Three	0.032	1.92	.074
Step Four	0.378	1.75	.101
	β	*z*	*p*
Sobel indirect effect	0.167	1.21	.226
Mindfulness Mirror Exposure Group	*n* = 21		
	β	*t*	*p*
Step One	0.819	5.06	.001***
Step Two	6.321	2.18	.042
Step Three	-0.006	-0.45	.660
Step Four	0.856	4.63	.001***
	β	*z*	*p*
Sobel indirect effect	-0.370	-0.39	.689

Note. * $p < .05$. ** $p < .01$. *** $p < .001$

ASI as mediator for MME. Within the Mindfulness-Based Mirror Exposure (MME) Group, analyses were run to determine whether ASI at follow-up significantly mediated the relationship between baseline EDE-Q scores and follow-up EDE-Q scores using a series of multiple regression analyses to test mediation. Step One found that baseline EDE-Q scores predicted EDE-Q scores at follow up. Step Two found that EDE-Q baseline scores significantly predicted ASI at follow up. Step Three found that ASI follow up scores did not significantly predict EDE-Q-follow up scores. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicates that anxiety sensitivity had no direct or indirect effect in meditating the outcome for participants in the MME Group (see Table 8).

SUDS as mediator for ME. Within the Mirror Exposure Group, analyses were run to determine whether SUDS significantly mediated the relationship between baseline EDE-Q scores and follow-up EDE-Q scores using a series of multiple regression analyses to test mediation. Step One found that baseline EDE-Q scores predicted EDE-Q scores at follow up. Step Two found that EDE-Q baseline scores did not significantly predict SUDS. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicated that SUDS did not mediate the relationship between disordered eating scores at baseline and follow up for participants in the Mirror Exposure Group (see Table 9).

Table 9. Subjective units of distress as a mediator of disordered eating baseline to follow up.

Mirror Exposure Group	$n = 19$		
	β	t	p
Step One	0.596	3.07	.007**
Step Two	0.191	0.04	.971
Step Three	0.014	1.56	.138
Step Four	0.593	3.18	.006**
	β	z	p
Sobel indirect effect	0.003	0.03	.975
Mindfulness Mirror Exposure Group	$n = 22$		
	β	t	p
Step One	0.773	4.74	.001***
Step Two	6.651	1.49	.149
Step Three	0.009	1.09	.288
Step Four	0.713	4.17	.001***
	β	z	p
Sobel indirect effect	0.059	.77	.436

Note. * $p < .05$. ** $p < .01$. *** $p < .001$

SUDS as mediator for MME. Within the Mindfulness-Based Mirror Exposure Group, analyses were run to determine whether SUDS significantly mediated the relationship between baseline EDE-Q scores and follow-up EDE-Q scores using a series of multiple regression analyses to test mediation. Step One found that baseline EDE-Q scores predicted EDE-Q scores

at follow up. Step Two found that EDE-Q baseline scores did not significantly predict SUDS. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicates that SUDS had no direct or indirect effect in meditating the outcome for participants in the Mindfulness-Based Mirror Exposure Group (see Table 9).

Mediation analyses for BSQ as the outcome for each group. ASI as mediator for ME. Within the Mirror Exposure Group, analyses were run to determine whether ASI at follow-up significantly mediated the relationship between baseline BSQ scores and follow-up BSQ scores using a series of multiple regression analyses to test mediation. Step One found that baseline BSQ scores predicted BSQ scores at follow up. Step Two found that BSQ baseline scores did not significantly predict ASI at follow up. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicated that anxiety sensitivity did not mediate the relationship between disordered eating scores at baseline and follow up for participants in the Mirror Exposure Group (see Table 10).

Table 10. Anxiety sensitivity as a mediator of body shape concern baseline to follow up.

Mirror Exposure Group	$n = 17$		
	β	t	p
Step One	0.893	5.87	.001***
Step Two	0.114	0.96	.353
Step Three	0.731	2.62	.020*
Step Four	0.809	6.09	.001***
	β	z	p
Sobel indirect effect	0.084	0.84	.397

Table 10 continued. Anxiety sensitivity as a mediator of body shape concern baseline to follow up.

