Judgment towards emotions as a mediator of the relationship between emotional eating and depression symptoms in bariatric surgery candidates

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Abstract
Purpose Emotional eating is common in bariatric surgery candidates, and often is associated with depression and poorer weight loss outcomes following surgery. However, less is known about other modifiable risk factors that may link depression and emotional eating. The aim of the current study was to examine facets of mindfulness as potential mediators of the relationship between emotional eating and depression severity in bariatric surgery candidates.

Methods Bariatric surgery candidates (n = 743) were referred by their surgeons for a comprehensive psychiatric pre-surgical evaluation that included self-report questionnaires assessing depression severity, emotional overeating, and facets of mindfulness. Mediation effects were examined for each mindfulness facet based on prior research.

Results Only the nonjudging mindfulness facet significantly mediated the relationship between emotional eating and depression, suggesting that greater emotional eating may be associated with greater depression severity through higher levels of judgement towards thoughts and emotions. A reverse mediation analysis showed that depression severity was not a significant mediator of the relationship between nonjudging and emotional eating.

Conclusion Fostering a nonjudgmental stance towards thoughts and feelings may be helpful in improving eating habits that would support greater post-surgical success. Other clinical and research implications are discussed.

Level of evidence Level V, descriptive study.

Keywords Depression · Obesity · Bariatric surgery · Mindfulness · Emotional eating

Introduction
Emotional eating, generally defined as eating with the intended function of reducing stress or emotional upset, is a common behavior found in bariatric surgery candidates (occurring in up to 40% of surgery candidates) and often is associated with depression and anxiety symptoms [1]. Pre-surgical emotional eating severity has been found to be significantly associated with poorer weight loss outcomes following three types of bariatric procedures (gastric bypass, laparoscopic adjustable gastric band, and biliopancreatic diversion [2]) and weight regain following gastric bypass surgery [3]. However, one study found that emotional eating was associated with increased odds of post-surgical weight loss success (defined as > 50% excess weight loss 2 years post-operatively [4]).

Depression is also common in bariatric surgery candidates, present in at least one quarter and up to one half of patients (e.g., [5–8]). There is some evidence to indicate that depression may not improve following bariatric surgery, especially in the long-term [6, 9]. One study found that while pre-operative depression was not predictive of post-operative depression 6–12 months following surgery, it was predictive of post-operative depression at 24–36 months post-surgery [10]. Some studies have also found that the risk of suicidality increases after bariatric surgery, with mood disorder and hopelessness independently being associated with this risk [11].
Therefore, the presence of pre-operative depression may serve as a risk factor for poor outcomes in bariatric surgery. However, findings on this have been mixed, with some studies indicating no effect of pre-operative depression on weight loss outcomes especially if the depression is well controlled [12, 13], some finding poorer weight loss outcomes in those with pre-operative depression [10], and some finding that pre-operative depression actually improves outcomes such as increasing physical quality of life and weight loss [14].

One reason for the inconsistency in results could be that depression may have an indirect impact on weight loss outcomes. Depression may be more directly related to engagement in post-surgical behaviors that are not conducive to good outcomes, such as missing follow-up medical appointments or engaging in problematic eating behaviors. For example, individuals with depression-obesity comorbidity may be prone to engaging in a vicious cycle of overeating to manage emotions, which may lead to weight gain and resulting feelings of low self-esteem, shame, and self-perceived inadequacy [15].

The relationship between depression and emotional eating has been well documented (e.g., [16–19]). Among overweight individuals, eating triggered by depression was associated with emotion regulation difficulties and lower psychological well-being [20]. This relationship may vary by severity of obesity, with emotion dysregulation being associated with greater emotional eating through depression in individuals with severe obesity but not moderate obesity [21]. Individuals with current or remitted depression endorsed significantly more emotional eating [22], and both emotional eating and dichotomous thinking mediated the relationship between depression and body mass index (BMI) [23]. Emotional eating also has moderated the relationship between depression and BMI [24, 25].

