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## Emotional Eating is Associated with Weight Loss Success among Adults Enrolled in a Weight Loss Program

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### Abstract

**Objective**—To examine associations between decreased emotional eating and weight loss success; and whether participation in a behavioral weight loss intervention was associated with a greater reduction in emotional eating over time as compared to usual care.

**Methods**—The present study is a secondary data analysis of a randomized controlled trial conducted at two university medical centers with 227 overweight adults with diabetes. Logistic and standard regression analyses were used to examine associations between emotional eating change and weight loss success (i.e., weight loss of  $\geq 7\%$  of body weight).

**Results**—At 6 months into the intervention, decreased emotional eating was associated with greater odds of weight loss success ( $p = .05$ ). The odds of weight loss success for subjects with decreased emotional eating at 12 months were 1.70 times higher than for subjects with increased emotional eating. Standard regression analyses showed that decreased emotional eating was significantly associated with greater weight loss at 6 ( $p = .01$ ) and 12 months ( $p = .00$ ). No differences in change in emotional eating were found between subjects in the behavioral weight loss intervention and usual care.

**Conclusions**—Strategies to reduce emotional eating may be useful to promote greater weight loss among overweight adults with diabetes.

### Keywords

obesity; emotional eating; diabetes; randomized clinical trial

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## Introduction

More than 2 out of every 3 U.S. adults are overweight or obese (Flegal et al., 2012). Furthermore, the majority (80.3%) of adults with diabetes are overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) and almost half (49.1%) are obese (BMI  $\geq 30$  kg/m<sup>2</sup>) (Nguyen et al., 2011). Two large randomized controlled trials examining behavioral weight loss treatments, the Diabetes Prevention Program (DPP) (Knowler et al., 2002) and the Look AHEAD trial, (Look AHEAD Research Group, 2003) demonstrated that weight loss is challenging for overweight adults with diabetes. Behavioral weight loss treatments recommend a weight loss goal of at least 7% of total body weight (Knowler et al., 2002; Look AHEAD Research Group, 2006), but approximately 1/3–1/2 of participants do not meet this goal (Wadden et al., 2009). Continued identification of factors predictive of success in behavioral weight loss programs is an important step toward improving weight loss interventions for adults with obesity and diabetes.

Emotional eating, or eating in response to emotional triggers (Greeno & Wing, 1994), could be a significant factor associated with weight loss outcomes among obese adults with diabetes. More than half (57%) of overweight adults report frequent episodes of emotional eating (Péneau et al., 2013). Emotional eating is associated with a higher frequency of snacking (O'Connor et al., 2008), eating in response to daily stressors (O'Connor et al., 2008), and greater consumption of energy-dense, high-fat foods, as measured in the laboratory (Oliver et al., 2000) and via self-report (Camilleri et al., 2014). Furthermore, emotional eating appears to be an important factor related to body weight over time (Keller & Siegrist, 2015).

Although few studies have examined associations between emotional eating and weight loss success and maintenance, these studies suggest that emotional eating may be inversely related to successful outcomes. In one study that included a non-treatment-seeking sample, adults who experienced a reduction in emotional eating over the course of a year reported significantly greater weight loss as compared to adults who reported a sustained level of emotional eating (Blair et al., 1990). Two previous studies have examined the association between emotional eating, as opposed to general disinhibition (i.e., eating in response to internal and external cues), and weight loss in treatment-seeking samples of overweight adults. Results showed that a higher level of self-reported emotional eating prior to treatment was significantly associated with less weight loss in behavioral (Niemeier et al., 2007) and surgical (Canetti et al., 2009) interventions. A higher level of self-reported emotional eating after treatment is also a risk factor for weight regain among adults who have successfully lost weight (Elfhag & Rössner, 2005). Thus, it is possible that adults who decrease emotional eating during the course of behavioral weight loss treatment, may be more likely to achieve successful weight loss as compared to adults who are unable to modify this tendency. However, the association between emotional eating and weight loss has not yet been examined among overweight or obese adults with diabetes.