Mindfulness Mirror Exposure Group	*n* = 21		
	β	*t*	*p*
Step One	0.839	8.18	.001***
Step Two	0.210	2.62	.017
Step Three	0.453	1.61	.126
Step Four	0.744	6.46	.001***
	β	*z*	*p*
Sobel indirect effect	.095	1.30	.193

Note. * $p < .05$. ** $p < .01$. *** $p < .001$

ASI as mediator for MME. Within the Mindfulness-Based Mirror Exposure Group, analyses were run to determine whether ASI at follow-up significantly mediated the relationship between baseline BSQ scores and follow-up BSQ scores using a series of multiple regression analyses to test mediation. Step One found that baseline BSQ scores predicted BSQ scores at follow up. Step Two found that BSQ baseline scores significantly predicted ASI at follow up. Step Three found that ASI- follow up scores did not significantly predict BSQ-follow up scores. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicates that anxiety sensitivity had no direct or indirect effect in meditating the outcome for participants in the Mindfulness-Based Mirror Exposure Group (see Table 10).

SUDS as mediator for ME. Within the Mirror Exposure Group, analyses were run to determine whether SUDS significantly mediated the relationship between baseline BSQ scores and follow-up BSQ scores using a series of multiple regression analyses to test mediation. Step One found that baseline BSQ scores predicted BSQ scores at follow up. Step Two found that BSQ baseline scores did not significantly predicted SUDS. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicated that SUDS did not mediate the relationship between

reported body shape concern at baseline and follow up for participants in the Mirror Exposure Group (see Table 11).

Table 11. Subjective units of distress as a mediator of body shape concern baseline to follow up.

Mirror Exposure Group	*n* = 17		
	β	*t*	*p*
Step One	.893	5.87	.001***
Step Two	.190	0.99	.338
Step Three	.155	0.74	.469
Step Four	.864	5.42	.001***
	β	*z*	*p*
Sobel indirect effect	.029	0.46	.643
Mindfulness Mirror Exposure Group	*n = 22*		
	β	*t*	*p*
Step One	.828	8.18	.001***
Step Two	.289	2.40	.026*
Step Three	.241	1.30	.207
Step Four	.758	6.70	.001***
	β	*z*	*p*
Sobel indirect effect	.069	1.07	.281

Note. * $p < .05$. ** $p < .01$. *** $p < .001$

SUDS as mediator for MME. Within the Mindfulness-Based Mirror Exposure Group, analyses were run to determine whether SUDS significantly mediated the relationship between baseline BSQ scores and follow-up BSQ scores using a series of multiple regression analyses to test mediation. Step One found that baseline BSQ scores predicted BSQ scores at follow up. Step Two found that BSQ baseline scores significantly predicted SUDS. Step Three found that SUDS scores did not significantly predict BSQ-follow up scores. The Sobel test of indirect effects was not significant. The bootstrap confidence intervals to assess indirect effect included 0, indicating no indirect mediation. This indicates that SUDS had no direct or indirect effect in meditating the outcome for participants in the Mindfulness-Based Mirror Exposure Group (see Table 11).

Observed Power

In considering the lack of significant findings for the primary analyses within the present study, power analyses were calculated for within-subjects, between-subjects, and within-between interactions for each predicted variable (EDE-Q and BSQ).

To detect within-subject differences across time, the observed power in the present study was .84 for BSQ, and the effect size was between medium and large (η^2 = .190). This indicates that there was sufficient statistical power to detect an effect across time. To detect between-subject differences (between groups), the observed power in the present study was .06 for the BSQ, and the effect size was very small (η^2 = .002), indicating little power to detect an effect. The power to detect a between- and within-subject interaction for the BSQ was .33, and the effect size was very small (η^2 = .012), again indicating insufficient power to detect an interaction effect.

To detect within-subject differences across time, the observed power in the present study was .93 for EDE-Q, and the effect size was between medium and large (η^2 = .251). This indicates adequate power to detect an effect across time. To detect between-subject differences, the observed power in the present study was .05 for the EDE-Q, and the effect size was very small (η^2 = .006), indicating little power to detect group differences. The power to detect a between- and within-subject interaction for the EDE-Q was .23, and the effect size was very small (η^2 = .057), again reflecting a non-optimal degree of power to detect an effect.

