



An exploratory study of Mindfulness Based Stress Reduction for emotional eating



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ABSTRACT

Emotional eating is an important predictor of weight loss and weight regain after weight loss. This two part study's primary aim was to explore changes in emotional eating in a general population of individuals taking the Mindfulness Based Stress Reduction (MBSR) program, with a secondary aim to explore whether changes in mindfulness predicted changes in emotional eating. Self-reported survey data exploring these questions were collected before and after the intervention for two sequential studies (Study 1 and Study 2). While there were no control groups for either study, in both studies emotional eating scores following the MBSR were significantly lower than scores prior to taking the MBSR ($p < 0.001$; $p < 0.001$). In Study 2, changes in mindfulness were correlated with changes in emotional eating ($r = 0.317$, $p = 0.004$). These results suggest that MBSR may be an effective intervention for emotional eating, and that further research is warranted to examine effects on weight loss and maintenance.

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1. Introduction

A 2008 epidemiologic study in *Obesity* predicted that by 2048, all American adults will be overweight or obese, posing significant social, economic, and health concerns for the future (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). Weight loss interventions have improved in their success rates, but weight maintenance following weight loss remains an under-researched and important problem (Anderson, Konz, Frederich, & Wood, 2001; Jeffery et al., 2000). Based on the disinhibition subscale of the Three Factor Eating Questionnaire, Neimeier et al. examined two potential predictors of weight loss and regain: internal disinhibition and external disinhibition (Niemeier, Phelan, Fava, & Wing, 2007). Internal disinhibition, or emotional eating, results from an inability to inhibit the drive to eat in response to internal processes, such as emotional distress. External disinhibition results from an inability to inhibit the drive to eat in response to external processes, such as seeing food in a social situation. Neimeier found that internal disinhibition is a much stronger predictor of weight loss and

regain than external disinhibition (Niemeier et al., 2007). Other studies have since explored the role of emotional eating in initial weight change, finding that internal disinhibition during weight loss interventions were predictive of later weight loss maintenance (Butryn, Thomas, & Lowe, 2009). In addition, higher levels of emotional eating predict weight gain, while lower levels of emotional eating predict weight loss (Koenders & van Strien, 2011; Silva et al., 2008).

Mechanistically, in individuals with chronically high stress levels, consumption of “comfort” foods may dampen the HPA axis, becoming a form of self-medication (Tomiyama, Dallman, & Epel, 2011). As the drive to emotionally eat becomes habitual, an inability to suppress this drive, or a lack of internal inhibition, will lead to increased intake of “comfort” foods in response to stressors. Successful interventions for long-term weight management must then have a two-pronged approach: to decrease chronic stress levels, but also to alter the individual's response to stress and the negative emotions that are triggered by it.

Mindfulness training, or the cultivation of non-judgmental awareness of the present moment, has been shown to improve emotional reactivity and decrease stress, as well as improve other health behaviors (Brewer et al., 2011; Goyal et al., 2014; Miller, Kristeller, Headings, & Nagaraja, 2014; O'Reilly, Cook, Spruijt-Metz, & Black, 2014). The Mindfulness-Based Stress Reduction

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(MBSR) program is an 8 week, highly accessible course currently offered in over 500 sites across the US. If mindfulness training is an effective intervention for decreasing emotional eating, the MBSR could present a low-cost strategy for addressing stress-and emotion-related eating, and potentially weight loss and weight loss maintenance.

To date, studies exploring the effects of mindfulness based interventions on emotional eating have had mixed results. A 2014 review concluded that mindfulness based interventions showed a significant reduction in binge eating behaviors with medium to large effect sizes. However, the effect on emotional eating was not consistent across studies, with two out of five showing improvements in emotional eating (Alberts, Thewissen, & Raes, 2012; Daubenmier et al., 2011; Katterman, Kleinman, Hood, Nackers, & Corsica, 2014). Of the three negative studies, two included participants with low levels of emotional eating at baseline, and the third was underpowered with a sample size of 7 (Kearney et al., 2012; Leahey, Crowther, & Irwin, 2008; Timmerman & Brown, 2012). One of these negative studies involved participants in a MBSR program for veterans, and found a correlation between increases in mindfulness skills and decreases in emotional eating (Kearney et al., 2012). Further research is required to determine the effectiveness of mindfulness based interventions, and MBSR in particular, at reducing emotional eating, as the effectiveness of MBSR in a robust general community sample has not been studied. In addition, it is important to investigate the relationship between changes in mindfulness and changes in emotional eating to determine if mindfulness is the key ingredient in the intervention.

