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Evaluating The Effectiveness Of An Ecological Momentary Intervention Targeting Body Checking Behaviors

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EVALUATING THE EFFECTIVENESS OF AN ECOLOGICAL MOMENTARY INTERVENTION TARGETING BODY CHECKING BEHAVIORS

A Masters Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Psychology

By

Jamie Marie Smith

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ABSTRACT

This study investigated the efficacy of an ecological momentary intervention (EMI) targeting body checking behaviors (weighing, mirror checking, and feeling the body for fat). Body checking has been shown to increase body dissatisfaction and play a role in eating disorders. A digitally based intervention delivered in individuals' naturalistic environments has not yet been explored in the literature. Therefore, the purpose of this study was to combine ecological momentary assessment (EMA) to capture body checking frequency and an EMI to target body checking. For the current study, 44 female undergraduates with high body checking levels and healthy weight participated in a five-day intervention where they received five messages via their smart phones each day assessing the frequency of body checking. On the final two days of the study, an intervention message was also sent containing cognitive-behavioral strategies for decreasing body checking. Multilevel modeling was used to investigate the relationship between time (within day and across days), body dissatisfaction, and reported body checking. Body checking behaviors increased within each day while decreasing across the five day intervention period. Additionally, analyses of pre to posttest measures found healthy improvements in a number of body image related constructs. These results suggest that targeting body checking behaviors through a brief ecological momentary intervention may be a useful clinical tool.

KEYWORDS: (body checking, ecological momentary assessment, ecological momentary intervention, body dissatisfaction, eating disorders)

This abstract is approved as to form and content

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INTRODUCTION

Body checking behaviors are performed to gather information about body size and weight (weighing, mirror checking, and feeling areas of the body for fat; Walker & Murray, 2012). These behaviors are common and often performed multiple times throughout the day. While some behaviors are more intentional than others, most body checking is performed quickly (in less than two minutes) and without much awareness in the moment (Walker & Murray, 2012).

The cognitive behavioral model of eating disorders views body checking as a maintaining factor for eating pathology and body dissatisfaction (Fairburn et al., 2003). While some treatments and strategies targeting body checking have been developed (Cooper, Whitehead, & Boughton, 2004; Fairburn, 2008), most of these treatments focus solely on mirror exposure (Morgan, Lazarova, Schelhase, & Saeidi, 2014; Delinsky & Wilson, 2006). Digital-based treatment options provide an opportunity to develop and evaluate new strategies to treat body checking behaviors. Ecological momentary assessment (EMA) and ecological momentary intervention (EMI) techniques are promising approaches to further understand and target body checking behaviors in the moment the behaviors are occurring (Heron, 2012; Lavender et al., 2013; Leahey, Crowther, & Mickelson, 2007). Therefore, the purpose of the current study was to develop and evaluate the effectiveness of an EMI approach to treating body checking behaviors.

Cognitive Behavioral Therapy for Eating Disorders

Eating disorders (i.e. anorexia nervosa, bulimia nervosa, and binge eating disorder) are comprised of patterns of disordered eating behaviors that may include binge eating, dietary restriction, compensatory behaviors (e.g., purging, fasting), and distorted body image (American Psychiatric Association, 2013). Cognitive behavioral therapy (CBT) has been found to be effective in treating these disorders and is often seen as the first-line therapeutic approach (Knott, Woodward, Hoefkens, & Limbert, 2015; Murphy, Straebler, Cooper, & Fairburn, 2010; Turner, Marshall, Stopa, & Waller, 2015). While two separate CBT models for bulimia nervosa and anorexia nervosa were developed in the past (Fairburn, Marcus, & Wilson, 1993; Fairburn, Shafran, & Cooper, 1999), individuals are often diagnosed with both of these disorders (along with 'atypical' eating disorders or eating disorder not otherwise specified, EDNOS) throughout their lifetimes. Adolescents typically initially present with anorexia, but often develop bulimia or EDNOS over time (Fairburn, Cooper, & Shafran, 2003). This overlap between diagnoses suggests similar etiologies in these disorders.

In 2003, Fairburn and colleagues proposed a transdiagnostic model for both bulimia and anorexia that focuses on how both of these conditions develop and are maintained. Additionally, enhanced cognitive behavior therapy (CBT-E) is the latest version of CBT that incorporates this transdiagnostic model (Fairburn, 2008). This theory and treatment method focus on the common mechanisms among eating disorders. Specifically, the model focuses on the over-evaluation of eating, shape, and weight and addresses other potential maintaining mechanisms such as mood intolerance, interpersonal difficulties, core low self-esteem, and clinical perfectionism (Fairburn et al.,

2003). The CBT transdiagnostic theory describes body checking as a maintaining factor for the over-evaluation of eating, shape, and weight such that excessive body checking serves to increase the extreme focus on the body which in turn leads to increased body checking when this hyper focus on body shape and size is obtained. This often becomes a vicious cycle of body dissatisfaction and frequent body checking.

Evidence for the CBT Model of Body Checking

A number of experimental studies have provided support for body checking's role in maintaining body dissatisfaction. Many of these studies make use of mirrors to manipulate body checking. Smeets and colleagues (2011) had participants either: estimate body part lengths in a mirror (body checking condition), estimate chair part lengths in a mirror (body exposure condition), or estimate chair part lengths without a mirror (control condition). After these estimations were preformed, those in the body checking condition were more dissatisfied with their bodies and displayed a heightened attentional bias for body checking compared to the mere exposure and control conditions, suggesting that the act of body checking directly leads to these negative effects (Smeets et al, 2011).

Walker (2014) designed a study investigating the effects of checking disliked body parts in front of a mirror (audio delivered instructions) and a mindfulness-based mirror exposure on those high in body dissatisfaction. Body checking led to lower mood, self-esteem, and body image (Walker, 2014). These findings again provide evidence supporting the maintaining role body checking plays in the overestimation of shape and weight.

A study by Shafran, Lee, Payne, and Fairburn (2007) recruited a nonclinical sample of 60 women with no history of eating disorders to examine the impact of mirror checking. Participants in this study had to undress to their underwear for the various 30 minute mirror checking conditions, which may be a more representative exercise of the types of checking behaviors that occur when women are at home. Participants were then instructed to focus on body areas of dissatisfaction in the high checking condition or describe their body parts using neutral language in the low checking condition (Shafran et al., 2007). Those in the high checking condition reported more body dissatisfaction, higher feelings of fatness, and an increase in the strength of self-critical thoughts regarding their bodies over time (Shafran et al., 2007). These results suggest that the focus on disliked areas, which is common among those with eating pathology and also among individuals without a diagnosed eating disorder, directly leads to negative outcomes.

In addition to studies utilizing mirrors as a means of manipulating body checking, Smeets, Jansen, and Roefs (2011) had participants view pictures of their bodies and used eye-tracking devices to ensure that they were focusing on the instructed areas. This design allowed the investigators to tightly control what areas were focused on (an aspect that cannot be as tightly controlled when having participants look in full length mirrors). Participants underwent positive or negative bias induction training where they were trained to focus on self-identified liked or disliked body parts for twenty minutes. After the negative bias training, participants expressed a decrease in body and weight satisfaction and a greater decrease in mood compared to the positive bias training (Smeets, Jansen, & Roefs, 2011). This study adds to the literature finding that excessive

attention and time spent focusing on disliked areas of the body serves to strengthen body dissatisfaction.

Body Checking Across Populations

Body checking is observed in both clinical and nonclinical populations. Body checking is performed more often in individuals with eating disorders compared to nonclinical samples (Shafran, Fairburn, Robinson, & Lask, 2004). Additionally, more frequent body checking is related to a more severe eating disorder symptomology (Shafran, et al., 2004).

Those with eating disorders also body check in idiosyncratic ways that are uncommon in those without eating pathology. Such behaviors include checking ring size, protrusion of bones, wrist size, and presence of fat under the chin and on cheeks (Walker & Murray, 2012; Reas, Whisenhunt, Netemayer, & Williamson, 2002). While such 'information gathering' behaviors are performed habitually in these individuals, the information gathered does not seem to impact the universally negative impact of body checking. For example, Shafran, Fairburn, Robinson, & Lask (2004) found that after weighing themselves, women with eating disorders responded to increases, decreases, or no changes in weight by universally restricting their diets further. Thus, the information gathered from body checking is often interpreted as a sign of a personal failure at control.