DISCUSSION

The present study was the first to examine the impact of mindfulness practice as a useful supplement to mirror exposure in comparing the two iterations of mirror exposure side by side with regard to disordered eating and body image amongst a group of college women endorsing moderate concerns in a one-session manipulation. As mindfulness skills are enhanced through meditation practice (Bauer, 2003), and mindfulness instructions have been deemed useful in mirror exposure with those endorsing weight and shape concerns, this study was unique in examining both combined. Given the added time and energy required to provide mindfulness-based training, it is important to discern the added benefit mindfulness may provide. Guided meditation has been utilized only once in previous mirror exposure interventions as a means of enhancing the mindfulness instructions (Luethcke et al., 2011), although not with a group endorsing problematic body image concerns, and not when compared to a no treatment control group. Findings of the present study indicated that although all participants improved across time with regard to disordered eating and body shape concern, there were no differences between groups. This suggests that even participants who had no active treatment that focused on body image reported improvements across time around disordered eating cognitions and behaviors as well as body shape concern.

There are many factors that may explain this unexpected finding. Random assignment was utilized to prevent differences between groups, and baseline differences were assessed and found no significant differences on the primary outcome variables. Despite this, there was a trend towards less severe pathology amongst the no treatment control group in terms of body shape concern (and the group demonstrated less pathology with regard to other non-primary outcomes such as less anxiety sensitivity). Furthermore, participants did not differ on how they qualified

for the study (by endorsing items exclusively related to body dissatisfaction or exclusively related to self-judgment or both) and group assignment, nor did they differ in endorsing severity of qualifying items endorsed (scores on the four items required to qualify for the study) and group assignment. It remains that although participants did not demonstrate significant differences at baseline on primary outcome measures, there was a definite trend towards less severe pathology amongst the no treatment control group, which may have impacted the outcome of the study.

The timespan between manipulation and follow up may have limited our ability to detect a significant effect across time, as both disordered eating and body image are constructs that may require a significant amount of time to observe differences. Specifically, the questions on the EDE-Q inquire about the number of occurrences (of behavior, thoughts, attitudes) in a month, therefore, if a participant is responding regarding changes over the past week, this could theoretically only impact roughly a quarter of their score on the measure. It may be possible that given more time, changes across time may be more apparent. In Moreno et al. (2012), differences between groups (each receiving a different type of instructions prior to mirror exposure) on subjective discomfort began to emerge only after 3 sessions of treatment. Additionally, treatment gains in the Moreno study were additive across time, in that significant reductions on body shape concern were seen after 5 weeks, and further reductions were evidenced after a one-month follow up. Nevertheless, in the topic of interest was improvements following a very brief manipulation, and it may be possible that distinctions between groups may not be elicited or apparent after one week. While, we did not find support for such a brief manipulation, this finding may establish a potential floor for the number and duration of mirror exposure manipulations required to see a meaningful impact.

Furthermore, participants may have become sensitized at pretest towards the nature of the study and thereby altered their behaviors between baseline and follow up. Participants initially completed the EDE-Q and were aware that responses on this measure would result in eligibility for further participation in the study. Therefore, it may have become apparent that their responses with regard to eating and body shape concern were of interest, and participants may have made intentional efforts toward more healthful attitudes and behavior following being informed of their eligibility status. Therefore, assessment effects may have been partly influential in the outcomes of the present study. Research suggests that learning may be significantly impacted by pre-assessment effects, as a person's perception of the demands of a task are learned through information utilized to respond to an assessment (in this case, the screening measure). This may in turn influence how an individual interacts with information learned, and impact self-regulation as a result (Cilliars, Schuwirth, Herman, Adendorff, & van der Vleuten, 2012).