The current study aimed to explore changes in emotional eating following MBSR in a community sample, and potential associations with changes in mindfulness.

2. Study 1

To explore whether participation in the MBSR program would reduce emotional eating, we first conducted a pilot study with a robust sample size using a limited number of questions about emotional eating incorporated into pre-post questionnaires completed by all participants.

3. Methods

3.1. Participants and data collection

Participants were drawn from individuals enrolled in the MBSR program at the Center for Mindfulness in Medicine, Health Care and Society at UMASS Medical School from January through August 2013. Each participant was provided a paper survey to fill out before and after the course. All participants were formally asked for permission to use their de-identified survey data for research, and were given the option to opt out of survey completion. There were no exclusion criteria, though individuals with significant mental health or addiction issues are routinely excluded from participation in the course. This study was approved by the Institutional Review Boards of the University of Massachusetts Medical School.

3.2. Intervention

Mindfulness-Based Stress Reduction (MBSR) is an 8 week long course with one 2.5–3 h long class per week with one 7 h silent retreat between weeks 6 and 7. The course was taught by certified instructors who receive supervision by senior teachers to ensure fidelity. Formal mindfulness practices taught in class include the body scan, seated and walking meditation, and gentle yoga. Participants are asked to complete formal mindfulness practices for

45 min per day, 6 days per week, using guidance provided on audio CDs, as well as other exercises and informal mindfulness practices (such as eating one meal per day mindfully). Though there is no explicit discussion of weight, mindful eating is taught through a mindful eating exercise in the first class, and the theme of self-care is repeated throughout the program, including instruction for healthy nutrition, physical activity, and adequate sleep.

3.3. Measures

Self-reported height, weight, and demographics were collected. Our primary outcome was assessed using a shortened modification of the Internal Disinhibition Scale (IDS), derived by Niemeier et al (Niemeier et al., 2007). from the Three Factor Eating Questionnaire (also known as the Eating Inventory), a widely used measure of disordered eating in obesity research (Stunkard & Messick, 1985). According to the factor structure identified by these authors, 8 items correspond to internal cues that disinhibit eating control. The full scale has documented reliability ($\alpha = 0.78$) and validity with U.S. adults (Niemeier et al., 2007). Higher scores (greater degree of emotional eating) predict less weight loss during weight loss treatment and weight regain post-treatment and during weight loss maintenance (Koenders & van Strien, 2011; Teixeira et al., 2010). Study 1 used three items from the scale to reduce participant burden: “When I feel anxious, I find myself eating”, “When I feel blue, I often overeat”, “When I feel lonely, I console myself by eating.” Participants answered these three items on a scale involving the options “Routinely,” “Often,” “Sometimes,” or “Never.” The total IDS score was computed by summing across all three items, with each answer of “Routinely” worth 3 points, “Often” worth 2 points, “Sometimes” worth 1 point, and “Never” worth 0 points.

3.4. Data analysis

SPSS was used for all data analyses. Paired *t*-test (2-tailed, $\alpha = 0.05$) were used to compare baseline and post intervention on dependent variables. Correlational analysis (Pearson) was used to determine relationships between variables.

4. Results

4.1. Participants

348 individuals completed baseline surveys and agreed to have their data used for research. Of those, 332 also completed post-MBSR surveys (Fig. 1). Mean age was 48.3 ± 14.2 S.D. Participants were 29.1% male and 70.9% female, which is a typical distribution for the MBSR program (Carmody, Baer, L B Lykins, & Olendzki, 2009). The average BMI was 25.3 ± 5 S.D. 185 participants were <25 , 96 were >25 and 41 participants were >30 (11 did not provide their weight). There was no significant difference in emotional eating answers or BMI at baseline between individuals who did not provide post-treatment data ($n = 16$) and the rest of the sample ($n = 332$).