Examining modifiable psychological processes that serve as links between emotional eating and depression could further inform treatment development efforts and improve surgical outcomes for these patients. Mindfulness may be one such process. It is defined as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” [26]. Mindfulness is typically understood as a multifaceted construct, including the ability to observe and describe experiences in the present moment using qualities such as being nonjudgmental and nonreactive [27]. Mindfulness processes may serve as a link between depression and emotional eating in that when one experiences depressive thoughts or feelings, they may engage with those experiences in a nonmindful way (e.g., be reactive and judgmental towards those thoughts and feelings). As a result of judging or reacting to those experiences, they then may engage in eating to reduce the discomfort that is felt towards those depressive thoughts and feelings. In fact, studies from bariatric surgery samples, patients with diabetes, college students, and other nonclinical samples have found that higher levels of mindfulness were negatively associated with emotional eating, including mindfulness facets such as acting with awareness, describing, and nonjudging [28–33]. In a Dutch general population, emotional eating was significantly and negatively associated with depression and this relationship was mediated by acting with awareness [16]. Interestingly, higher levels of observing predicted greater emotional eating in some studies [7, 34, 35].

In a study of 820 bariatric surgery candidates, it was found that higher levels of acting with awareness and describing were associated with less emotional eating above and beyond depression severity, with a trend towards a similar relationship with nonreacting [34]. However, this prior study did not examine mediational effects between these variables, and no known studies have examined the degree to which mindfulness mediates the relationship between depression severity and emotional eating specifically within bariatric surgery candidates. Perhaps one reason for the mixed findings with respect to depression symptoms on bariatric outcomes could be that the interaction between symptoms and the reaction towards those symptoms is most important, rather than the symptoms themselves per se. A non-accepting stance towards those emotional experiences could result in engaging in actions that would reduce the likelihood of surgical success, such as emotional eating.

The current report from the Rhode Island Bariatric Surgery (RIBS) study of the Methods to Improve Diagnostic Assessment and Services (MIDAS) Project seeks to extend findings from the prior study [34] by examining the potential mediating effects of mindfulness on the relationship between depression severity and emotional eating within bariatric surgery candidates. In contrast to the prior study [34], the current study also used a continuous, empirically validated measure of emotional eating and a more comprehensive empirically validated depression severity measure. Based on prior research suggesting that multiple facets may be related to depression and emotional eating, all five facets of mindfulness (observing, describing, acting with awareness, nonjudging, and nonreacting) were tested as potential mediators. However, it was hypothesized that the mindfulness facet of acting with awareness would be the strongest mediator between depression severity and emotional eating based on some studies [16, 32, 34].

Materials and methods

Participants

Participants included 743 individuals seeking bariatric surgery in Rhode Island for whom complete data were available on self-report measures of depression severity, mindfulness...
facets, and emotional overeating. Other inclusion criteria were: adults age 18 and older; and participants who were sufficiently able to speak and read English to complete study procedures. Exclusion criteria were: unable to read or write at a sufficient level to complete questionnaires or other study procedures; and cognitive impairment. Patients were not excluded from the study based on particular psychiatric diagnoses. Data were collected from July 2004 through October 2009. The majority of participants were White, female, married, and had graduated high school (Table 1). Average BMI for this sample was 47.4 and ranged from 45.9 to 63.2, indicating that all of the participants were classified as obese based on criteria from the National Institutes of Health [36].

**Procedure**

Surgeons referred participants for a comprehensive pre-surgical psychiatric evaluation as part of the surgical clearance process. The evaluations were conducted at the outpatient psychiatry practice of Rhode Island Hospital. The RIBS program is an integrated clinical-research program, in which evaluations are conducted as part of a clinical service to determine psychiatric clearance for bariatric surgery and informed consent is obtained to use the information from the evaluation for research purposes. Informed consent was obtained prior to administering the evaluation, and procedures were carried out in accordance with the Declaration of Helsinki. All research procedures were approved by the institutional review committee at Rhode Island Hospital. Details on the development of the RIBS study have been presented elsewhere [37].

**Measures**

**Five facet mindfulness questionnaire (FFMQ) [27]**

The FFMQ is a self-report questionnaire composed of 39 items and consists of 5 subscales assessing different facets of mindfulness: observing (the degree to which one attends to present moment experiences; “I notice the smells and aromas of things”), describing (the capacity to label and put words to internal experiences; “I’m good at finding the words to describe my feelings”), acting with awareness (the tendency to be on “autopilot” and not attend to experiences in the present moment while engaging in activities; “I find myself doing things without paying attention”), being non-judgmental (the degree to which one evaluates thoughts and feelings as bad and criticizes oneself for having these experiences; “I think some of my emotions are bad or inappropriate and I should not feel them”), and being non-reactive (the degree to which one is able to notice thoughts and feelings without responding to or further engaging with them; “I perceive my feelings and emotions without having to react to them”). Items are rated on a 5-point ordinal scale ranging from 1 (never or very rarely true) to 5 (very often or always true), with higher scores indicating higher levels of mindfulness. There are no specified cut-offs, but scores range from 7 to 35 on the nonreact subscale, and from 8 to 40 on the remaining subscales. The FFMQ has demonstrated reliability and validity [27], and each of the subscales in the current study showed good internal consistency (Cronbach’s alpha ranging from 0.79 to 0.87).