Expectation around participation in the study itself may have been sufficient to alter body image and eating attitudes, potentially undermining the nature of the manipulation. There is sufficient empirical evidence to suggest that the expectation of improvement and confidence in a particular method may be sufficient to produce self-healing (Harrington, 1997). Participants self-selected into the study by signing up and providing an email address for further participation. The motivation behind these actions remains unknown, but it is possible that participants may have been interested in improving their body image and disordered eating and thereby elected to participate in the study believing that it would be helpful. This course of action may have elicited a placebo effect. Indeed other research reviewing placebo response in eating disorders has found a relationship between the level of pathology and response to the placebo effect, with less severe pathology associated with greater response to placebo (Blom et al., 2014). The level of pathology

in the present sample was also low, lending support to the idea that placebo response may have influenced the results.

Demand characteristics may have impacted the outcome of the study. Participants were contacted via personal email in order to schedule sessions, and interacted with various individuals (the investigator and research assistants) across the duration of the study. Participants may have experienced a desire to help the investigator by demonstrating improvements and responding according to social desirability. This is also consistent with the high return rate seen for post-assessment in the present study (though monetary and research compensation may have also been motivating factors).

Further, there remains the possibility of regression towards the mean. Participants may have been selected based on an extreme first measurement, and the score observed at follow up may be closer to average. Although this explanation may provide an insight into the changes in scores observed across the study, it should also be noted that both body image and disordered eating are relatively stable characteristics. A study examining changes over a two week period on a measure of body image (involving no active treatment component) with college women found no improvements across time on various subscales related to body image, except on one subscale measuring rationale acceptance (Cash & Grasso, 2005). Reviews of research on body image have found that body dissatisfaction is stable across the lifespan (Tiggeman, 2004). Studies have shown stability in disordered eating pathology in that a significant proportion of individuals either maintain or worsen over time (Ackard, Fulkerson, & Neumark-Sztainer, 2011; Eisenberg et al., 2011; Thomas, Vartanian, & Brownell, 2009).

Overall, it appeared that the sample was representative of a group of young women endorsing considerable disordered eating patterns and body shape concern. Comparing mean

scores on the global measure of disordered eating utilized, participants in the current sample scored between 1 and 1.5 standard deviations higher than community samples (Fairburn & Beglin, 1994; Mond, Hay, Rodgers, & Owen, 2004), and scored 1 standard deviation higher than a large sample of U.S. college women (Luce et al., 2008). Furthermore, participants scored on average above the cut-off identified by Mond et al. (2006) as indicative of likely eating disorder cases. Likewise, our sample scored in the upward end of the moderate concern range on the measure of body shape concern, with the exception of participants in the no treatment group, who scored in the upward end of the slight worry range. This indicates that the sample was indeed one endorsing concern around body dissatisfaction and disordered eating attitudes and behaviors. Nevertheless, our participants also scored within the overweight range of the BMI scale, and therefore concerns about body shape and eating may be due in part to societal pressure to conform to a thin ideal.

Finally, the possibility remains that the similarities between groups were found because the manipulation in the active treatment conditions was ineffective. However, manipulation checks revealed that both active treatment conditions improved on state mindfulness, particularly the decentering aspect, while the control group showed no such change. Additionally, the Mirror Exposure Group demonstrated a reduction in positive affect, while the Mindfulness Mirror Exposure Group demonstrated a surprising increase in experiential avoidance following the intervention. The only change from pre to post noted in the no treatment group was a reduction in negative affect following completion of puzzles. At the same time, there were no significant differences between active treatment and control groups with regard to emotion regulation, although this was expected to occur. These manipulation checks were chosen as they are theoretical components of mindfulness based intervention, and were projected to change

following participation in a mindfulness activity. Mirror exposure shares similar properties with mindfulness-based intervention, as it involves present-moment focus and exposure, and therefore, the constructs measured in the manipulation checks were expected to improve to a lesser extent.

Predetermined mediators were tested in order to examine the impact of other variables impacting our outcome measures. The proposed variables fell short of significance for both direct and indirect mediation. It remains possible that other mediators may have impacted the outcome of our study, such as the proposed mechanisms of mindfulness (i.e., emotion regulation, avoidance, negative affect), or mood and anxiety symptoms found to differ between participants at baseline.