4.2. Effects of intervention

Analysis of the primary outcome, emotional eating, revealed a significant decrease in emotional eating scores following MBSR based on emotional eating questions derived from the Internal Disinhibition Scale (IDS) ($n = 327$, pre mean = 2.9 ± 2.6 SD, post mean = 2.1 ± 2.1 SD, $p < 0.001$, 95% CI [0.56, 0.95]). In addition, higher emotional eating scores at baseline were correlated with greater change in emotional eating following MBSR ($r = 0.594$,

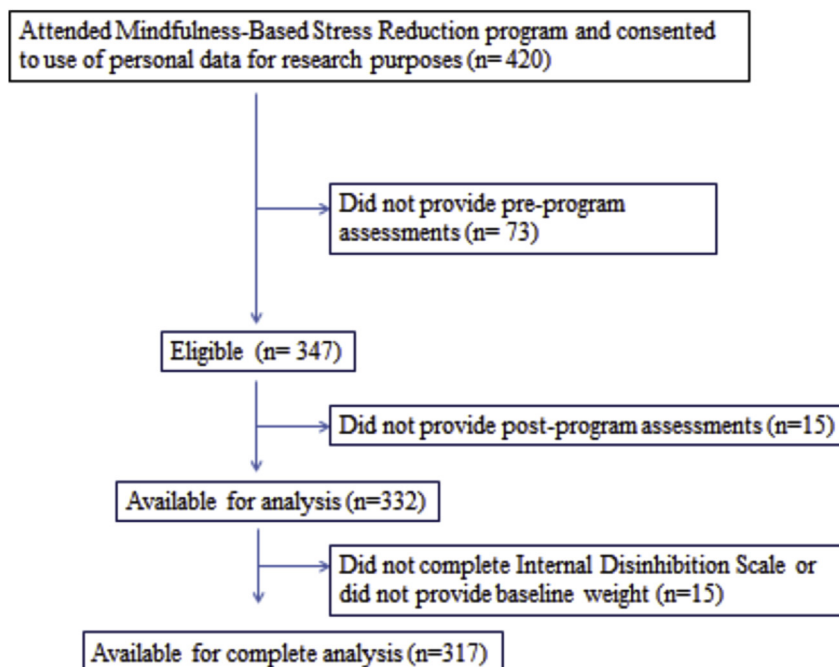


Fig. 1. Flow of participants through Study 1.

$p < 0.001$). Though participants with a normal BMI ($BMI < 25$) had significantly lower emotional eating scores at baseline than those who were overweight or obese ($BMI > 25$) based on the shortened IDS ($BMI < 25$: $n = 183$, mean = 2.2 ± 2.3 SD; $BMI > 25$: $n = 137$, mean = 3.8 ± 2.8 SD; $p < 0.001$, 95% CI $[-2.23, -1.11]$), baseline BMI was not significantly correlated with changes in emotional eating following MBSR ($n = 317$, $r = -0.050$, $p = 0.372$).

5. Discussion

There was a significant decrease in emotional eating scores following the MBSR course ($p < 0.001$). In addition, there was a significant correlation between baseline emotional eating scores and changes in emotional eating following the intervention, suggesting a larger effect for those struggling more with emotional eating ($p < 0.001$). Though BMI and baseline emotional eating scores were significantly correlated, baseline BMI did not serve as a predictor for changes in emotional eating. Study 1 involved a large sample size and used survey data from nearly all MBSR participants, as they were asked to complete the survey as part of the first and last session. Limitations included a lack of control group and the use of a non-validated subscale of the Internal Disinhibition Scale.

6. Study 2

In order to further explore changes in emotional eating following MBSR, Study 2 was performed with the full Internal Disinhibition Scale, as well as the short form of the Five Facet Mindfulness Questionnaire to explore the potential role of mindfulness. Study 2 was performed using an online, opt-in survey format.

7. Methods

7.1. Participants and data collection

Participants were drawn from individuals enrolled in the MBSR

program at the Center for Mindfulness in Medicine, Health Care and Society at UMass Medical School from April through September 2015. Each participant in the MBSR program was sent an optional informed consent and online survey to fill out before and after the course. As with Study 1, there were no exclusion criteria for the study, though individuals with significant mental health and addiction issues are routinely excluded from participation in the course. Voluntary self-report online survey data was collected prior to the first class and again at the end of the 8 week course. This study was approved by the Institutional Review Boards of the University of Massachusetts Medical School.