Unlike some of the more severe behaviors associated with eating disorders, body checking is a behavior that is also common in nonclinical samples. People who are dissatisfied with their bodies spend more time focusing on disliked areas and also compare themselves more to attractive peers and celebrities (Walker & Murray, 2012).

While body checking is thought to serve a negative purpose in clinical samples, it can have more positive or neutral effects in lower frequency among those without eating pathology. This effect can occur when individuals are satisfied with their appearance or are focusing on liked parts of the body (Walker & Murray, 2012). Walker and Murray (2012) note that no research has extensively examined the impact of low frequency body checking. However, studies have found that higher frequency body checking behaviors in those high in body dissatisfaction and low in self-esteem are a risk factor for the development of eating disorders among non-clinical women (De Beradrdis et al., 2007). In an ecologically designed study conducted with non-clinical women with high body dissatisfaction, body checking was found to predict higher levels of negative affect and body dissatisfaction (Stefano, Hudson, Whisenhunt, Buchanan, & Latner, in press).

Although the goal of body checking is to obtain information about body weight and shape, it does not always yield reliable and accurate results (Walker & Murray, 2012). For example, the results are biased based on the person's mood and recent food intake (Fairburn, Shafran, and Cooper, 1998). Repetitive body checking can cause increased distress due to natural changes in the body based on time of day and food consumed. When in high arousal states, information gained from body checking can reinforce beliefs already held about body shape and size (Fairburn, Shafran, and Cooper, 1998).

Body Checking Treatments

Because body checking appears to maintain body dissatisfaction, targeted treatment for body checking behaviors is an important component of CBT. These

treatments often utilize similar strategies to those used in other anxiety-based disorders. For example, the preoccupation with shape/weight and body checking behaviors in eating disorders has been compared to the obsessions and compulsive behaviors in obsessive-compulsive disorder (Zohar, 2012). Therefore, exposure and response prevention techniques in OCD treatment are often used to treat body checking behaviors. A common exposure is conducted by having patients look at themselves in mirrors for extended periods of time (often for a full 50 minutes in a therapy session), while focusing on the whole body and limiting the performance of typical body checking behaviors. Another exposure involves restricting body checking behaviors during 'high risk' times for body checking (e.g., no mirrors during morning routines or no weighing before or after meals). These exposure and response prevention methods allow individuals to habituate to the anxiety they feel by not performing their typical responses (body checking). When such responses are not performed, patients' anxiety eventually subsides after a period of time.

Body checking treatments also frequently utilize mirror exposure. The key difference between body checking in mirrors and mirror exposure aimed at improving body image is the prolonged time of exposure, a focus on nonjudgmental acceptance, and attention to the body as a whole opposed to only specific disliked parts (Delinsky & Wilson, 2006; Trentowska, Bender, & Tuschen-Caffier, 2013). Since women with higher body dissatisfaction have been found to use mirrors differently than their satisfied counterparts (Farrell, Shafran, & Fairburn, 2004), targeting mirror use is likely an advantageous intervention opportunity. Group therapies utilizing mirror exposures in most sessions have been found to be effective at decreasing body checking (Morgan, Lazarova, Schelhase, & Saeidi, 2014). A three session mirror exposure treatment was

also more effective at reducing body checking and showed better improvement on a number of other body image outcomes compared to a nondirective therapy (Delinsky & Wilson, 2006). This literature demonstrates the feasibility of mirror exposures and their ability to impact body checking (Hildebrandt, Loeb, Troupe, & Delinsky, 2012)

Additionally, Cooper, Whitehead, and Boughton (2004) delineate a number of behavioral experiments that can be used for treating body checking. One such experiment involves slowly decreasing body checking behaviors performed for 'safety' reasons (i.e. checking size in mirror or weighing to avoid weight gain or feelings of anxiety) and tracking feared outcomes (Cooper, Whitehead, & Boughton, 2004). Another behavioral experiment involves reducing body avoidance and checking behaviors and monitoring for decreases in distress and negative thoughts about body on the days where checking/avoidance is low. The authors note the importance of finding other activities to engage in to help resist the urge to check; it may also be important to track the amount of time that one gains by reducing body checking (Cooper, Whitehead, & Boughton, 2004).

Fairburn (2008) also outlines body checking treatment guidelines for enhanced cognitive behavior therapy (CBT-E). Fairburn describes seven steps to utilize when working with patients to reduce body checking. First, he recommends psychoeducation about body checking (i.e. the commonness of body checking and the impact of body checking and comparisons to others on body dissatisfaction). Second, he recommends tracking body checking for two days in a journal. Third, he suggests a therapeutic discussion about the purpose, reason, frequency, and impact of body checking between the therapist and patient. Fourth, behaviors that should be terminated are identified (use of tape measures, pinching, feeling bones, and feeling rings; Fairburn, 2008). For other

behaviors that need to be modified (time spent in mirror or trying on clothes), environmental factors related to body checking should be identified to help in developing strategies that are helpful in resisting body checking urges. Fifth, Fairburn recommends targeting mirror use specifically (i.e. limiting use of mirrors to a limited number of reasons or reducing mirrors in house). In the sixth step, comparison-making is addressed. In this step, reasons for making comparisons, biases present, and consequences of comparisons are all explored. Finally, any avoidance behaviors are targeted while monitoring patients to ensure extreme body checking does not replace avoidance behaviors. The Fairburn model was used as the primary foundation for developing the interventions in the current study.

Ecological Momentary Assessment

Ecological Momentary Assessment (EMA) is a method of data collection in which individuals are prompted to report on behaviors and psychological states in their daily lives, in the moment (Runyan & Steinke, , 2015). Repeated measurements taken in the context of an individual's environment have a number of benefits compared to more traditional methods: they limit biases retrospective accounts contain, allow for analyses of intraindividual changes throughout a day, and capture a more accurate representation of experiences that is not possible in laboratory experiments (Runyan & Steinke, 2015). In recent years, EMA has been used to assess a wide variety of constructs including: dieting, HIV prevention behaviors, smoking cessation, depression, and social support (Cook, McElwain, & Bradley-Springer,2016; McKee, Ntoumanis, & Taylor, 2014;

McElwain, & Bradley-Springer, 2016; McCarthy, Minami, Yeh, & Bold, 2015; Vranceanu, Gallo, & Bogart, 2009).

In a handful of previous studies, EMA has also been used to assess body checking. One EMA study prompted participants to report body checking behaviors, negative affect, and body image dissatisfaction five times per day for five days (Stefano et al., in press). Lavender and colleagues (2013a) utilized this method to assess body checking behaviors in 118 women with anorexia. Participants were prompted six times daily for two weeks about whether they had performed one of two body checking behaviors (checking joints and bones for fat and checking for thighs touching; Lavender et al., 2013a). Another study asked participants about body comparisons made to other people four times a day for one week (Leahey, Crowther, & Mickelson, 2007). EMA is well-suited to assess the frequency of a behavior like body checking because it is often done without much awareness throughout the day, therefore more conventional methods of retrospective reporting often miss the true nature of this behavior.

Ecological Momentary Intervention

Ecological Momentary Intervention (EMI) shares many of the same benefits as EMA (i.e. real world applicability and ecological validity). EMI involves delivering interventions to people in their daily lives (primarily through mobile telephones; Heron & Smyth, 2010). EMA has been found to be effective for a variety of health behaviors including: diabetes management, smoking cessation, weight control, physical activity, healthy eating, and eating disorders (Heron & Smyth, 2010; Rodgers et al., 2005; King et al., 2008; Patrick et al., 2009; Franklin et al., 2006).

Many body-related EMI procedures are seen as add-ons to existing treatment and are delivered after inpatient or outpatient therapy or psychoeducational sessions (Bauer, Percevic, Okon, Meermannn, & Kordy, 2003; Robinson et al., 2006; Heron, 2012). In such studies, EMI is used as a tool to sustain and continue practice of strategies taught during more intensive sessions. Such studies have found some support for the effectiveness of EMI at impacting some behaviors, while core body dissatisfaction proves to be more resistant to change (Heron, 2012).

Purpose and Hypotheses

The current study sought to combine EMA and EMI procedures, which has been identified as an important future direction for research (Heron & Smyth, 2010). In previous EMA work assessing body checking, the mere act of reporting on body checking for a five day period served to decrease body checking behaviors, suggesting that the act of monitoring these behaviors alone could serve an intervention function (Stefano, et al., in press). Additionally, for the current study, an intervention targeting body checking was designed after consulting the current treatment literature (Fairburn, 2008; Cooper, Whitehead, & Boughton, 2004; Delinsky & Wilson, 2006, etc.) and modifying treatments for a digitally delivered format. Therefore, combining strategies that have individually been effective in reducing body checking behaviors, into a digital intervention that can be delivered in a natural environment has the potential to powerfully target and change body checking behaviors.