If emotional eating is a reliable predictor of weight loss, it may be clinically useful to assess in behavioral weight loss treatments, which generally target weight loss through reduced-energy diet and increased physical activity (Knowler et al., 2002; Look AHEAD Research

Group, 2003). The current study examined whether a decrease in self-reported emotional eating during treatment was significantly associated with a greater likelihood of achieving clinically significant weight loss ( $\geq 7\%$  of initial body weight). At this time, decreasing emotional eating is not a major target or primary goal of behavioral weight loss treatment. Nonetheless, it seems plausible that general dietary modifications recommended in behavioral weight loss interventions (e.g., setting a calorie goal, reducing intake of energy-dense foods) could indirectly result in changes in certain eating behaviors, including emotional eating. Thus, the secondary study aim of this study was to examine whether a multifaceted behavioral weight loss program was associated with a greater reduction in emotional eating over time as compared to usual care.

## Methods

### Study Design

The present study is a secondary data analysis of a study designed to compare the impact of a behavioral weight loss program (i.e., a commercial weight loss program involving a structured meal plan with individualized weight loss counseling) to usual care on weight loss, glycemic control, and cardiovascular disease risk factors among overweight adults with type 2 diabetes (Rock et al., 2014). The study was conducted at two university medical centers. Participants in the weight loss program were assigned to a reduced-energy diet with either a lower- or higher-carbohydrate (45% vs. 65% of energy) diet. The program included pre-packaged foods and individual behavioral counseling sessions. Participants in usual care completed a 1-hour individual counseling session with a dietitian at baseline and at the 6-month time point. Additionally, monthly email and telephone check-ins were included. Assessment visits were completed at baseline, 6, and 12 months. Further description of study interventions and assessments is available in the primary study outcome paper (Rock et al., 2014). The study was approved by the Institutional Review Boards at both institutions and participants provided written informed consent.

### Participants

A total of 227 men and women were enrolled in the study. Participants were recruited through direct mailings, local advertisements, flyers, email listservs, social media, [clinicaltrials.gov](http://clinicaltrials.gov), and word of mouth. Eligibility criteria included overweight or obesity (BMI 25–45 kg/m<sup>2</sup>), presence of type 2 diabetes,  $\geq 18$  years of age, willing and able to perform a step test for assessing cardiopulmonary fitness, and willing to participate in any of the study activities over the course of one year. Exclusion criteria included pregnancy, breastfeeding, or plans to become pregnant in the next year, food allergies or intolerance, history of bariatric surgery, presence of a psychiatric disorder that would interfere with study participation (e.g., eating disorder), severe depression (as indicated by a baseline score  $>28$  on the Beck Depression Inventory), current involvement in another diet intervention study or organized weight loss program, and weight loss  $>10$  pounds in the past 3 months. Additional exclusion criteria were HbA<sub>1c</sub>  $>11\%$  (97 mmol/mol), fasting triglyceride level  $>600$  mg/dL, and serum creatinine level  $\geq 1.4$  mg/dL (women) or 1.5 mg/dL (men).

## Measures

**Anthropometry**—Height was measured in duplicate at baseline with a standard stadiometer, and an average of the two values was used for analyses. Weight was measured at all clinic visits using a digital scale. Height and weight were used to calculate BMI (kg/m<sup>2</sup>).

**Emotional Eating**—The emotional eating subscale of the revised version of the Three Factor Eating Questionnaire (TFEQ-R18) (Karlsson et al., 2000) was used to measure emotional eating in the current study. The TFEQ-R18 is a revised version of a commonly used measure of eating behaviors, the original TFEQ (Stunkard & Messick, 1985). An emotional eating subscale is not included in the original measure. The revised TFEQ-R18 includes three subscales, cognitive restraint, uncontrolled eating, and emotional eating. The emotional eating subscale of the TFEQ-R18 consists of 3-items that assess emotional eating including “When I feel anxious, I find myself eating,” “When I feel sad or blue, I often overeat,” and “When I feel lonely, I console myself by eating.” Response options are true and false, and subscale total ranges from 0–3 with higher scores indicating greater emotional eating. The TFEQ-R18 was developed on the basis of factor analyses of the original TFEQ (Stunkard & Messick, 1985) in a large sample of obese subjects (Karlsson et al., 2000).