Intervention: The Mindfulness Based Stress Reduction Program served as the intervention, as in Study 1.

7.2. Measures

7.2.1. Internal disinhibition scale

In order to assess the primary outcome of changes in emotional eating following completion of the MBSR program, the complete Internal Disinhibition Scale derived by Niemeier et al. was used for Study 2 (Niemeier et al., 2007). Participants answered 7 items as “True” or “False,” with the final item on the scale rated 1–4, where 1 = rarely, 2 = sometimes, 3 = usually, and 4 = always. The final item was re-coded so that a rating of 1 or 2 is scored as 0 and a rating of 3 or 4 is scored as 1, and the total IDS score was computed by summing across all 8 items, with each “True” response worth 1 point. The cutoff criteria for identifying a participant as an “emotional eater” was originally described by Lillis et al. as 5 points or greater (Lillis et al., 2015). However, this results in an under-representation of men, who tend to report less emotional eating. Therefore Niemeier has recommended a revised cut-off of at least 4 for men and at least 5 for women (Niemeier, H., personal communication).

7.2.2. Five facet mindfulness questionnaire

In order to assess the secondary outcome of the relationship between changes in mindfulness and changes in emotional eating,

a 24 item version of the Five Facet Mindfulness Questionnaire-Short Form (FFMQ-SF) was used (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011). Participants answered questions on a Likert scale ranging from “never or very rarely true” to “very often or always true.” Questions related to the five subscales of the FFMQ: observing, describing, non-reacting, acting with awareness, and non-judging. Total scores for each subgroup calculated by summing up items, with reverse scoring for twelve items that were worded in the opposite direction.

7.2.3. Perceived stress scale

The PSS is the most widely used psychological instrument for measuring the perception of stress (Cohen, Kamarck, & Mermelstein, 1983). Study 2 used a short version of the PSS, which has 4 items and is rated on a 5-point Likert type scale, ranging from 0 (never) to 4 (very often). Items are designed to explore how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress in the past week. The scores on two items that were worded in the opposite direction were reverse-scored. A total PSS score was computed by summing across all 4 items.

7.2.4. Data analysis

SPSS was used for all data analyses. Paired t-tests (2-tailed, $\alpha = 0.05$) and intervention effects. Correlational analysis (Pearson) was used to determine relationships between variables. Bivariate regression analysis was performed to assess how well changes in mindfulness predicted changes in emotional eating. A stepwise multiple regression was performed to control for demographic variables in this hypothesized interaction. The change in IDS score from pre-treatment to post-treatment was normalized using a square root transformation to be eligible for use in analyses. Baseline BMI and post-intervention BMI were normalized using a logarithmic transformation to be eligible for use in analyses.

8. Results

8.1. Participant data

268 individuals completed the baseline survey, and 117 individuals completed the post-treatment survey. Out of the 117 individuals who completed the pre-treatment and the post-treatment survey, 8 were considered missing for outliers in weight changes (lost or gained 100 + pounds), and 35 were missing at least one entry (BMI, IDS, PSS or FFMQ in pre or post survey) (see Fig. 2). Data analysis was completed on participants who completed both the pre-treatment and post-treatment IDS ($n = 83$). Table 1 provides baseline characteristics for participants in Study 2. There were no significant differences in age, sex, race, IDS, FFMQ, PSS, or BMI at baseline between individuals who did not provide post-treatment data ($n = 151$) and the rest of the sample ($n = 117$), nor between individuals who provided complete data ($n = 74$) and those with incomplete survey data ($n = 43$).