**Clinically useful depression outcome scale (CUDOS) [38]**

The CUDOS is an 18-item self-report questionnaire of depression, tied to DSM-IV criteria. Items are rated on a 5-point ordinal scale, ranging from 0 (not at all true) to 4 (almost always true). The last two items assess interference of depression symptoms and quality of life; therefore, a total score is derived by summing the first 16 items. Cutoffs on the CUDOS are as follows: 0–10 = nondepressed; 11–20 = minimal depression; 21–30 = mild depression; 31–45 = moderate depression; 46 and above = severe depression. The CUDOS has demonstrated excellent reliability and discriminant/
convergent validity [38]. Internal consistency in the current sample also was excellent (Cronbach’s alpha = 0.89).

**Emotional overeating questionnaire (EOQ) [39]**

The EOQ is 6-item self-report measure assessing the frequency of overeating in response to emotions such as anxiety, sadness, and anger. For each emotion, participants were asked, “On how many of the past 28 days have you eaten an unusually large amount of food given the circumstances in response to feelings of [emotion]?” Each item is rated on a 7-point scale: 0 = no days, 1 = 1–5 days, 2 = 6–12 days, 3 = 13–15 days, 4 = 16–22 days, 5 = 23–27 days, and 6 = every day. The EOQ has demonstrated good internal consistency and test–retest reliability. It also has been shown to be significantly correlated with binge eating frequency, eating disorder features, and depressive symptomatology [39]. A total score was calculated by taking the average of the six items, with higher scores indicating more frequent emotional overeating. In the current study, internal consistency was good (Cronbach’s alpha = 0.70).

**Data analyses**

Initial Pearson correlations were calculated between the EOQ, CUDOS, and FFMQ subscales. Separate mediation analyses were conducted for each FFMQ facet on the relationship between depression severity and emotional eating using a nonparametric bootstrapping approach via the Hayes PROCESS Macro 4.0 for SPSS version 25 [40]. The Preacher and Hayes [41] model was used, as this test has been recognized as the preferred test of cross-sectional mediation [42]. For each analysis, depression severity (CUDOS) was the predictor variable, emotional eating (EOQ) the outcome variable, and the mindfulness facet (FFMQ facet) the mediator variable. Z-score-based bias corrections were used to derive confidence intervals. Mediation is considered significant if the lower and upper bounds of these confidence intervals do not contain zero [41]. The nonparametric bootstrapping approach was chosen because it does not require any distributional assumptions, whereas the Sobel test assumes a normal distribution of the cross products which can negatively affect statistical power [43]. Therefore, the Sobel test is reported in the current study merely for comparison purposes.

**Results**

Means and standard deviations for each of the measures are presented in Table 2. Results showed that on average patients engaged in emotional eating for nearly 20% of the days in the past 28 days. On average, patients reported minimal levels of depression on the CUDOS; secondary analyses indicated that 138 (18.6%) of patients reported mild or higher levels of depression severity on the CUDOS, which indicates clinically significant depression [38]. Highest mean levels of mindfulness were observed on the act with awareness scale, whereas lowest mean level of mindfulness was found on the nonreact subscale. As shown in Table 3, the CUDOS was most significantly correlated with the act with awareness and nonjudging facets of the FFMQ. All other significant correlations above 0.30 occurred between various FFMQ facets.

Results from the mediation analyses showed that only the nonjudging facet significantly mediated the relationship between depression severity and emotional eating (Fig. 1). In step 1 of the mediation model, the regression of depression severity on emotional eating, ignoring nonjudging, was significant (Coeff = 0.01, SE = 0.004, p = 0.02). In Step 2, the regression of depression severity on the mediator, nonjudging, was also significant (Coeff = −0.30, SE = 0.02, p < 0.001). Step 3 showed that the mediator (nonjudging) controlling for depression severity was significantly associated with emotional eating (Coeff = −0.02, SE = 0.01, CI = −0.03 to −0.002, p = 0.03). Furthermore, Step 4 showed that when controlling for the mediator (nonjudging), depression severity was not significantly associated with emotional eating (Coeff = 0.005, SE = 0.005, p = 0.31). This model accounted for 50.5% of the variance (1 − [c’/c]*100). The Sobel test also indicated that the indirect effect between depression severity and emotional eating via nonjudging was significant (Coeff = 2.23, SE = 0.002, p = 0.03).