The hypotheses for the study were:

1). Levels of body checking, body dissatisfaction, body image avoidance, internalization of the thin-ideal, and body checking cognitions will decrease from pre-test to posttest after the five-day intervention.

2). Body checking will decrease across the five-day intervention.

3). Body checking will decrease directly following intervention prompts on days four and five.

METHOD

Participants

Recruitment and Selection. A total of 353 participants were screened to recruit the 57 female participants who met the inclusion criteria. The final sample contained 44 participants (see procedures for further information). Participants were recruited from introductory psychology classes and received class credit for completion of the study. In addition to course credit, these participants were also entered into a lottery to win one of three $50 Visa gift cards (with higher compliance resulting in more entries into the lottery).

Only females were chosen for the current study due to their higher rate of eating disorders and body dissatisfaction; additionally, males have been shown to be more positively impacted by media and social comparisons, and thus may not respond similarly to interventions compared to females (McNeill & Firman, 2014). Participants were selected for the study based the following criteria: 1) owning a smartphone, 2) having a Body Mass Index (BMI) in the healthy or underweight range (i.e., less than 25), and 3) having high levels of body checking (defined as 1 standard deviation above the mean for college females on the Body Checking Questionnaire). These inclusion criteria were selected to obtain a sample of women who engage in significant body checking despite their healthy or underweight status.

Demographics. The mean age of the female undergraduate participants was 18.39 (SD = 0.58). Of the 44 participants, 90.9% (n = 40) identified themselves as White, 2.3% (n = 1) as Hispanic or Latino, 4.5% (n = 2) as Black or African American, 2.3% (n = 1)

as American Indian or Alaska Native, and 2.3% (n = 1) as other. Participants' mean BMI scores were 21.83 (SD = 1.88). Participants obtained an average score of 82.41 (SD = 8.05) on the Body Checking Questionnaire, indicating a trait level of body checking that is above the mean obtained for college females (m = 56.0, SD = 16; Reas et al., 2002).

Measures

Pre/Post Measures. The following measures were administered to participants for both pretest and posttest (see Appendix A), with the EMA portion of the study in the occurring between the pretest and posttest (note that the demographic questionnaire was only completed during the pretest). The measures that were chosen have been shown to be related to body checking and were administered to determine if the intervention targeting body checking lead to improvements in these other areas as well (including trait level body checking).

The Body Checking Cognitions Scale (BCCS; Mountford, Haase, & Waller, 2006) is a 19-item self-report measure of cognitions about the function of body checking (Cronbach's α = .64). Participants were asked to identify how frequently they had unhealthy cognitions about body checking behaviors (e.g., "I think body checking will make me more comfortable around other people", "Body checking stops me from losing control of what I eat") on a 5 point Likert-type scale form never (1) to very often (5). Only the total score was used for the BCCS.

The Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) is a self-report measure of trait body dissatisfaction consisting of 34 items (α = .93).

Participants were asked to report feelings about various aspects of their shape and weight using a Likert-type scale from never (1) to always (6).

The Body Image Avoidance Questionnaire (BIAQ; Rosen, Srebnik, Saltzberg, & Wendt, 1991) is a 19-item self-report measure of body image avoidance ($\alpha = .83$). Participants were asked to indicate how often they engaged in a number of avoidance behaviors.

The Body Checking Questionnaire (BCQ; Reas, Whisenhunt, Netemeyer, & Williamson, 2002) is a 23-item measure of trait body checking behaviors ($\alpha = .73$). Participants were asked how often they engaged in a range of checking behaviors (i.e. "I check to see if my thighs spread when I'm sitting down." and "I pinch my upper arms to measure fatness."). Only the total scores were used for the BCQ. This measure was used to screen participants for the study who had high trait levels of body checking, defined as one standard deviation above the mean found for college females in the validation study (a score of 72).

The Sociocultural Attitudes Towards Appearance Scale (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) is a 30-item self-report measure of internalization of the thin-ideal ($\alpha = .90$). Participants were asked the extent to which they agreed with a number of statements regarding media's influence on attitudes about physical appearance. The SATAQ contains four subscales: internalization-general ($\alpha = .88$), internalization-athlete ($\alpha = .85$), pressures ($\alpha = .89$), and information ($\alpha = .83$).

The demographic questionnaire included basic demographic questions (age, year in college, race, ethnicity, height, and weight). BMI was calculated based on self-reported

height and weight using the following formula: BMI = (weight in pounds/[height in inches]^2) x 703.

EMA Measures. The Body Checking Behaviors measure was administered at every prompt during the five day EMA portion of the study. Participants were asked to report the number of times they had engaged in eight body checking behaviors since they were last contacted (or since they woke up if it was the first contact of the day). These behaviors included: weighed self, felt thighs for fatness, sucked in stomach, felt/pinched stomach to measure fatness, compared body to other individuals, checked body size in the mirror, checked for fat jiggling, and checked to see if thighs spread while sitting down. These behaviors were chosen based on research by Crowther (2013) regarding the most frequent checking behaviors.

Procedures

This study received approval from the Missouri State University Institutional Review Board (see Appendix B) prior to data collection. Female participants with smartphones completed the pretest which consisted of the full battery of pretest measures described above. Of the 353 participants who completed this pretest, 57 qualified for the study based on having a BMI in the healthy or underweight range (less than 25) and high levels of body checking. Of the 57 qualifying participants, 49 enrolled in the text-based portion of the study. Participants were directed to watch an instructional video that explained the nature of body checking behaviors and the procedure of the study. After they confirmed that they had watched the video, participants were instructed to enroll in a

class on Remind 101. Remind 101 allowed researchers to send text messages directly to participants' phones through a third party number.

Participants then received questionnaires via text messages for one practice day and five experimental days (a total of six days). Each text contained a hyperlink that directed participants to a questionnaire hosted through Qualtrics (see Figure 1). From 9:00 AM to 10:00 PM participants received a total of five text messages. These messages were sent at randomized times that were at least 120 minutes apart. If participants did not complete the questionnaire within 30 minutes, a reminder text was sent.

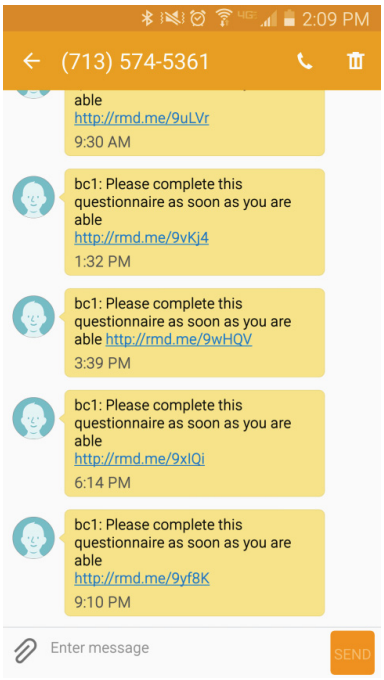

Figure 1. Example text messages participants received.

The first day was a practice day intended to familiarize participants with the study procedure. Questionnaires were of similar length and format to the experimental questionnaires, but they asked about study habits instead of body checking (see Appendix C). At the end of the practice day, participants were provided feedback about their response rate. If they responded to at least 60% of the questionnaires (3 out of the 5

questionnaires for the day), they were informed that they could continue with the study for the five experimental days. Four participants were removed for failure to meet the minimum response rates. This EMA protocol was modeled after other EMA designed studies (Stefano, et al., in press; Heron & Smyth, 2013; Ridolfi, Myers, Crowther, & Ciesla, 2011).

During the following five experimental days of the EMA protocol, participants continued to receive five daily text messages. These messages contained links to Qualtrics surveys asking about frequency of eight body checking behaviors (see Figure 2). One participant was excluded as an outlier from analyses for extremely discrepant body checking behavior frequencies; therefore, final sample size was $N = 44$.