8.2. Relationship between weight and emotional eating at baseline

Baseline score on the full internal disinhibition scale was correlated with baseline BMI ($n = 74$, $r = 0.313$, $p = 0.007$; $r = 0.322$, $p = 0.005$ using normalized baseline BMI), and there was a significant difference between the baseline internal disinhibition scores of participants with normal BMI and of participants who were overweight or obese (BMI $> 25 = 3.6 + 2.5$ SD, $n = 37$; BMI $< 25 = 2.2 + 2.7$ SD, $n = 37$; $p = 0.022$, 95% CI [2.24, 3.50]). There was also a significant difference between baseline internal disinhibition scores of obese participants versus those with a BMI of less than 30 (BMI $> 30 = 4.5 + 2.1$ SD, $n = 11$; BMI $< 30 = 2.6 + 2.7$ SD, $n = 63$; $p = 0.036$, 95% CI [2.24, 3.50]). There were no significant correlations between internal disinhibition scale and the total FFMQ baseline score or the total PSS baseline score ($r = -0.199$, $p = 0.074$; $r = -0.001$, $p = 0.992$, respectively).

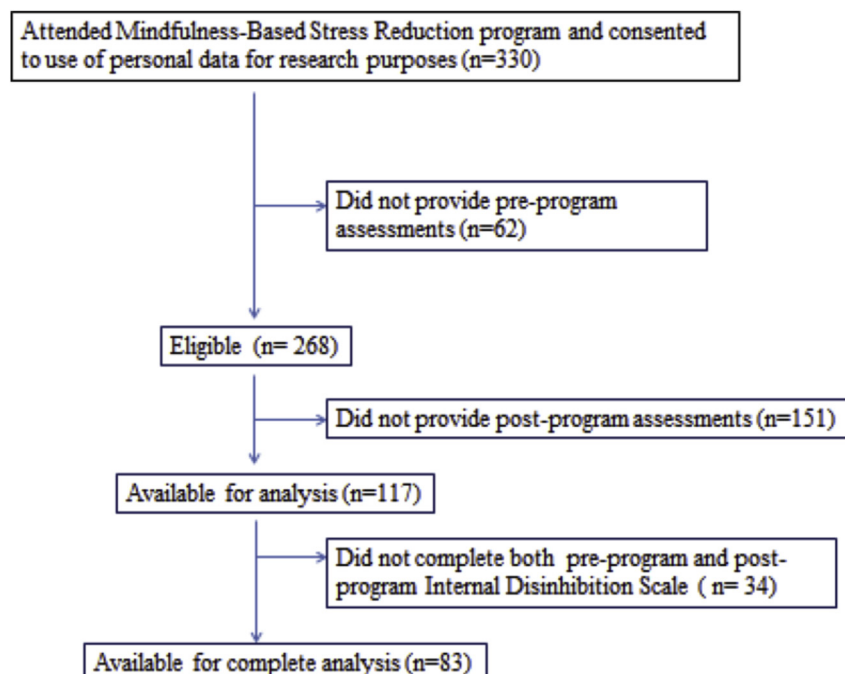


Fig. 2. Flow of participants through study 2.

Table 1
Baseline characteristics for study 2.

Baseline Characteristic	n (%):
Male	25 (30.1%)
Age (y) (mean $\pm$ SD)	49.7 $\pm$ 12.3 SD
BMI (mean $\pm$ SD)	25.7 $\pm$ 4.9 SD
Weight (mean $\pm$ SD)	160.3 $\pm$ 34.2 SD
Emotional Eaters	26 (31.3%)
Emotional Eaters by Sex:	
Male:	7 (28.0%)
Female:	19 (32.8%)
BMI:	
<25	37 (44.6%)
>25	37 (44.6%)
≥ 30	11 (13.2%)
No BMI provided	9 (11%)
White	76 (91.6%)
FFMQ-SF (mean $\pm$ SD)	74.7 $\pm$ 13.1 SD
Perceived Stress Scale (mean $\pm$ SD)	11.0 $\pm$ 3.3 SD
Internal Disinhibition Scale (mean $\pm$ SD)	2.9 $\pm$ 2.8 SD
Total Classes Attended = 8	53 (63.9%)
All Day Attended?	68 (81.9%)

9. Linear multiple regression for baseline characteristics

Multiple regression was used to identify which baseline factors (age, baseline FFMQ, baseline PSS) affect baseline emotional eating.

The multiple regression model with all four predictors produced $R^2 = 3.4$, $F(4, 65) = 45.67$, $p = 0.01$. Baseline BMI had significant positive regression weights, indicating participants with higher BMI were expected to have higher emotional eating at baseline, after controlling for the other variables in the model ($n = 70$, $B = 0.31$ with 95% CI of 0.044–0.293, $p = 0.009$). Age, baseline FFMQ and baseline PSS did not contribute to the multiple regression model (all P s > 0.05).