Strengths of the present study include a design that allowed for the comparison of a mindfulness-based mirror exposure to a pure mirror exposure exercise, which is unique to the literature. Furthermore, the examination of mindfulness training prior to mirror exposure in a group endorsing beliefs consistent with an eating disorder had not yet been thoroughly explored for useful contributions to the eating disorder literature. As in Luethcke et al. (2011), who examined brief mindfulness training amongst college females not endorsing body shape or weight concern who received neutral instructions, mindfulness instructions or cognitive dissonance instructions, the present study found no differences between groups. Additionally, no previous empirical study has compared mirror exposure to a no treatment control group, making this study the first to do so. Another strength was the use of brief interventions, which may shed light on the potential of such interventions for use in settings where a briefer treatment is necessary. Many studies have examined mirror exposure as administered over multiple sessions (Delinsky & Wilson, 2006; Moreno-Dominguez et al., 2012) or for durations lasting up to 50

minutes (Jansen et al., 2008) for individuals with disordered eating symptoms. Luethcke found that a one-time mirror exposure was useful in reducing symptoms amongst college students not reporting problematic eating (Luethcke et al., 2011). Similar to the findings of Luethcke and colleagues (2011), the present study found support for the use of a brief intervention in terms of disordered eating and body image outcomes, although our treatment groups did not outperform our control. Further, while many studies implemented mirror exposures lasting up to 50 minutes (Jansen et al., 2008), the present study used a very brief (average 15 minute) exposure, which may be better suited for certain treatment settings. Further, knowing that the MME group did not differ from the ME group suggests that in settings where a mindfulness-based supplement is not feasible, utilizing pure mirror exposure may be a beneficial alternative. Additionally, this study was the first to utilize a no treatment control group as a comparison for mirror exposure.

This study also featured some notable limitations, including a small sampling of time (1 to 2 weeks), which may not allow for the impact of the manipulation to be observed as discussed above. However, there is prior research to suggest that mindfulness changes may not be apparent immediately following a brief intervention, but are clearly apparent at one-week follow up (Bowen & Marlatt, 2009), thus supporting our use of the one-week follow up. Indeed other research in mirror exposure has demonstrated that gains build up to one month following mirror exposure, so it may be that our short follow-up period was not sufficient to capture the potential change due to the manipulation. Additionally, the sample was made up of young college females, and does not examine men or other age groups. Nevertheless, this sample is justified in that adolescent and college women are at increased risk for disordered eating above and beyond that of other samples (Cook-Catone & Phelps, 2003; Eisenberg et al., 2001). Furthermore, the sample size may have lacked adequate power to detect differences between groups, as our calculated

power to detect group differences or interactions was very low. Although sample sizes were consistent with other studies, it is possible that more participants would have yielded significant differences between groups. Participants also reported subjective units of distress that were generally low, perhaps indicating a lack of distress at the task, thus meaning that corrective learning could not take place. Typically in exposure treatment, SUDS in the 40-60 range are considered optimal for exposures (Foa, Hembree, & Rothbaum, 2007). Lastly, participants were asked to self-report weight and height, which may have resulted in some inaccuracies in reporting. However, one study found that college females were 93% accurate in self-reporting weight and height, with 4% underestimating their weight (Quick et al., 2015).

Future research should look to examine brief interventions in a longitudinal manner (for example, follow ups after one month or longer), as this would also be of great importance to understand how treatment gains stand the test of time. Additionally, an intervention using multiple sessions, perhaps administering psychoeducation on different aspects of mindfulness and employing more than one mirror exposure might increase treatment benefits, and to better understand the role the mindfulness training and meditation may still hold in mirror exposure treatment. The present findings do not suggest that mindfulness training added to mirror exposure out-performs mirror exposure alone, but mindfulness provides many useful attitudinal aspects and skills that may prove useful given further practice, as participants in the present study that participated in a mindfulness-based activity endorsed increased psychological flexibility following manipulation, and did not demonstrate the decrease in positive emotions found in the group receiving only mirror exposure. Given this study used a small subset of women very similar in age, socioeconomic status, and racial/ethnic background, future research will want to examine the current interventions with larger, more diverse samples.