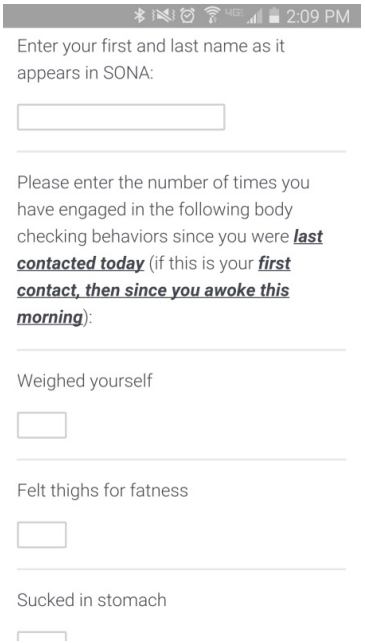

Figure 2. Questionnaire completed at each time point as it appears to participants on mobile Qualtrics.

Additionally, on experimental days four and five participants also received an intervention at every other time point (a total of five interventions). Interventions were delivered after body checking frequency questions and were delivered in the same order

for all participants. Interventions were pilot tested with a group of students in a research lab to confirm that the interventions were clear and useful. The five interventions detailed below consisted of psychoeducation, visualization, and behavioral and cognitive strategies to reduce body checking.

The first intervention focused on helping participants understand the connection between checking and negative affect (Fairburn, 2008; Cooper, Whitehead, & Boughton, 2004; Smeets et al, 2011), "Think of a time in your life when you were checking your body a lot. Reflect on how you felt about your body overall during that time period. Research has shown that when people engage in a lot of body checking, they actually tend to focus more on their bodies and become more preoccupied with their shape and weight. Think about whether this is true for you. How do you feel about your body when you engage in a lot of body checking?"

The second intervention focused on utilizing visualization techniques to help participants recognize that focusing on aspects of their body they view negatively serves to increase their preoccupation with shape/size (Fairburn, 2008; Walker, 2014; Shafran et al., 2007), "Imagine yourself standing in front of a full length mirror wearing only a swimsuit. Now, think about focusing on all the parts of your body that you dislike. What would your mood and feelings about your body be like after doing this? Compare this imaginary experience to what occurs when you engage in a lot of body checking. How are those experiences similar or different?"

The third intervention provided participants with a behavioral strategy (deep breathing) to challenge unwanted urges to check (Fairburn, 2008; Cooper, Whitehead, & Boughton, 2004), "Body checking is very common and not necessarily bad. When you're

getting dressed, you often want to check your body in a mirror. On the other hand, there are also times when people can experience unwanted urges to check their bodies. For example, feeling the urge to weigh yourself frequently may become problematic. Techniques such as deep breathing can help you to 'ride out' an urge until it fades. Deep breathing involves inhaling for a count of four, holding for a count of two and exhaling for a count of four, holding for a count of two, and repeating. Identify two checking urges that you will attempt to resist by using deep breathing in the next day."

The fourth intervention contained a cognitive strategy to challenge unwanted urges (cognitive challenging; Fairburn, 2008; Cooper, Whitehead, & Boughton, 2004), "Many strategies can be used when an unwanted urge to check your body occurs. Cognitive challenging is one of these strategies. When you have an unwanted urge to check, you can try repeating to yourself "checking will only make me want to check more" and/or "this too shall pass". How do you think it would feel to use this technique? What could you say to yourself the next time you have an unwanted urge to check?"

The fifth and final intervention required participants to reflect on how to interact with a friend who was engaging in excessive checking (Stice, Marti, Spoor, Presnell, & Shaw, 2008; Fairburn, 2008), "Imagine you are having coffee with a close friend. This friend appears fit and physically active. She shares with you how bad she feels about her body. She tells you how long it takes her to get ready in the morning because of how often she changes clothes and examines herself in the mirror. She describes being unhappy with her stomach and constantly sucking her stomach in and feeling if it sticks out from her pants. Think about what type of things you would tell this friend regarding her constant mirror checking and checking of her stomach. What would you tell this

friend about her checking behaviors (mirror checking, sucking in stomach, and feeling stomach)? Would you tell her to do anything differently?"

Participants were required to remain on the screen containing the intervention text for a period of 10-20 seconds (depending on the length of text). After reading the intervention statement, participants were asked one or two questions that required them to type responses. These questions asked participants to reflect on the intervention strategy presented.

After experimental day five, participants received an email directing them to complete a posttest (which consisted of the same battery of assessments as the pretest without the demographic questionnaire). All 44 participants completed this posttest. Upon completion of the posttest, participants received a debriefing email containing further resources and referrals for those with questions or those concerned about their body image or eating behaviors. Three participants were also chosen to win $50 gift cards.

RESULTS

Compliance

A total of 1,084 text messages were sent across all forty-four participants throughout the study. The overall compliance rate during the five experimental days of the EMI portion of the study was 93.08%. Reminder messages were sent 27.86% of the assessment times (302 reminders), which prompted 75.17% of the participants to respond and complete the current questionnaire.

Compliance rates for intervention prompt responses were also assessed. Of the 220 interventions sent to participants, 86.82% were completed (191 interventions). The response rate for each of the five interventions is as follows: intervention one- 84.09%; intervention two- 86.36%, intervention three- 90.91%, intervention four- 88.64%, and intervention five- 84.09%.

Aggregate and Descriptive Analyses

A breakdown of the 11,528 body checking behaviors reported by the sample into each of the eight behaviors can be seen in Table 1. All further analyses were conducted using one aggregate score of all eight checking behaviors. Analyses revealed that of the 1,009 time points where participants responded to surveys, some checking was reported at 910 time points or 90.19% of the time. At each time point a mean number of 11.43 (*SD* = 15.42) checking behaviors was reported. Individual participants reported engaging in a five-day total number of checking behaviors that ranged from 36 to 950 (*M* = 262.00, *SD* = 255.03).

Table 1. Aggregate Breakdown of Reported Body Checking Behavior Frequencies.

Behavior Type	Reported Frequency	Number of Participants*	Percentage of Total Checking Behaviors
Weighed self	141	*n* = 25	1%
Felt thighs for fatness	877	*n* = 41	8%
Sucked in stomach	2507	*n* = 44	22%
Felt/pinched stomach	1478	*n* = 44	13%
Compared body to others	2549	*n* = 44	22%
Checked body in mirror	2432	*n* = 44	21%
Checked for fat jiggling	677	*n* = 35	6%
Checked thighs while sitting	829	*n* =39	7%

* Number of participants endorsing a specific body checking behavior at least one time.

Preliminary Analyses

To understand the design of the study, a scatterplot of participant checking frequencies by time point is shown in Figure 3. In this figure, time was coded to represent time points one through twenty-five (five daily surveys throughout five days). Intervention time points are starred. A visual inspection of the data indicated that checking frequency appeared to increase within each day (i.e. from morning to evening each day) while decreasing across days. There was also a large grouping of data points at 0; 9.81% of the time (99 time points), participants reported no checking behaviors.

For the analyses, time was coded into two separate variables to get a better understanding of trends in reported body checking frequencies. First, days were coded. Second, time was coded to represent time of day, calculated by creating a time since first

text message (i.e. time completed survey – first text message time by day). The pattern of body checking frequencies using this coding can be seen in Figure 4. In future analyses this "time of day" variable was used to capture the true time that participants responded to prompts.

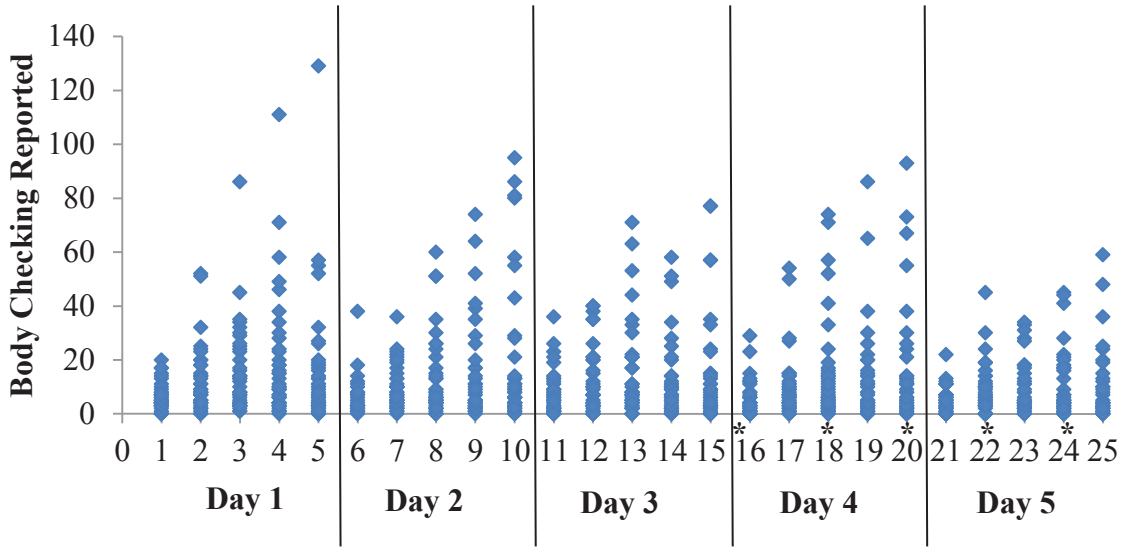

Figure 3. Body checking frequency by time point.