We then performed additional multivariate analysis looking at

female and male and participants with high ($BMI > 25$) and low BMI ($BMI < 25$) separately.

In male participants, baseline BMI had significant positive regression weights, indicating participants with higher BMI were expected to have higher emotional eating at baseline, after controlling for the other variables in the model ($n = 21$, $B = 0.69$ with 95% CI of 0.184–0.721, $p = 0.003$). Age, baseline FFMQ and baseline PSS did not contribute to the multiple regression model (all P s > 0.05).

In female participants, baseline BMI, age, baseline FFMQ and baseline PSS were not significantly associated with baseline emotional eating (all P s > 0.05). Both in overweight and normal weight participants, baseline BMI, age, baseline FFMQ and baseline PSS were not significantly associated with baseline emotional eating (all P s > 0.05).

9.1. Effects of intervention

Analysis of the primary outcome, emotional eating, revealed a significant decrease in IDS scores following completion of the MBSR program (pre = 2.9 ± 2.8 SD, post = 2.0 ± 2.4 SD, $p < 0.001$, 95% CI [0.40, 1.30]). We examined possible factors that could contribute to this result based on findings from Study 1. Participants who qualified as emotional eaters at baseline ($IDS \geq 4$ for men, $IDS \geq 5$ for women) had a larger change in IDS score following MBSR than those who were not emotional eaters at baseline ($p = 0.001$, 95% CI [2.21, 3.40])., Fig. 3; note that this finding is unchanged if the cut-off of $IDS \geq 5$ is used for both men and women). In contrast, there was no significant difference in change in emotional eating scores following the intervention in individuals with a normal BMI compared to those who were overweight or obese ($p = 0.789$).

There were no significant changes in BMI for the sample overall, nor did baseline emotional eating status or baseline BMI predict weight changes post-MBSR (all P s > 0.05).

9.2. Regression analysis

In a bivariate linear regression model, change in total FFMQ score significantly predicted change in IDS ($n = 82$, $r = 0.317$,

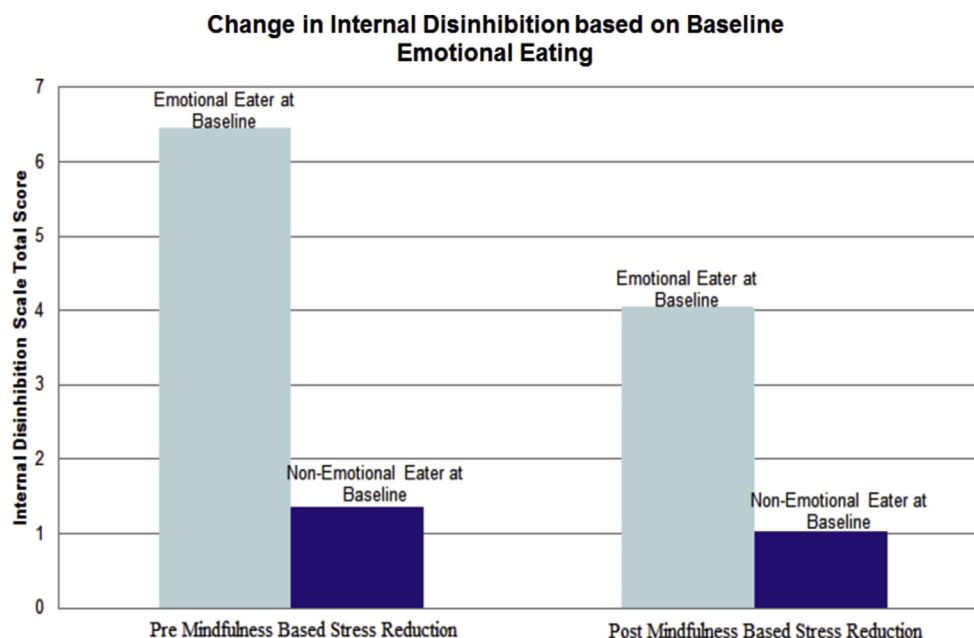


Fig. 3. Comparison of change in emotional eating (Internal Disinhibition Scale) following MBSR in emotional eaters ($IDS > 4$ for men, $IDS > 5$ for women) vs. Non-emotional eaters.