## Statistical Analyses

For the current study, participants assigned to the weight loss program (i.e., lower or higher carbohydrate) were combined because weight loss was not significantly different between the two diet assignments.<sup>27</sup> Change scores were calculated (range –3 to +3) to determine the change in emotional eating during the first half of the intervention (i.e., baseline to the 6 month time point), during the second half of the intervention (i.e., the 6 month time point to the 12 month time point), and over the course of the entire intervention (i.e., baseline to the 12 month time point). Next, to examine variability in emotional eating scores, frequencies were calculated to identify the percentage of subjects who experienced varying levels of change in emotional eating over the course of the intervention. Descriptive statistics were then calculated to examine demographic characteristics of the sample.

The first study aim was evaluated with two logistic regression analyses which were calculated to examine whether a decrease in emotional eating was associated with weight loss success at 6 and 12 months. Weight loss success was defined as  $\geq 7\%$  of initial body weight since behavioral weight loss programs recommend initial weight loss of 7–10% of body weight.<sup>5,6</sup> In both models, change in emotional eating was the independent variable and weight loss success was the dependent variable and treatment group, gender, and baseline BMI were entered as covariates. The following coding was used to identify categorical variables: male gender was coded as 0, female gender was coded as 1; usual care was coded as 0, the behavioral weight loss program was coded as 1. Two standard multiple regression analyses were then calculated to examine the association between change in emotional eating and BMI at the 6 month and 12 month time points, after controlling for treatment group, gender, and baseline BMI. The second study aim was examined with a mixed (between-within subjects) ANOVA. In this model, group assignment (i.e., weight loss program vs. usual care) was entered as an independent variable and emotional eating was the

dependent variable. The criterion for statistical significance was set at  $p < .05$ . All calculations were performed using SPSS 20.0 ([www.SPSS.com](http://www.SPSS.com)).

## Results

Men (49.9%) and women (51.1%) were evenly represented in the sample. Approximately two-thirds of the sample were married or living together (67.8%), and almost three-quarters (72.7%) reported an income greater than \$50,000. Mean 12 month weight loss was greater among those enrolled in the weight loss program (8.2% of initial body weight), as compared to participants assigned to usual care (2.5% of initial body weight).<sup>27</sup>

At baseline, a majority (72%) of participants reported some emotional eating and many (38%) endorsed a high level of emotional eating. Frequency statistics analyzed separately from baseline to 6 months and then 6 months the 12 month time point showed variability in emotional eating scores for almost two-thirds (62%) of the participants, and stability in emotional eating scores for more than one-third (38%) of the participants. From baseline to the 12 month time point, 32% of subjects reported a decrease in emotional eating and 16% reported an increase in emotional eating.

Table 1 presents the impact of change in emotional eating on weight loss success at 6 and 12 months, after controlling for treatment group, gender, and baseline BMI. Six months into the intervention, greater decreases in emotional eating were associated with greater odds of weight loss success, although this relationship only approached significance ( $p = .05$ ). At the 12-month time point, greater decreases in emotional eating were significantly associated with greater odds of weight loss success ( $p = .00$ ). Subjects who reported decreases in emotional eating over the course of the 12 months were 1.70 times more likely to achieve weight loss success than subjects who reported increases in emotional eating. Next, standard multiple regression analyses were used to examine associations between emotional eating change and BMI (i.e., at 6 and 12-months) as a continuous variable. Treatment group, gender, and baseline BMI were entered as covariates. Decreased emotional eating over the course of 6 months was significantly associated with a lower BMI at the 6-month time point ( $p < .001$ ). Similarly, decreased emotional eating over the course of 12 months was significantly associated with a lower BMI at the 12 month time point ( $p < .000$ ).

ANOVA results examining mean emotional eating scores showed that there was no significant interaction between group assignment (i.e., behavioral weight loss intervention, usual care) and time, Wilks Lambda = .97,  $F(2, 189) = 2.70$ ,  $p = .07$ , partial eta squared = .03. There was a significant main effect for time, Wilks Lambda = .96,  $F(2, 189) = 3.76$ ,  $p = .03$ , partial eta squared = .04, with both groups showing a slight reduction in emotional eating across the time points. The main effect comparing the two types of interventions was not significant,  $F(1, 190) = .001$ ,  $p = .97$ .