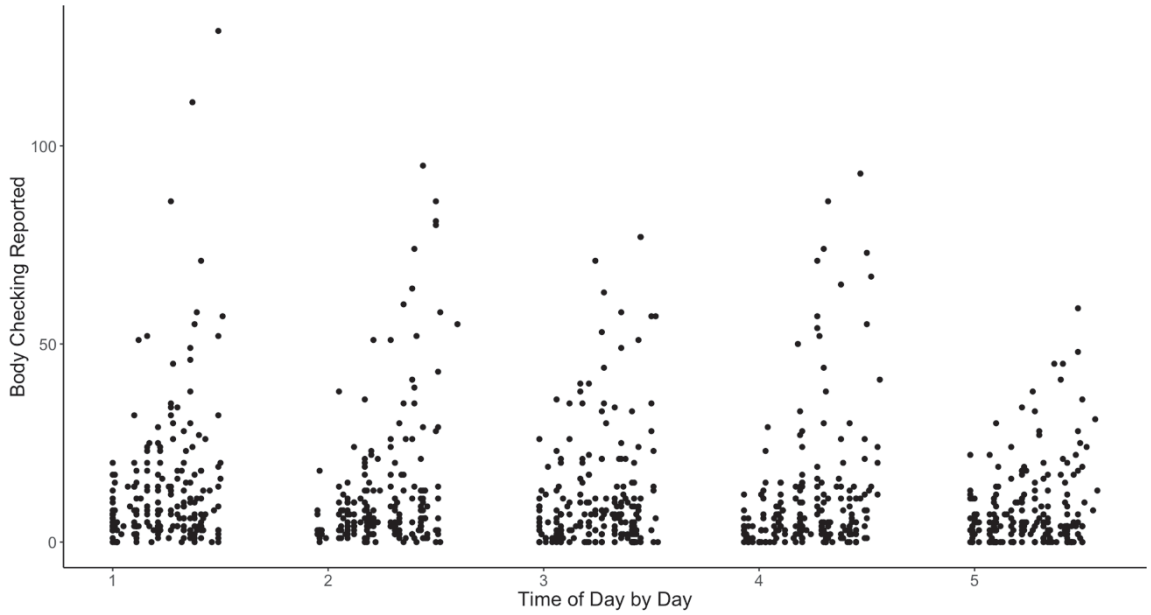

Figure 4. Body checking frequency by time of day.

Hypothesis 1: Pretest and Post Test Analyses

A series of dependent *t*-tests were conducted to analyze changes in the pretest and posttest measures given before and after the five day EMA/EMI intervention. All five measures displayed healthy changes after the intervention (see Table 2 for all statistical values). Body checking appeared to be impacted the greatest, representing a large effect size. Body dissatisfaction, body image avoidance, and internalization of the thin-ideal all decreased moderately. Body checking cognitions represented a comparatively smaller effect, while still considered a medium effect size.

Table 2. Means of Pre and Post Test Scores

Scale	Pretest *M* (*SD*)	Posttest *M* (*SD*)	*t*	*d*
Body Shape Questionnaire (BSQ)	130.00 (24.35)	113.95 (29.18)	-5.11**	.77
Body Checking Questionnaire (BCQ)	82.61 (8.11)	67.16 (15.43)	-7.51**	1.13
Body Image Avoidance Questionnaire (BIAQ)	41.45 (11.63)	34.20 (11.75)	-5.18**	.78
Body Checking Cognitions Scale (BCCS)	61.23 (10.90)	53.52 (15.67)	-3.29*	.50
Sociocultural Attitudes Towards Appearance Questionnaire- 3 (SATAQ- 3)	115.80 (15.14)	107.10 (19.87)	-4.09**	.62

Note. * = $p \leq .002$, ** = $p \leq .001$.

Hypothesis Two: Multilevel Analyses

A multilevel model (MLM, also known as hierarchical linear modeling) was the primary method of analysis. MLM was chosen for this type of data due to its ability to account for the nested nature of EMA data (i.e. each participant has twenty five time points). This analysis does not require creating aggregate sums for variables across individuals, and it can instead remain sensitive to differences across time within each individual. In addition to the nested nature of this type of data, missing data is common because participants are being frequently prompted. MLM is ideal for this EMA design due to its ability to account for missing data without the replacement of missing values.

MLM was used to investigate the relationship between time, pre-test BSQ scores (a measure of body dissatisfaction), and reported body checking. The two time variables (day, time of day) were used as the time predictors. As seen in Figure 4, body checking behaviors appeared to decrease across days, while increasing within each day. This independent variable coding was used to analyze those overall changes within and across days. Data were screened for assumptions and found to be satisfactory. The analyses were conducted using the *nlme* package in *R* (Pinheiro, Bates, DebRoy, & Sarkar, 2014) using participants as nested variables with time (within day, across days) and BSQ predicting aggregate body checking. BSQ was analyzed as an independent variable to control for the wide spread in checking frequencies (i.e. body dissatisfaction levels account for some of the variance in checking scores), as seen in Figure 4.

First, an intercept only model (non-random) and a random intercept only model were compared to determine the need for nesting the data by participant. Table 3 includes statistical values for all model comparisons, and Table 4 contains regression values for

the predictors for the step they were entered into the equation. The random intercept model was found to be better than the intercept only model; therefore, all further analyses were nested by a random intercept by participant. Next, body dissatisfaction (obtained from pretest BSQ scores) was controlled for to try to account for the large spread in checking across participants. This model was significant indicating that as the BSQ increased, number of checking behaviors increased. In the next model, day was added as a predictor to examine the trend across days after controlling for body dissatisfaction. The addition of this variable was significant, with body checking decreasing from day one to day five. Time of day was then added to the model to examine within day checking trends. This model was significant indicating that body checking increased throughout each day, even after controlling for body dissatisfaction and across day trends. Finally, the interaction of day and time of day was found to be marginally significant ($p = 0.08$).

To examine this marginal interaction of across and within days, we examined the simple slopes within each day predicting body checking, controlling for body dissatisfaction. The daily body checking slopes decrease in magnitude from day one to five as seen in Table 5. Therefore, across days overall there is a decrease in body checking, and the overall magnitude increase of body checking within each day also decreased.

Table 3. Model Comparisons

Model	*df*	*AIC*	*BIC*	*LogLik*	*L. Ratio*	*p-value*
Non-Random Intercept	2	8386.813	8396.647	-4191.407		
Random Intercept	3	7825.286	7840.036	-3909.643	563.527	<0.001
BSQ Control	4	7819.176	7838.843	-3905.588	8.110	0.004
Day	5	7801.638	7826.221	-3895.819	19.538	<0.001
Within Day	6	7716.663	7746.163	-3852.331	86.975	<0.001
Interaction	7	7715.683	7750.100	-3850.842	2.980	0.084

Note. Models are compared sequentially to the one below it.

Table 4. Regression values for Hierarchical Regression Analyses

		b	*SE*	*t*	*p*
Step 1	BSQ	0.194	0.065	2.981	0.005
Step 2	Day	-1.067	0.240	-4.436	<0.001
Step 3	Within Day	19.190	2.015	9.525	<0.001
Step 4	Interaction	-2.476	1.437	-1.723	0.085

Note. Each *b* value presented is for the step the variable was entered.

Table 5. *Simple Slopes for Within Day Effects*

	b	*t*	*p*
Day 1	24.335	4.182	<0.001
Day 2	27.280	5.637	<0.001
Day 3	15.133	4.032	<0.001
Day 4	22.029	5.065	<0.001
Day 5	11.513	3.922	<0.001

Hypothesis Three: Intervention Analyses

Days four and five served as intervention days. During these days, an intervention was sent to participants at every other time point. As such, these individual days were analyzed to determine how body checking was impacted when participants had seen an intervention at the previous time point. Time points were coded to represent whether an intervention had been received: 1) time points were coded as a '1' if participants had received an intervention at the previous time point and responded to it, and 2) time points were coded as a '0' if participants had not received or responded to an intervention at the previous time point. Using this coding scheme, 10 time points were coded as a '0' if participants had responded only to the checking frequency questions of a previous prompt but not the intervention.