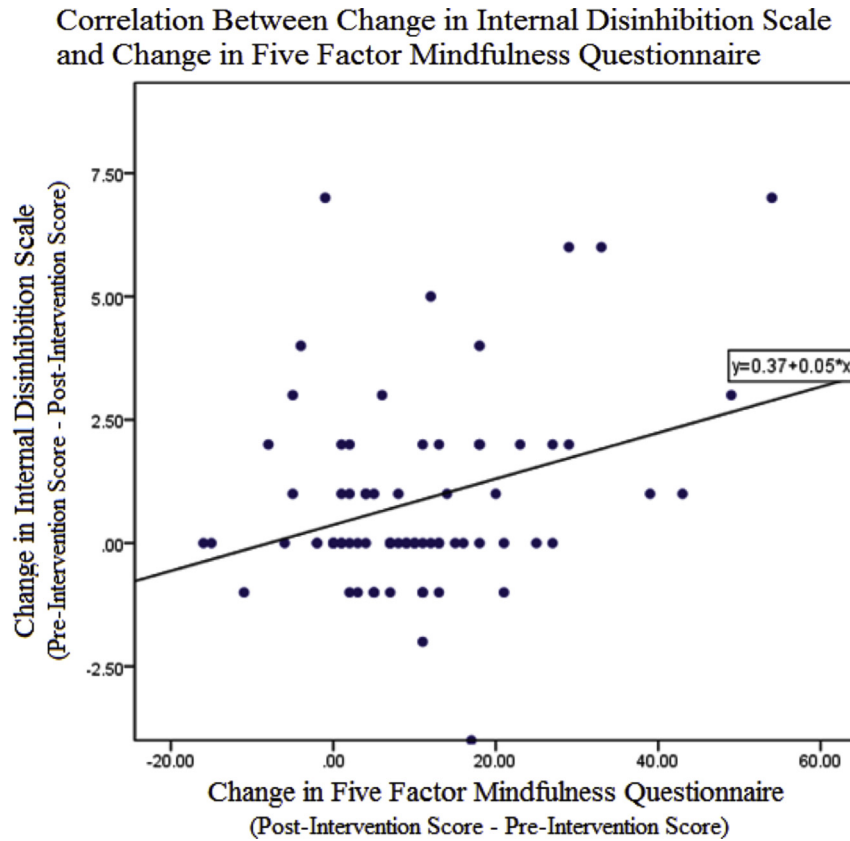


Fig. 4 Correlation between pre-post change in Internal Disinhibition Scale and Five Favor Mindfulness Questionnaire using bivariate linear regression model..

Table 2

Stepwise Multiple Regression: Relationship between change in FFMQ and change in IDS when controlling for other factors.

Model	n	B	CI (95%)	p
1. Age	78	0.054	0.018–0.090	0.004
2. Baseline BMI	70	0.048	0.013–0.085	0.009
3. Baseline IDS scores	70	0.037	0.007–0.068	0.017
4. Change in PSS score	70	0.026	–0.009–0.062	0.147

$p = 0.004$; $r = 0.286$, $p = 0.013$ using transformed data; Fig. 4). A stepwise multiple regression was then performed. The relationship between change in FFMQ and change in IDS remained significant after controlling for age ($n = 78$, $B = 0.054$ with 95% CI of 0.018–0.090, $p = 0.004$; $B = 0.009$ with 95% CI of 0.002–0.016, $p = 0.018$ using transformed data), baseline BMI ($n = 70$, $B = 0.048$ with 95% CI of 0.013–0.085, $p = 0.009$; $B = 0.009$ with 95% CI of 0.002–0.016, $p = 0.017$ using normalized data), and baseline IDS score ($n = 70$, $B = 0.037$ with 95% CI of 0.007–0.068, $p = 0.017$; $B = 0.004$ with 95% CI of 0.001–0.013, $p = 0.033$ using transformed data), but significance was lost when change in PSS was added to the model ($n = 70$, $B = 0.026$ with 95% CI of –0.009 to 0.062, $p = 0.147$; $B = 0.005$ with 95% CI of –0.002 to 0.012, $p = 0.183$). See Table 2.