Our hypothesis was that nonjudging would mediate the relationship between depression severity and emotional eating; however, given the cross-sectional nature of the data and the fact that depression severity was measured at the same time point as nonjudging, we conducted a post hoc analysis to test depression as a possible mediator between nonjudging and emotional eating as done in prior studies (e.g., [45]). The purpose of this analysis was to provide greater confidence in the results, which would suggest that nonjudging is worthy of further investigation.
as a potential mediator in future longitudinal studies that could establish temporal precedence. This post hoc analysis revealed that the regression of nonjudging on emotional eating, while ignoring depression severity (mediator), was significant (Coeff = −0.02, SE = 0.01, \( p = 0.002 \)). The regression of nonjudging on depression severity (mediator) also was significant (Coeff = −0.72, SE = 0.05, \( p < 0.001 \)). Depression severity (mediator) was not significantly associated with emotional eating after controlling for nonjudging (Coeff = 0.004, SE = 0.005, CI = −0.005 to 0.014, \( p = 0.30 \)), and nonjudging remained significantly associated with emotional eating even after controlling for depression severity (Coeff = −0.02, SE = 0.007, \( p = 0.03 \)). The Sobel test also confirmed that depression severity did not significantly mediate the relationship between nonjudging and emotional eating (Coeff = −1.00, SE = 0.004, \( p = 0.32 \)).

**Discussion**

To our knowledge, this is the first study to examine mindfulness facets as potential mediators of the relationship between depression severity and emotional eating in bariatric surgery candidates. Results indicated that only the nonjudging facet of mindfulness significantly mediated the relationship between depression severity and emotional eating, suggesting that it may be judgment towards thoughts and feelings, rather than the depression itself, that is associated with greater emotional eating. Items on the nonjudging scale reflect criticism towards oneself for having thoughts and feelings and judging them as irrational, abnormal, or bad (and then, items are reverse-scored, such that higher scores reflect less self-criticism or judgment). Therefore, the content of the nonjudging items is highly

### Table 3 Correlations between emotional eating, depression, and mindfulness facets

| Variable                  | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| EOQ                       | −   |     |     |     |     |     |     |
| CUDOS                     | 0.08* | −  |     |     |     |     |     |
| Observe                   | 0.09* | 0.04 | −  |     |     |     |     |
| Describe                  | −0.04 | −0.29** | 0.35** | −  |     |     |     |
| Aware                     | −0.08* | −0.49** | 0.02 | 0.43** | −  |     |     |
| Nonjudge                  | −0.11** | −0.47** | −0.14** | 0.31** | 0.56** | −  |     |
| Nonreact                  | −0.02 | −0.16** | 0.41** | 0.41** | 0.16** | 0.09* | −  |

*EOQ* Emotional Overeating Questionnaire (\( M = 1.8; SD = 1.2 \)), *CUDOS* Clinically Useful Depression Outcome Scale (\( M = 12.1; SD = 9.7 \)), *Observe* FFMQ observing facet (\( M = 24.0; SD = 6.4 \)), *Describe* FFMQ describing facet (\( M = 29.3; SD = 6.1 \)), *Aware* FFMQ acting with awareness facet (\( M = 31.4; SD = 5.7 \)), *Nonjudge* FFMQ nonjudging facet (\( M = 30.9; SD = 6.2 \)), *Nonreact* FFMQ nonreacting facet (\( M = 21.5; SD = 5.5 \))

*\( p < 0.05 \)
**\( p < 0.01 \)

**Fig. 1** Nonjudging mediates the relationship between depression and emotional eating

\[ a = -0.305** \]

\[ b = -0.017* \]

\[ c' = 0.05 \]
consistent with the experiences of people with depressive symptoms and rumination, which may explain why this subscale in particular emerged as a significant mediator between depression and emotional eating.

Prior studies have found that pre-surgical emotional eating was associated with poorer weight loss outcomes [2], including weight regain [3]. Continued research examining the impact of emotional eating on bariatric weight loss outcomes is warranted, particularly studies that assess the impacts of emotional eating on longer term surgical outcomes (> 2 years post-surgery) and that examine potential mediators and moderators of the relationship between emotional eating and weight loss outcomes.