Two regressions were then conducted to examine the impact of interventions on day four and on day five. These analyses controlled for BSQ and within day time. On day four, body checking behaviors were not found to be significantly different when assessed directly following an intervention (M = 11.53, SD = 15.23) compared to not directly following an intervention (M = 11.02, SD = 16.86), b = 0.278, $t(159)$ = 0.178, p = 0.859. Day five body checking behaviors directly following an intervention (M = 7.78, SD = 9.97) compared to not directly following an intervention (M = 9.29, SD = 10.65) was in the direction hypothesized (i.e. directly following an intervention, less body checking is performed), although not significant, b = -1.454, $t(153)$ = -1.519, p = 0.131.

Qualitative Findings

First Intervention. The first intervention asked participants how they felt about their bodies when they engaged in a lot of body checking. Most participants responded that body checking made them feel worse:

> *"After body checking It brings me down and I feel a lot less motivated to get all my things done. It makes me not want to wear the clothes I like if I don't look as skinny as I want to and I don't like going out as much."*
>
> *"I feel worse about myself. I pick every little flaw and jiggle out and regret eating that day."*

A minority of participants reported more neutral or positive impacts of increased checking:

> *"I use to feel shame or regret for not taking better care of it [my body]. But I actually do take good care of it. Over time I've learned to accept it and now body checking is more benchmark to make sure I'm on goal."*
>
> *"Depending on how I'm doing with eating healthy and exercising I can either feel better about the way I look or worse."*

Second Intervention. Participants were asked about their feelings after imagining looking in a mirror while wearing a bathing suit and focusing on disliked areas and how this experience relates to their body checking. Participants reported a strong negative impact following this type of mirror use and also related the experience to their normal behaviors:

> *"I would be upset about how my body looks and I would think I look like a whale. I would also think that I am the fattest person I the world and that no one likes me*

because of my size… The experience are similar because I focus on the parts of my body that I hate and it make my sad."

"I wouldn't feel good. I'm the most unfit that I've ever been… they're the same because I'm picking apart every flaw that I have when I'm not fully clothed."

Third Intervention. In the third intervention, participants were given information about a behavioral strategy, deep breathing, and asked to identify two behaviors they would attempt to resist using this strategy. Participants identified a variety of behaviors to target:

"Sucking in my stomach and comparing my size to someone else's."

"Looking in the mirror, feeling my fat"

Additionally, two participants discussed not finding deep breathing to be useful:

"I don't think that deep breathing will help me resist these urges, it will just draw attention to how self-conscious I am. But if I were to use this technique, I'd do it when I am constantly looking at my reflection in windows/mirrors on days when I'm not feeling pretty. I could also breathe whenever I want to compare myself to other women in the room I'm in."

"It doesn't seem like it would work."

Fourth Intervention. The fourth intervention introduced cognitive challenging. Participants were asked about feelings regarding using the technique and prompted to identify a phrase they could use to challenge their urge to body check. Many participants reported liking the strategy and identified possible phrases:

"It would be comforting to tell myself that checking doesn't matter and there is no reason for me to check… I would tell myself that I was made in the image of God and I am perfect in his eyes, and that beauty comes from the inside."

"I think it would feel better than how I felt after the urge…[I would tell myself] It's not going to solve anything."

Other participants reported that such a strategy would be difficult to implement, but could be effective. Some were concerned about the possibility of such a strategy becoming "obsessive" or actually increasing the urge to body check. Ten participants described not liking the strategy or feeling like it would not be effective:

"Using this technique would make me feel like I have a serious problem and in turn make me feel anxious… I could remind myself that checking will only make me sad."

Fifth Intervention. In the final intervention, participants were given a description of a friend who was engaging in frequent body checking. Participants were then asked to describe what they would tell this friend about her body checking and if they would tell her to do anything differently. Participants mostly reported talking to their friend about how she should not body check or should body check less, how she looks good and does not need to body check, and how they also understand her behavior because they body check as well:

"I would tell her to stop that she looks great and she shouldn't talk so bad about herself… I would tell her to stop constantly pointing out the bad and start point out some good things about her body."

"I would tell her that she is skinny and honestly I'd probably tell her I do the same things in the mornings… To focus on her great features instead."

Instead of providing compliments and reassurances, some participants talked about the role that body checking is playing for their friend. Many suggestions given were similar to strategies received in previous interventions, suggesting the saliency of these suggestions given to them:

"I would tell her that the more she body-checks, the more she becomes aware and self-conscious about herself. It will only lead to more body checking in the future… I would tell her to try and use techniques, like the breathing exercise, before she looks in the mirror."

DISCUSSION

The current study combined EMA and EMI procedures to examine the effectiveness of a five day intervention targeting body checking behaviors. This study adds to the literature examining digital interventions. Hypothesis 1 and 2 were supported, demonstrating that a range of attitudes and behaviors related to body checking were positively impacted following the intervention and also that body checking decreased across the five day intervention. Hypothesis 3 was not supported, as body checking did not decrease directly following intervention prompts on the final two days of the intervention.

Hypothesis 1- Levels of body checking, body dissatisfaction, body image avoidance, internalization of the thin-ideal, and body checking cognitions will decrease from pre-test to posttest after the five-day intervention.

Comparisons on pretest and posttest scores demonstrated improvements in body checking, body dissatisfaction, body image avoidance, internalization of the thin-ideal, and body checking. This evidence in support of Hypothesis 1 suggests that the five day intervention was effective in having a positive impact on a range of attitudes and behaviors related to body checking. Additionally, body checking was shown to be most strongly impacted by the intervention, providing more support for the ability of the intervention to change body checking behaviors. Effect sizes for this five-day digital based intervention were comparable to effects seen in a range of other body related interventions: a three week meditation training, a five minute acceptance intervention

conducted after a body dissatisfaction induction , a three session body image intervention group conducted with adolescent girls, and a seven minute educational video intervention targeting negative impacts of media exposure (Albertson, Neff, & Dill-Shackleford, 2014; Wade, George, & Atkinson, 2009; Richardson & Paxton, 2010; Posavac, Posavac, & Weigel, 2001).

Hypothesis 2- Body checking will decrease across the five-day intervention.

The second hypothesis was also supported, with body checking decreasing across the five day intervention period. Participants reported an average of around 76 body checking behaviors on day 1 and around 58 behaviors on day 5. This result mirrors findings seen in weight loss literature suggesting text-based interventions can be effective in promoting heath behaviors and weight loss (Patrick, et al., 2009; Shapiro, et al., 2012). Although the current intervention was conducted over a shorter time period compared to many EMI studies, it is encouraging that behavior change was still seen.

The simple act of monitoring body checking behaviors over the course of five days could have had an impact on the reduction in body checking behaviors over time in this study. EMA procedures repeatedly ask participants assessment questions, and reactivity can occur when the procedure itself causes changes. The question of reactivity has been discussed and evaluated in the EMA literature. For example, a four week EMA smoking cessation study found that participants who were sent six daily prompts (on measures assessing mood, withdrawal, motivation and confidence to quit smoking, and cigarettes smoked) compared to one daily prompt, differed in secondary outcomes such as lower craving and anxiety, but showed no differences in smoking cessation

(McCarthy, et al., 2015). Additionally, Heron and Smyth (2013) found no evidence of reactivity in a one to two week EMA procedure assessing body image, and other studies assessing eating and body- related constructs have also found no evidence of reactivity (Heron, 2011). However, Heron (2011) also noted that reactivity associated with behaviors that have high awareness (e.g., pain) is uncommon, but behaviors that have low awareness may result in greater reactivity in response to EMA. In fact, a previous EMA study assessing body checking and not implementing an 'intervention' was still found to result in decreased body checking over the course of five days (Stefano et al., in press).

Therefore, body checking behaviors that are often performed without much awareness in non-clinical women may be reactive to EMA procedures that result in greater awareness. The impact of the EMA procedures could also be similar to results demonstrated by self-monitoring procedures used in weight loss intervention studies. The monitoring of dietary intake and physical exercise has been shown to have positive impacts (i.e. weight loss and higher performance of health behaviors) in weight loss programs as well (Burke, Wang, & Sevick, 2011). Interestingly, the decrease in body checking seen in the current EMI study was greater compared a study utilizing only EMA to assess body checking (Stefano et al., in press), suggesting that the interventions implemented in the current study had a unique impact on participants in addition to self-monitoring.