## Discussion

In the present sample, approximately 3 out of 4 treatment-seeking, overweight and obese adults with type 2 diabetes reported that they engage in emotional eating. The importance of emotional eating was demonstrated as a reduction in emotional eating over the 12-month

course of treatment was associated with significantly greater odds of achieving successful weight loss, as compared to an increase in emotional eating.

The current study adds to a growing body of literature which suggests that there may be an association linking emotional eating and the ability to lose weight in behavioral weight loss programs. Two prior studies have shown that high emotional eating at baseline was predictive of less weight loss in behavioral (Niemeier et al., 2007) and surgical (Canetti et al., 2009) weight loss interventions. The current study extends these findings by showing that a reduction in emotional eating may be critical to achieving weight loss success, particularly among overweight and obese adults with diabetes. It is possible that augmenting weight management interventions with a focus on teaching skills for decreasing emotional eating may improve weight loss outcomes.

In the present study, a multi-component behavioral weight loss program did not yield greater improvements in emotional eating as compared to usual care. Behavioral weight loss programs typically include a minor focus on emotional eating in which the impact of thoughts and emotions on behavior are addressed (Look AHEAD Research Group, 2006). More recently, innovative weight loss treatments have incorporated a focus on modifying emotional eating behavior. Although initial pilot study outcomes showed decreased emotional eating following treatment (Forman et al., 2009; Roosen et al., 2012), in two controlled trials, this change in emotional eating was not greater than change observed in the control groups (Tapper et al., 2009; Goldbacher et al., 2015). Continued efforts need to focus on developing treatments that have a sizable impact on emotional eating behavior, in order to improve weight loss outcomes.

In conclusion, the present study highlighted the significance of emotional eating in overweight/obese adults with diabetes. Although decreased emotional eating was associated with greater odds of weight loss success, the gold standard behavioral weight loss treatment for overweight adults did not yield greater improvements in emotional eating, as compared usual care. To our knowledge, rates of emotional eating in this specific sub-sample have not previously been reported. Additional strengths of this study include the relatively large sample of treatment-seeking individuals who completed a randomized weight management trial. Despite its strengths, the study is limited by the use of a self-report measure of emotional eating which may not accurately reflect true eating behavior. Moreover, it is unknown whether reducing emotional eating directly impacts weight, and it is likely that there are unmeasured variables contributing to weight loss outcomes. Nevertheless, the present study has important research and clinical implications. Assessment of emotional eating as a risk factor prior to and during weight management treatments, in both clinical and research domains, is an important area of further study.

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funding sponsor had no role in the conduct of the study; collection, management, analysis and interpretation of the data; preparation, review or approval of the manuscript (except for verifying the specific weight loss program activities that comprised the intervention); and decision to submit the manuscript for publication.

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**Table 1**

Association between change in emotional eating and weight loss success

<i>Predictor</i>	<i>B</i>	<i>Wald</i>	<i>p</i>	<b>OR (95% CI)</b>
Emotional eating change baseline to 6 months <sup>a</sup>				
Baseline BMI	.01	.14	.71	1.01 (.94, 1.09)
Treatment group	2.66	35.69	.00	14.34 (5.99, 34.35)
Gender	-.52	2.45	.12	.60 (.31, 1.14)
Change in emotional eating	-.30	3.91	.05	.74 (.55, 1.00)
Emotional eating change baseline to 12 months <sup>b</sup>				
Baseline BMI	.03	.76	.38	1.03 (.96, 1.11)
Treatment group	1.99	26.02	.00	7.32 (3.41, 15.75)
Gender	-.32	.97	.33	.73 (.38, 1.38)
Change in emotional eating	-.53	12.52	.00	.59 (.44, .79)

*Note.* From logistic regression models with weight loss success (weight loss of  $\geq 5\%$  of initial body weight) as the dependent variable.

<sup>a</sup>Weight loss at 6 months.

<sup>b</sup>Weight loss at 12 months.