Based on the findings from the present study, it is possible that fostering a nonjudgmental stance towards thoughts and feelings may be helpful in improving eating habits that would support greater postsurgical success. A recent metanalysis of mindfulness-based interventions (MBIs) for weight loss concluded that MBIs were related to significant weight loss and reduced problematic eating behaviors among overweight and obese individuals [45]. MBIs have demonstrated large effect sizes for improving eating behaviors and medium effect sizes for reducing anxiety and depression among overweight or obese adults [46], and they have significantly reduced emotional eating especially when combined with weight management or behavioral strategies [47, 48]. A pilot randomized controlled trial utilizing Acceptance and Commitment Therapy (ACT), which includes fostering mindfulness skills and acceptance towards difficult thoughts and feelings, found that ACT was associated with significant improvement in eating disordered behaviors, body dissatisfaction, quality of life, and acceptance towards weight-related thoughts and feelings compared to standard follow-up by the surgical team in bariatric surgery patients [49]. A 1-day ACT workshop also significantly reduced emotional eating, with results maintained at a 3-month follow-up [50]. While some studies have found that mindfulness training did not result in significant weight loss (as measured by BMI) among overweight or obese individuals [51], overall, the literature to date suggests that the relationship between mindfulness and weight loss is worthy of further investigation.

This study had several strengths. First, it included a large clinical sample of adults seeking bariatric surgery. Second, to our knowledge, this is the first study to examine which specific facets of mindfulness mediate the relationship between emotional eating and depression severity within bariatric surgery candidates. Third, this study utilized validated and well-established measures of mindfulness, emotional overeating, and depression. However, this study also had a number of limitations that should be noted. Due to the cross-sectional nature of this sample, a causal relationship between depression and emotional eating cannot be isolated because of the lack of the temporal component for formal mediation analyses. Although these constructs often are assessed in a static manner, the use of adaptive or maladaptive mindfulness strategies in the presence of discomfort often is a complex, dynamic, and contextual process [52, 53]. Therefore, future studies should continue to examine the impact of mindfulness on the relationship between symptoms such as depression or anxiety and emotional eating in a more contextual fashion, via longitudinal and experimentally based paradigms. Furthermore, the current study only addressed potential mediation with respect to depression symptoms; future studies should examine these relationships with other psychiatric symptoms that are common in this sample, including social anxiety [7, 54, 55] and posttraumatic stress [56–58]. In this way, it would be helpful to determine if there are transdiagnostic factors such as mindfulness and emotion regulation strategies underlying various types of psychological symptoms that play an important role in emotional eating, that could then be identified as potential targets for treatment to reduce emotional eating.

Mean levels of depression as reported on the CUDOS were within the “minimal” range, and a smaller portion of the sample (18.6%) reported clinical levels of depression. In addition, on average, emotional overeating was reported to occur on nearly 20% of the days in the past 28 days. These lower levels of depression and emotional overeating represent another limitation to the current study, and therefore, future research should continue to examine these relationships in samples with higher levels of depression and greater frequency of emotional overeating. Participants were undergoing the evaluation to obtain psychiatric clearance for bariatric surgery, and it is possible that depression and emotional overeating may have been underreported for fear that endorsing them would result in psychiatric nonclearance. Future research should examine these variables in ways that will lower demand characteristics, such as conducting research-only evaluations that are completely separate from the clinical process of psychiatric pre-surgical clearance.

The sample consisted of primarily White females; therefore, the results of this study may not generalize to a population with different demographic characteristics. Future research should include a more diverse sample in terms of age, ethnicity, and gender to continue to examine these relationships. Because participants were individuals seeking bariatric surgery, results also may not generalize to individuals who are not seeking treatment for obesity or who are seeking a different type of weight loss treatment.

In summary, research should continue exploring the mediation effects of mindfulness on the relationship between depression and emotional eating, to further identify important targets for treatment. Such studies could also focus on exploring the relationship between different types of emotional eating, such as eating in response to different negative (anxiety, anger, and depression) and positive (happiness)
emotions [20]. Although some preliminary evidence suggests the potential efficacy of MBIs in addressing weight loss and emotional eating, additional studies are needed to examine the long-term effects of changes in mindfulness on emotional eating and weight loss outcomes, and how baseline levels of these variables may moderate long-term outcomes. Future research also should examine whether variables other than mindfulness (e.g., emotion regulation) mediate the relationship between depression and emotional eating, as prior studies suggest that emotion regulation skills may be important treatment targets for emotional eating as well [25, 59].