One unexpected finding was that body checking behaviors increased throughout the course of each individual day. In an EMA study with 118 women with anorexia by Lavender and colleagues (2013), a daily pattern of anxiety that is lower in the morning and increases in the late afternoon and evening was associated with increased rates of

body checking. This suggests that increasing daily anxiety could be associated with the increasing daily pattern of body checking as observed in the current sample. Additionally, previous EMA studies have demonstrated a causal relationship between mood/stress and eating disorder symptoms (binging and vomiting; Smyth et al., 2007). In order to assess the possibility that increasing rates of anxiety/stress over the course of the day are associated with an increased in body checking, a future study could assess these variables along with body checking.

Hypothesis 3- Body checking will decrease directly following intervention prompts on days four and five.

Hypothesis 3 was not supported. Body checking did not decrease directly following intervention time points on days four and five. This finding could have been obtained because some of the interventions themselves were not particularly effective. Qualitative analyses found that participants did not find some of the strategies to be helpful. Future studies should further investigate the types of interventions participants find to be most useful.

Additionally, messages to participants in the current study were not customized. Heron and Smyth (2010) note that individually tailored messages have been shown to increase effectiveness of interventions. Robinson and colleagues (2006) also found that participants who enrolled in a six month EMI study post treatment for bulimia desired more personalized intervention responses and messages seen as more 'routine' often made participants feel as if they weren't heard and even patronized. Therefore, the lack of

personalized intervention messages in the current study could have reduced the effectiveness of the interventions.

It's also possible that the interventions were not immediately effective in reducing body checking because most of the interventions used would require some practice to perfect the strategies. Results did suggest that by day five, body checking was lower directly following an intervention compared to not directly following an intervention, although this result was not significant. A longer period of daily assessment (e.g., a 10 day assessment) would help determine the impact of a potentially slower-acting intervention.

Limitations

The current study does have several limitations. Participants were not asked about the extent to which they were implementing the intervention strategies presented to them, an area that Heron (2012) recommends assessing in EMI studies. In the current study, it is unclear how frequently or the extent to which participants were utilizing the intervention strategies. Additionally, demand characteristics may have lead participants to respond in ways that conformed to what they believed to be the intention of the study (Heron, 2012). For example, by the end of day 5 it was clear that reducing body checking was the goal and therefore, participants may have reported lower levels of checking to meet perceived researchers' wishes. Additionally, the sample was comprised of predominately white college females with high levels of body dissatisfaction, limiting the generalizability of the findings.

Clinical and Research Implications

Fairburn and Rothwell (2015) discuss the need for continued investigation of smartphone applications that are designed for assessment and monitoring of eating behaviors within cognitive behavioral treatment. The current study suggests that the assessment and intervention of body checking using a digital ecological design is a feasible and reliable option. Additionally, response rates were high for this study, with around 90% compliance throughout the study. This study revealed that the evening was a high risk time for body checking behaviors, and this finding should serve to inform clinicians in how to best intervene with clients exhibiting high levels of body checking. Qualitative reports from participants in the study also emphasized the importance of obtaining feedback about whether interventions are found to be acceptable and/or effective for individuals.

Future research should continue to examine body checking interventions that are delivered in "real-time". The current study demonstrates the possibility for a standalone five day intervention to positively impact body checking and attitudes surrounding body image. Future digital interventions should be examined in clinical populations and as add-ons to in person treatments. Such interventions should aim to be personalized for individual needs and delivered at times relevant for the individual (i.e. high risk times). Additionally, participants should be given opportunities to report on their use of strategies and preferences for intervention style.

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APPENDICES

Appendix A. Pre and Posttest Measures

Body checking Cognitions Scale (BCCS; Mountford, Haase, & Waller, 2006)

Factor 1: Objective verification

8	By body checking I can tell how much weight I have put on.
9	Body checking helps to confirm what the scales say.
12	I have to body check to see where the weight is going.
13	I keep checking in the hope that one day I will be happy with the way I look.
15	Body checking is the most accurate way to tell what I look like.
21	Body checking tells me when I need to do more exercise.

Factor 2: Reassurance

2	I think body checking will reassure me about my size.
3	I think body checking will help to calm me down when I feel anxious about my shape or weight.
5	Body checking is a good thing for me to do.
7	Body checking makes me feel better.

Factor 3: Safety beliefs

16	I have to check that my body is hidden in the way I like before I leave the house.
17	If I resist body checking, I will feel worse.
18	I think checking my body will tell me how I feel.
19	I can't remember what I look like if I don't check.
20	I think body checking will make me more comfortable around other people.

Factor 4: Body control

1	Body checking today allows me to decide how much/little I can eat tomorrow.
4	Body checking helps me to control my weight.
6	Body checking stops me from losing control of what I eat.
14	If I stop body checking my weight will shoot up.

Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987)

We should like to know how you have been feeling about your appearance over the **PAST FOUR WEEKS**. Please read each question and circle the appropriate number to the right. Please answer <u>all</u> the questions.

OVER THE PAST <u>FOUR WEEKS:</u>

		Never	Rarely	Sometimes	Often	Very often	Always
1.	Has feeling bored made you brood about your shape?	1	2	3	4	5	6
2.	Have you been so worried about your shape that you have been feeling you ought to diet?	1	2	3	4	5	6
3.	Have you thought that your thighs, hips or bottom are too large for the rest of you?	1	2	3	4	5	6
4.	Have you been afraid that you might become fat (or fatter)?	1	2	3	4	5	6
5.	Have you worried about your flesh being not firm enough?	1	2	3	4	5	6
6.	Has feeling full (e.g. after eating a large meal) made you feel fat?	1	2	3	4	5	6
7.	Have you felt so bad about your shape that you have cried?.	1	2	3	4	5	6
8.	Have you avoided running because your flesh might wobble?	1	2	3	4	5	6
9.	Has being with thin women made you feel self-conscious about your shape?	1	2	3	4	5	6
10.	Have you worried about your thighs spreading out when sitting down?	1	2	3	4	5	6
11.	Has eating even a small amount of food made you feel fat?	1	2	3	4	5	6
12.	Have you noticed the shape of other women and felt that your own shape compared unfavorably?	1	2	3	4	5	6
13.	Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?	1	2	3	4	5	6
14	Has being naked, such as when taking a bath, made you feel fat?	1	2	3	4	5	6
15.	Have you avoided wearing clothes which make you particularly aware of the shape of your body?	1	2	3	4	5	6
16.	Have you imagined cutting off fleshy areas of your body?	1	2	3	4	5	6
17.	Has eating sweets, cakes, or other high calorie food made you feel fat?	1	2	3	4	5	6
18.	Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?	1	2	3	4	5	6
19.	Have you felt excessively large and rounded?	1	2	3	4	5	6
20.	Have you felt ashamed of your body?	1	2	3	4	5	6
21.	Has worry about your shape made you diet?	1	2	3	4	5	6
22.	Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?	1	2	3	4	5	6
23.	Have you thought that you are in the shape you are because you lack self-control?	1	2	3	4	5	6
24.	Have you worried about other people seeing rolls of fat around your waist or stomach?	1	2	3	4	5	6
25.	Have you felt that it is not fair that other women are thinner than you?	1	2	3	4	5	6
26.	Have you vomited in order to feel thinner?	1	2	3	4	5	6
27.	When in company have your worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?	1	2	3	4	5	6
28.	Have you worried about your flesh being dimply?	1	2	3	4	5	6
29.	Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	1	2	3	4	5	6
30.	Have you pinched areas of your body to see how much fat there is?	1	2	3	4	5	6
31.	Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?	1	2	3	4	5	6
32.	Have you taken laxatives in order to feel thinner?	1	2	3	4	5	6
33.	Have you been particularly self-conscious about your shape when in the company of other people?	1	2	3	4	5	6
34.	Has worry about your shape made you feel you ought to exercise?	1	2	3	4	5	6

Body Image Avoidance Questionnaire (BIAQ; Rosen, Srebnik, Saltzberg, & Wendt, 1991)

Body Image Avoidance Questionnaire

Circle the number which best describes how often you engage in these behaviors at the present time.