Baseline IDS retained strong significance with all of these factors included in the multiple regression model ($B = 0.434$ with 95% CI of 0.276–0.591, $p < 0.001$; $B = 0.083$ with 95% CI of 0.05–0.115, $p < 0.001$ using transformed data).

10. Discussion

The aim of the present study was to examine changes in emotional eating in a community sample after completion of the MBSR program. In this sample of participants not necessarily seeking to lose weight, participation in MBSR with no specific content tailored to eating or weight loss resulted in significant reduction in emotional eating. The reduction in emotional eating was associated with changes in self-reported mindfulness, suggesting that mindfulness may be an active ingredient in this effect.

The primary finding of a decrease in emotional eating following MBSR is contrary to Kearney et al.'s negative finding in 2012 (Kearney et al., 2012). Some possible explanations for these differing results could involve differences in study design, as our study involved a large sample from the general population as opposed to a small, predominantly male, veteran population, with high rates of trauma, mental illness and pain syndromes. In addition, our study used the Internal Disinhibition Scale as a measure of emotional eating, whereas Kearney et al. used the full Three Factor Eating Questionnaire, from which the Internal Disinhibition Scale was originally derived (Niemeier et al., 2007).

Katterman's 2014 review article suggested that prior negative findings of changes in emotional eating with mindfulness based interventions may have been secondary to low emotional eating levels at baseline (Katterman et al., 2014). Our study did not pre-select for emotional eaters, but nonetheless found a significant reduction in emotional eating scores across our sample from the general population taking MBSR for a variety of reasons. However, consistent with the idea that the presence of emotional eating may be a moderator of response to MBSR, we found that baseline

emotional eating scores did predict greater reduction in emotional eating post-MBSR. Another factor is our more robust sample size, as the three studies cited that did not find improvements in emotional eating following mindfulness-based interventions each had a sample size smaller than 50 (Kearney et al., 2012; Leahey, Crowther, & Irwin, 2008; Timmerman & Brown, 2012).

The secondary finding of a relationship between change in mindfulness and change in emotional eating is in agreement with Kearney et al.'s prior work (Kearney et al., 2012). Replication of this finding lends more weight to the suggestion that increased mindfulness may be a key ingredient in the reduction of emotional eating following mindfulness training.

In addition, it is important to note that there was no relationship between baseline weight and change in IDS, suggesting that MBSR may be similarly effective for reducing emotional eating in those struggling with weight as for those who are not. There was, however, a strong relationship between baseline emotional eating and change in IDS, suggesting that the program may be more helpful for those struggling with emotional eating.

Consistent with trends nationwide, the majority of participants in the MBSR classes were overweight or obese. Emotional eating is common in the overweight/obese population and may play a larger role in weight gain and failure to lose weight than other lifestyle behaviors (Koenders & van Strien, 2011; Niemeier et al., 2007). Our findings suggest that MBSR may be effective at reducing emotional eating in the general population, without the addition of content specifically targeting eating or weight loss. Based on the findings presented here, additional randomized studies are warranted to examine the value of MBSR for weight loss and maintenance of weight loss.

11. Limitations and future directions

The main limitation of Study 1 was the use of a non-validated scale to measure emotional eating, the modified 3 item form of the Internal Disinhibition Scale, while the main limitation of Study 2 was the selection bias toward individuals willing to fill out the online voluntary survey. In addition, over half of the individuals in Study 2 who completed the pre-MBSR survey failed to complete the post-MBSR survey. This is likely because there was no incentive provided. Though there were no baseline differences between those individuals who completed both the pre-MBSR and post-MBSR survey and those who only completed the baseline survey, there was a large loss to follow-up. A limitation of both studies is the lack of a control group.

This study suggests a role for increasing mindfulness in reducing emotional eating. Future directions should involve an active control group to further explore the key ingredients of the MBSR intervention. Implications for weight loss should also be examined with long-term follow-up given that mindfulness leads to changes in long-standing cognitive and emotional habits and the impact on weight may thus be gradual as participants develop new, healthier habits (Fulwiler, Brewer, Sinnott, & Loucks, 2015).

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