**Strengths and limits**

Strengths included use of a large sample of adults seeking bariatric surgery, examination of specific facets of mindfulness as potential mediators within bariatric surgery candidates, and utilization of validated and well-established measures of mindfulness, emotional overeating, and depression. Limits included a cross-sectional and primarily White and female sample.

**What is already known on this subject?**

Few studies have examined the combined relationship between mindfulness, depression, and emotional eating, with even fewer studies examining mindfulness as a potential mediator. To our knowledge, no known studies have examined this potential mediational relationship specifically in bariatric surgery candidates.

**What this study adds?**

The current study adds to the existing literature by examining mindfulness facets as potential mediators between depression symptoms and emotional eating specifically in bariatric surgery candidates. Results from the current study suggest that nonjudgment towards thoughts and feelings may be one particular mechanism to target in treatments to reduce emotional eating in bariatric surgery candidates who are experiencing depression symptoms.

**Author contributions** All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by KLD, VM, IC, and MZ. The first draft of the manuscript was written by KLD and VM, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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**Data availability** The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Declarations**

**Conflict of interest** The authors have no relevant financial or nonfinancial interests to disclose.

**Ethical approval** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Institutional Review Board at Rhode Island Hospital.

**Consent to participate** Written informed consent was obtained from all individual participants included in the study.

**References**

1. Miller-Matero LR, Armstrong R, McCulloch K, Hyde-Nolan M, Eshelman A, Genaw J (2014) To eat or not to eat; is that really the question? An evaluation of problematic eating behaviors and mental health among bariatric surgery candidates. Eat Weight Disord 19:377–382. https://doi.org/10.1007/s40519-014-0118-3

2. Castellini G, Godini L, Amedei SG, Faravelli C, Lucchese M, Ricca V (2014) Psychological effects and outcome predictors of three bariatric surgery interventions: a 1-year follow-up study. Eat Weight Disord 19:217–224. https://doi.org/10.1007/s40519-014-0123-6

3. Guerdjikova AI, West-Smith L, McElroy SL, Sonnanstine T, Stanford K, Keck PE (2007) Emotional eating and emotional eating alternatives in subjects undergoing bariatric surgery. Obes Surg 17:1091–1096. https://doi.org/10.1007/S11695-007-9184-1

4. Wedin S, Madan A, Correll J, Crowley N, Malcolm R, Karl Byrne T, Borckardt JJ (2014) Emotional eating, marital status, and history of physical abuse predict 2-year weight loss in weight loss surgery patients. Eat Behav 15:619–624. https://doi.org/10.1016/j.eatbeh.2014.08.019

5. Alosco ML, Spitznagle MB, Strain G, Devlin M, Cohen R, Crosby RD, Mitchell JE, Gunstad J (2015) Pre-operative history of depression and cognitive changes in bariatric surgery patients. Psychol Health Med 20:802–813. https://doi.org/10.1080/13545064.2014.959531

6. Booth H, Khan O, Prevost AT, Reddy M, Charlton J, Gulliford MC (2015) Impact of bariatric surgery on clinical depression. Interrupted time series study with matched controls. J Affect Disord 174:644–649. https://doi.org/10.1016/j.jad.2014.12.050

7. Dalrymple KL, Clark H, Chelminski I, Zimmerman M (2018) The interaction between mindfulness, emotion regulation, and social anxiety and its association with emotional eating in bariatric surgery candidates. Mindfulness 9:1780–1793. https://doi.org/10.1007/s11695-018-9921-4

8. Kalarchian MA, King WC, Devlin MJ, Marcus MD, Garcia L, Chen JY, Yanovski SZ, Mitchell JE (2016) Psychiatric disorders and weight change in a prospective study of bariatric surgery patients: a 3-year follow-up. Psychosom Med 78:373–381. https://doi.org/10.1016/j.psychn.2016.09.027