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APPENDIX A
MINDFULNESS MEDITATION SCRIPT

"While sitting down in your chair, place your feet flat on the floor. Sit up straight. Relax your shoulders, relax your neck, and place your hands in your lap or on your knees. As you settle into a comfortable position, commit yourself to simply being fully awake, fully present for these next few moments. If you feel comfortable with it, gently close your eyes. Otherwise, just look toward the floor.

Focus on tuning into the feeling of the breath moving in and out of your body. Focus on the sensation of the breath moving through your nose on each inbreath and each outbreath. Allow yourself to just be here in this moment, following the breath as it comes in and as it goes out. Just breathe and let go. Breathe and let be.

Naturally your mind may wander off into thoughts of one kind or another. Take note of any thoughts as they come up. Note what's on your mind and how your body is feeling. Acknowledge these thoughts, whatever they are, without judging or evaluating them. And then just gently let them go. Bring your attention back to the breath, focusing on the feeling of the breath coming in and out of your nostrils.

And each time you notice that your mind has gone off somewhere else, wherever that may be, just bring your attention back to the feeling of the breath. And if the mind wanders off a thousand times, you simply bring it back a thousand times, intentionally cultivating an attitude of patience and gentleness towards yourself. This means choosing as best you can not to react to or judge any of your thoughts or feelings, impulses or perceptions, reminding yourself instead that absolutely anything that comes into the field of awareness is ok. We simply sit with it and breathe with it and observe it, staying open and awake in the present moment, right here, right now, a continual process of seeing and letting be, seeing and letting go, rejecting nothing, pursuing nothing, dwelling in stillness and in calmness as the breath moves in and out.

If you'd like, commit yourself to bringing this attitude of attention and acceptance with you throughout your day, being fully aware in the present moment, noticing any thoughts or feelings that may arise, without judging them – just being right here and right now, accepting the present moment, and accepting yourself, no matter what happens. Remember that you can always bring your focus back to your breath, back to the sensations of the present moment, to cultivate this sense of attention and acceptance."

APPENDIX B
RECRUITMENT FLYER

Are you a woman who feels dissatisfied with her body?

Would you like to participate in research investigating how to improve female body image?

Participate in a study at LSU investigating the effects of interventions for weight and shape concerns. You could earn **$20 dollars** for two sessions of participation and enter a lottery to win **$30 dollars**.

If interested, please contact Jessica at LSUpsychresearch2014@gmail.com

Or go to https://www.surveymonkey.com/s/LSUBodyImageStudy

APPENDIX C
IRB APPROVAL FORM

ACTION ON PROTOCOL APPROVAL REQUEST

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

TO: Alex Cohen
Psychology

FROM: Robert C. Mathews
Chair, Institutional Review Board

DATE: April 23, 2014
RE: IRB# 3472

TITLE: Effects of Mirror Exposure and Brief Mindfulness Interventions in Undergraduate Females

New Protocol/Modification/Continuation: New Protocol

Review type: Full ___ Expedited _X_ **Review date:** 4/23/2014

Risk Factor: Minimal _X_ Uncertain _____ Greater Than Minimal_____

Approved _X_ **Disapproved**_____

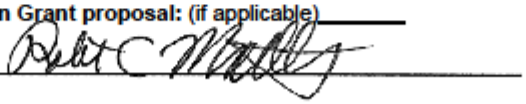
Approval Date: 4/23/2014 **Approval Expiration Date:** 4/22/2015

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 1200

LSU Proposal Number (if applicable): _____

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

By: Robert C. Mathews, Chairman 

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

Jessica Kinsaul is originally from Norcross, GA. She completed her B.S. in psychology from the University of Georgia and received her M.A. in clinical health psychology from Appalachian State University. Following this, she entered the clinical psychology doctoral program at Louisiana State University. She completed her psychology internship at The Medical College of Georgia at Georgia Regents University/Charlie Norwood Veteran Affairs Medical Center. She will soon begin her postdoctoral fellowship at the Durham Veteran Affairs Medical Center in Durham, North Carolina.