

Weight Bias Internalization, Emotion Dysregulation, and Non-Normative Eating Behaviors in
Prebariatric Patients

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Abstract

Objective: Weight bias internalization (WBI) is associated with eating disorder psychopathology and non-normative eating behaviors among individuals with overweight and obesity, but has rarely been investigated in prebariatric patients. Based on findings demonstrating a relationship between emotion dysregulation and eating behavior, this study sought to investigate the association between WBI and eating disorder psychopathology as well as non-normative eating behaviors (i.e., food addiction, emotional eating, and eating in the absence of hunger), mediated by emotion dysregulation.

Method: Within a consecutive multicenter study, 240 prebariatric patients were assessed using self-report questionnaires. The mediating role of emotion dysregulation was examined using structural equation modeling.

Results: The analyses yielded no mediational effect of emotion dysregulation on the association between WBI and eating disorder psychopathology. However, emotion dysregulation fully mediated the associations between WBI and emotional eating as well as eating in the absence of hunger. Further, emotion dysregulation partially mediated the relationship between WBI and food addiction symptoms.

Discussion: Prebariatric patients with high levels of WBI are at risk for non-normative eating behaviors, especially if they experience emotion regulation difficulties. These findings highlight the importance of interventions targeting WBI and improving emotion regulation skills for the normalization of eating behavior in prebariatric patients.

Individuals with overweight and obesity often experience negative stereotypes regarding their weight, and are likely to internalize this weight bias¹. Weight bias internalization (WBI), defined as the application of negative weight-based stereotypes to oneself², is related to impaired physical health, lower self-esteem, and higher general psychopathology in individuals with overweight and obesity^{2,3}. In a population-based sample, WBI was found to be greater in individuals with obesity (class I to III) than in individuals with overweight⁴. Studies in treatment seeking and community samples with obesity suggested a close link between WBI and increased eating disorder psychopathology⁵, binge-eating frequency^{2,6}, and non-normative eating behaviors such as higher levels of emotional eating⁶ and food addiction⁷. However, the relationship between WBI and eating in the absence of hunger⁸, another aspect of non-normative eating behavior, has not yet been investigated. So far, only one study examined WBI in prebariatric adolescent patients and revealed associations of WBI with higher levels of general psychopathology, eating disorder psychopathology, and more objective binge-eating episodes⁹. As prebariatric patients at body mass index (BMI) ≥ 40 kg/m² differ from non-treatment seeking individuals with obesity in weight status and other variables such as health-related quality of life¹⁰, it is essential to explore the impact of WBI on psychological functioning in this patient group.

Little is known about mechanisms linking WBI with eating disorder psychopathology and non-normative eating behaviors. The relationship may be partially explained by emotion dysregulation, which was positively associated with eating disorder symptoms and eating disorder psychopathology in a community sample with overweight as well as in treatment seeking and non-treatment seeking underweight to obese samples with anorexia nervosa, bulimia nervosa, and binge-eating disorder¹¹⁻¹³. Additionally, emotion dysregulation was related to non-normative eating behaviors such as food addiction and emotional eating^{14,15}. Research on weight bias suggests that coping strategies used to deal with stigmatizing situations may alleviate or increase the impact of weight bias on psychological functioning^{1,16}.

Therefore, emotion dysregulation may impede effective coping with WBI, and thus, may mediate the impact of WBI on eating behavior.

The aim of this study was to investigate the impact of emotion dysregulation as a mediator between WBI and eating disorder psychopathology, and between WBI and non-normative eating behaviors (i.e., food addiction, emotional eating, and eating in the absence of hunger) in prebariatric patients. We hypothesized that greater WBI would predict greater emotion dysregulation, which in turn would predict higher eating disorder psychopathology and more non-normative eating behaviors.

METHODS

Participants and Study Design

This study is part of a longitudinal registry for the assessment of psychosocial parameters in a consecutive bariatric sample from six German bariatric surgery centers (PRAC: Psychosocial Registry for Bariatric Surgery, for detail see¹⁷). The study was approved by the respective ethics committees, and written informed consent was obtained prior to study participation. This study included preoperative data of $N = 240$ patients recruited from March 2012 to June 2014.

Measures

Predictor Variable

Weight Bias Internalization Scale (WBIS). The German version of the WBIS^{2,4} was used to measure WBI with 10 items, integrated to a mean score^{4,9}. Internal consistency in the current sample was $\alpha = 0.86$.