9. Matini D, Ghanbari Jolfaei A, Pazouki A, Pishgharoudsari M, Ehtesham M (2014) The comparison of severity and prevalence of major depressive disorder, general anxiety disorder, and eating disorders before and after bariatric surgery. Med J Islamic Republic Iran 28:109. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4301202/
10. De Zwaan M, Enderle J, Wagner S, Mühlhans B, Ditzen B, Gefeller O, Mitchell JE, Mülller A (2011) Anxiety and depression in bariatric surgery patients: a prospective, follow-up study using structured clinical interviews. J Affect Disord 133:61–68. https://doi.org/10.1016/j.jad.2011.03.025
11. Adamowicz JL, Salwen JK, Hymowitz GF, Vivian D (2016) Predictors of suicidality in bariatric surgery candidates. J Health Psychol 21:1992–1998. https://doi.org/10.1177/1359105315596618
12. Dawes AJ, Maggard-Gibbons M, Maher AR, Booth MJ, Miike-Lye I, Beroes JM, Shekelle PG (2016) Mental health conditions among patients seeking and undergoing bariatric surgery: a meta-analysis. JAMA 315:150–163. https://doi.org/10.1001/jama.2015.18118
13. Fuchs HF, Laughter V, Harnsberger CR, Berducci M, DuCoint C, Langert J, Sandler JB, Jacobsen GR, Perry W, Horgan S (2016) Patients with psychiatric comorbidity can safely undergo bariatric surgery with equivalent success. Surg Endosc 30:251–258. https://doi.org/10.1007/s00464-015-4196-8
14. Sockalingam S, Hawa R, Wnuk S, Santiago V, Kowgier M, Jack
15. Fuchs HF, Laughter V, Harnsberger CR, Berducci M, DuCoint C, Langert J, Sandler JB, Jacobsen GR, Perry W, Horgan S (2016) Patients with psychiatric comorbidity can safely undergo bariatric surgery with equivalent success. Surg Endosc 30:251–258. https://doi.org/10.1007/s00464-015-4196-8
16. Höppener MM, Larsen JK, van Strien T, Ouwens MA, Winkens LHH, Eisinga R (2019) Depressive symptoms and emotional eating: mediated by mindfulness? Mindfulness 10:670–678. https://doi.org/10.1007/s12676-019-1002-4
17. Lier HO, Biringer E, Stubhaug B, Tangen T (2013) Prevalence of psychiatric disorders before and 1 year after bariatric surgery: the role of shame in maintenance of psychiatric disorders in patients undergoing bariatric surgery. Nord J Psychiatry 67:89–96. https://doi.org/10.3109/08039488.2012.684703
18. Paans NPG, Bot M, Brouwer IA, Visser M, Roca M, Kohls E, Watkinson E, Penninx BWJH (2018) The association between depression and eating styles in four European countries: the MoodFOOD prevention study. J Psychosom Res 108:85–92. https://doi.org/10.1016/j.jpsychores.2018.03.003
19. Sevincer GM, Konuk N, Ipekcioglu D, Crosby RD, Cao L, Coskun A, Lye I, Beroes JM, Shekelle PG (2016) Mental health conditions among patients seeking and undergoing bariatric surgery: a meta-analysis. JAMA 315:150–163. https://doi.org/10.1001/jama.2015.18118
20. Braden A, Mursh-Elzenen D, Watford T, Emley E (2018) Eating when depressed, anxious, bored or happy: Are emotional eating types associated with unique psychological and physical health correlates? Appetite 125:410–417. https://doi.org/10.1016/j.appet.2018.02.022
21. Willem C, Gandolphe M-C, Doba K, Roussel M, Verklin H, Pattou F, Nandino J-L (2020) Eating in case of emotion dys-regulation, depression and anxiety: different pathways to emotional eating in moderate and severe obesity. Clin Obes 10:e12388. https://doi.org/10.1111/cob.12388
22. Paans NPG, Bot M, van Strien T, Brouwer IA, Visser M, Penninx BWJH (2018) Eating styles in major depressive disorder: results from a large-scale study. J Psychiat Res 97:38–46. https://doi.org/10.1016/j.jpsychires.2017.11.003
23. Antoniou EE, Bongers P, Jansen A (2017) The mediating role of dichotomous thinking and emotional eating in the relationship between depression and BMI. Eat Behav 26:55–60. https://doi.org/10.1016/j.eatbeh.2017.01.007
24. Konttinen H, van Strien T, Männistö S, Joussilahti P, Hautkala A (2019) Depression, emotional eating and long-term weight changes: a population-based prospective study. Int J Behav Nutr Phys Act 16:28. https://doi.org/10.1186/s12966-019-0791-8
25. Van Strien T (2018) Causes of emotional eating and matched treatment of obesity. Curr Diab Rep 18:35. https://doi.org/10.1007/s11892-018-1000-x
26. Kabat-Zinn J (1994) Wherever you go, there you are: mindfulness meditation in everyday life. Hyperion, New York
27. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L (2006) Using self-report assessment methods to explore facets of mindfulness. Assessment 13:27–45. https://doi.org/10.1177/1073191105283504
28. Larsen JK, van Strien T, Eisinga R, Engels RC (2006) Gender differences in the association between alexithymia and emotional eating in obese individuals. J Psychosom Res 60:237–243. https://doi.org/10.1016/j.jpsychosomres.2005.07.006
29. Lattimore P, Fisher N, Malinowski P (2011) A cross-sectional investigation of trait disinhibition and its association with mindfulness and impulsivity. Appetite 56:241–248. https://doi.org/10.1016/j.appet.2010.12.007
30. Ouwens MA, Schiffer AA, Visser LI, Raeijmaekers NJ, Nyklícek I (2015) Mindfulness and eating behaviour styles in morbidly obese males and females. Appetite 87:62–67. https://doi.org/10.1016/j.appet.2014.11.030
31. Pidgeon A, Lakota K, Champion J (2013) The moderating effects of mindfulness on psychological distress and emotional eating behaviour. Aust Psychol 48:262–269. https://doi.org/10.1111/j.1742-9544.2012.00091.x
32. Tak SR, Hendrickx C, Nefs G, Nyklícek I, Speight J, Pouwer F (2015) The association between types of eating behaviour and dispositional mindfulness in adults with diabetes. Results from diabetes MILES. The Netherlands. Appetite 87:288–295. https://doi.org/10.1016/j.appet.2015.01.006
33. Hsu T, Forestell CA (2021) Mindfulness, depression, and emotional eating: the moderating role of nonjudging of inner experience. Appetite 160:105089. https://doi.org/10.1016/j.appet.2020.105089
34. Levin ME, Dalrymple K, Himes S, Zimmerman M (2014) Which facets of mindfulness are related to problematic eating among patients seeking bariatric surgery? Eat Behav 15:298–305. https://doi.org/10.1016/j.eatbeh.2014.03.012
35. Sala M, Vanzhula IA, Levinson CA (2019) A longitudinal study on the association between facets of mindfulness and eating disorder symptoms in individuals diagnosed with eating disorders. Eur Eat Disord Rev 27:295–305. https://doi.org/10.1002/erv.2657
36. National Institutes of Health (1998) Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults–The evidence report. National Institutes of Health. Obes Res 6:51S–209S
37. Zimmerman M, Francione-Witt C, Chelminski I, Young D, Borescu D, Attiullah N, Pohl D, Roye GD, Harrington DT (2007) Presurgical psychiatric evaluations of candidates for bariatric surgery, part 1: reliability and reasons for and frequency of exclusion. J Clin Psychi 49:131–140. https://doi.org/10.1016/j.comppsych.2007.10.006
38. Zimmerman M, Chelminski I, McGlinchey JB, Posternak MA (2008) A clinically useful depression outcome scale. Compr Psychiatry 49:131–140. https://doi.org/10.1016/j.comppsych.2007.10.006
39. Masheb RM, Grilo CM (2005) Emotional overeating and its associations with eating disorder psychopathology among overweight patients with binge eating disorder. Int J Eat Disord 39:141–146. https://doi.org/10.1002/eat.20221
40. Hayes AF (2022) Introduction to mediation, moderation, and conditional process analysis: a regression based approach (3rd edition). Guilford Press
41. Preacher KJ, Hayes AF (2008) Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behav Res Methods 40:879–891. https://doi.org/10.3758/brm.40.3.879

42. MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V (2002) A comparison of methods to test mediation and other intervening variable effects. Psychol Methods 7:83–104. https://doi.org/10.1037/1082-989X.7.1.83

43. Efron B, Tibshirani RJ (1993) An introduction to the bootstrap. Chapman & Hall, Boca Raton

44. Gaudiano BA, Schofield CA, Davis C, Rifkin LS (2017) Psychological inflexibility as a mediator of the relationship between depressive symptom severity and public stigma in depression. J Contextual Behav Sci 6:159–165. https://doi.org/10.1016/j.jcbs.2017.04.010

45. Konttinen H (2020) Emotional eating and obesity in adults: the role of depression, sleep and genes. Proc Nutr Soc 79:283–289. https://doi.org/10.1017/S0029665120000166

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Aldao A (2013) The future of emotion regulation research: capturing context. Perspect Psychol Sci 8:155–172. https://doi.org/10.1177/1745691612459518

Bonanno GA, Burton CL (2013) Regulatory flexibility: an individual differences perspective on coping and emotion regulation. Perspect Psychol Sci 8:591–612. https://doi.org/10.1177/1745691613504116

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