	Always	Usually	Often	Sometimes	Rarely	Never
1. I wear baggy clothes	5	4	3	2	1	0
2. I wear clothes I do not like	5	4	3	2	1	0
3. I wear darker color clothing	5	4	3	2	1	0
4. I wear a special set of clothing, e.g., my "fat clothes"	5	4	3	2	1	0
5. I restrict the amount of food I eat	5	4	3	2	1	0
6. I only eat fruits, vegetables and other low calorie foods	5	4	3	2	1	0
7. I fast for a day or longer	5	4	3	2	1	0
8. I do not go out socially if I will be "checked out"	5	4	3	2	1	0
9. I do not go out socially if the people I am with will discuss weight	5	4	3	2	1	0
10. I do not go out socially if the people I am with are thinner than me	5	4	3	2	1	0
11. I do not go out socially if it involves eating	5	4	3	2	1	0
12. I weigh myself	5	4	3	2	1	0
13. I am inactive	5	4	3	2	1	0
14. I look at myself in the mirror	5	4	3	2	1	0
15. I avoid physical intimacy	5	4	3	2	1	0
16. I wear clothes that will divert attention from my weight	5	4	3	2	1	0
17. I avoid going clothes shopping	5	4	3	2	1	0
18. I don't wear "revealing" clothes (e.g., bathingsuits, tank tops, or shorts)	5	4	3	2	1	0
19. I get dressed up or made up	5	4	3	2	1	0

Body Checking Questionnaire (BCQ; Reas, Whisenhunt, Netemeyer, &Williamson, 2002)

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Body Checking Questionnaire

Circle the number which best describes how often you engage in these behaviors at the present time.

1 = never
2 = rarely
3 = sometimes
4 = often
5 = very often

Table Appendix *(Continued)*

1. I check to see if my thighs spread when I'm sitting down.	1	2	3	4	5
2. I pinch my stomach to measure fatness.	1	2	3	4	5
3. I have special clothes which I try on to make sure they still fit.	1	2	3	4	5
4. I check the diameter of my wrist to make sure it's the same size as before.	1	2	3	4	5
5.1 check my reflection in glass doors or car windows to see how I look.	1	2	3	4	5
6. I pinch my upper arms to measure fatness.	1	2	3	4	5
7. I touch underneath my chin to make sure I don't have a "double chir."	1	2	3	4	5
8. I look at others to see how my body size compares to their body size.	1	2	3	4	5
9. I rub (or touch) my thighs while sitting to check for fatness.	1	2	3	4	5
10. I check the diameter of my legs to make they're the same size as before.	1	2	3	4	5
11. I ask others about their weight or clothing size so I can compare my own weight/size.	1	2	3	4	5
12. I check to see how my bottom looks in the mirror.	1	2	3	4	5
13.1 practice sitting and standing in various positions to see how I would look in each position.	1	2	3	4	5
14. I check to see if my thighs rub together.	1	2	3	4	5
15. I try to elicit comments from others about how fat I am.	1	2	3	4	5
16. I check to see if my fat jiggles.	1	2	3	4	5
17. I suck in my gut to see what it is like when my stomach is completely flat.	1	2	3	4	5
18. I check to mare sure my rings fit the same way as before,	1	2	3	4	5
19. I look to see if I have cellulite on my thighs when I am sitting.	1	2	3	4	5
20. I lie down on the floor to see if I can feel my bones touch the floor.	1	2	3	4	5
21. I pull my clothes as tightly as possible around myself to see how I look.	1	2	3	4	5
22. I compare myself to models on TV or in magazines.	1	2	3	4	5
23. I pinch my cheeks to measure fatness.	1	2	3	4	5

Note: The BCQ is in questionnaire format and can therefore be administered in either individual or group settings. Completion time for the measure is approximately 5-10 minutes. To score the total BCQ, simply sum all the items. To calculate the overall appearance scale, sum the following items: 3, 5, 8, 11,12, 13, 15, 17, 21, 22 . To calculate the specific body parts scale, sum the following items: 1, 2, 6, 9,10, 14, 16, 19. To calculate the idiosyncratic checking scale, sum the following items: 4, 7, 18, 20,23.

Sociocultural Attitudes Towards Appearance Scale (SATAQ-3; Thompson, J. K., van den Berg, P., Roehrig, M., Guarda, A. S., & Heinberg, L. J., 2004)

SOCIOCULTURAL ATTITUDES TOWARDS APPEARANCE SCALE - 3 (SATAQ-3)

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely Disagree = 1
Mostly Disagree = 2
Neither Agree Nor Disagree = 3
Mostly Agree = 4
Definitely Agree = 5

1. TV programs are an important source of information about fashion and "being attractive." _____
2. I've felt pressure from TV or magazines to lose weight. _____
3. I do not care if my body looks like the body of people who are on TV. _____
4. I compare my body to the bodies of people who are on TV. _____
5. TV commercials are an important source of information about fashion and "being attractive." _____
6. I do not feel pressure from TV or magazines to look pretty. _____
7. I would like my body to look like the models who appear in magazines. _____
8. I compare my appearance to the appearance of TV and movie stars. _____
9. Music videos on TV are not an important source of information about fashion and "being attractive." _____
10. I've felt pressure from TV and magazines to be thin. _____
11. I would like my body to look like the people who are in movies. _____
12. I do not compare my body to the bodies of people who appear in magazines. _____
13. Magazine articles are not an important source of information about fashion and "being attractive." _____
14. I've felt pressure from TV or magazines to have a perfect body. _____
15. I wish I looked like the models in music videos. _____
16. I compare my appearance to the appearance of people in magazines. _____
17. Magazine advertisements are an important source of information about fashion and "being attractive." _____
18. I've felt pressure from TV or magazines to diet. _____
19. I do not wish to look as athletic as the people in magazines. _____
20. I compare my body to that of people in "good shape." _____
21. Pictures in magazines are an important source of information about fashion and "being attractive." _____
22. I've felt pressure from TV or magazines to exercise. _____
23. I wish I looked as athletic as sports stars. _____
24. I compare my body to that of people who are athletic. _____
25. Movies are an important source of information about fashion and "being attractive." _____
26. I've felt pressure from TV or magazines to change my appearance. _____
27. I do not try to look like the people on TV. _____
28. Movie starts are not an important source of information about fashion and "being attractive." _____
29. Famous people are an important source of information about fashion and "being attractive." _____
30. I try to look like sports athletes. _____

Demographic Questionnaire

Age:

Year in College:

Race:

Ethnicity:

Height:

Weight:

Appendix B. Human Subjects IRB Approval

Approval Date: 9/25/2015
Expiration Date of Approval: 9/24/2016

RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)
Submission Type: Initial
Expedited Category: 7.Surveys/interviews/focus groups
Study #: 16-0098

Study Title: Examination of an Intervention for Body Checking

This submission has been approved by the above IRB for the period indicated. It has been determined that the risk involved in this research is no more than minimal.

Investigator's Responsibilities:

Federal regulations require that all research be reviewed at least annually. It is the Principal Investigator's responsibility to submit for renewal and obtain approval before the expiration date. You may not continue any research activity beyond the expiration date without IRB approval. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.

You are required to obtain IRB approval for any changes to any aspect of this study before they can be implemented (use the procedures found at http://orc.missouristate.edu). Should any adverse event or unanticipated problem involving risks to subjects or others occur it must be reported immediately to the IRB following the adverse event procedures at the same website.

This study was reviewed in accordance with federal regulations governing human subjects research, including those found at 45 CFR 46 (Common Rule), 45 CFR 164 (HIPAA), 21 CFR 50 & 56 (FDA), and 40 CFR 26 (EPA), where applicable.

Appendix C. Control Interventions

Control interventions

1. Think about where you have studied and/or attended class in the past few days. Consider the distractions present when you were in different locations. Research has shown that people are not as good at multitasking as they think they are. Think about whether this is true for you.
    a. How do you feel about your ability to study or pay attention in class when there are a lot of distractions around you?

2. Imagine yourself trying to study in your room. You are reviewing notes for a test coming up in a few days. You are also watching Netflix and texting your friend. Consider how hard it is to focus on studying.
    a. How would it feel to turn off Netflix and tell your friend you will text her after you are done studying?

3. You are having coffee with a close friend. This friend appears stressed. She shares with you how bad she feels she is doing in her classes. She tells you how long it takes her to read chapters for classes because of how distracted she gets with talking to her roommate and watching Netflix. She describes being unhappy with her past test grades. Think about what type of things you would tell this friend regarding her study habits.
    a. What would you tell this friend about her study habits?
    b. Would you tell her to do anything differently?