Mediator Variable

Difficulties in Emotion Regulation Scale (DERS). The 36-item German version of the DERS¹⁸ was used to assess emotion dysregulation. The DERS provides a total sum score and

six subscale scores: Nonacceptance of Emotional Responses (Nonacceptance), Difficulties Engaging in Goal-Directed Behavior (Goals), Impulse Control Difficulties (Impulse), Lack of Emotional Awareness (Awareness), Limited Access to Emotion Regulation Strategies (Strategies), and Lack of Emotional Clarity (Clarity). In this study, internal consistency was $\alpha = 0.94$ for the total scale and $0.76 \leq \alpha \leq 0.91$ for the subscales.

Outcome Variables

Eating Disorder Examination-Questionnaire (EDE-Q). To assess eating disorder psychopathology, the 22 items with subscale assignment (Restraint, Eating Concern, Weight Concern, and Shape Concern) of the German version of the EDE-Q¹⁹ were administered. Internal consistency of the global mean score in this sample was $\alpha = 0.85$.

Yale Food Addiction Scale (YFAS). The 25-item German version of the YFAS²⁰ was used to measure addictive eating behavior. A symptom count score indicates the number of food addiction symptoms. Internal consistency in this study was $\alpha = 0.90$.

Dutch Eating Behavior Questionnaire – Emotional Eating (DEBQ). Emotional eating was assessed using the 10-item Emotional Eating subscale of the German version of the DEBQ²¹. In this study, internal consistency of the mean score was $\alpha = 0.94$.

Eating in the Absence of Hunger Questionnaire (EAH). In an adapted version of the EAH⁸ (German translation by AH – unpublished manuscript), 7 items were used for a combined assessment of the frequency of keeping *or* starting eating due to emotional, sensory or social cues while not being hungry. Internal consistency of the sum score was $\alpha = 0.89$.

All measures demonstrated good reliability and validity^{4,8,18-21}.

Control Variables. Demographic information included age, sex, and educational level (years of school education). BMI (kg/m^2) was calculated from measured weight and height for $n = 210$ (87.50%) patients. If measured BMI was not available, patients provided self-reported weight and height.

Data Analytic Plan

Statistical analyses were performed using IBM SPSS AMOS 20.0. The models were tested using structural equation modeling and were estimated with the maximum likelihood method approach. To assess the adequacy of fit, the χ^2 test (Bollen-Stine bootstrap corrected in case of multivariate non-normality²²), the minimum discrepancy, divided by degrees of freedom (CMIN/DF), the Goodness-of-Fit-Index (GFI), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Residual (SRMR) were determined. A non-significant χ^2 value indicates that a model is compatible with the data²³. For a good model fit, CMIN/DF should be ≤ 2 , GFI, CFI, and TLI should be ≥ 0.95 , and RMSEA and SRMR should be ≤ 0.05 ²³.

Analyses comprised three steps: First, the direct associations of WBI and outcome variables were tested. Second, emotion dysregulation (DERS total score) was included as a mediator between WBI and outcome variables. Third, as a small number of studies examining associations of the DERS subscales with eating disorder psychopathology and non-normative eating behaviors led to inconsistent results^{11,13}, an explorative analysis was conducted to examine the mediating role of emotion dysregulation dimensions (DERS subscales) on the relationships between WBI and outcome variables. Analyses were controlled for age, sex, education, and BMI, allowing these variables to predict every other manifest variable in the model. Subsequently, all non-significant relationships ($p > 0.05$) were deleted. Standardized regression weights were interpreted as small < 0.30 , medium < 0.50 , and large ≥ 0.50 ²⁴. A two-tailed $\alpha < 0.05$ was applied to statistical testing.

RESULTS

Sample Characteristics

The sample consisted of $N = 240$ patients (68.75% women) with a mean age of $M = 45.08$ years ($SD = 10.43$; range 22–66 years) and a mean BMI of $M = 48.63$ kg/m² ($SD = 7.48$; range 36.00–77.75 kg/m²).

Structural Equation Modeling

In the first step, WBI positively predicted higher levels of eating disorder psychopathology, Food Addiction, Emotional Eating, and Eating in the Absence of Hunger, respectively (medium to large effects, standardized values: 0.66, 0.38, 0.37, and 0.33; $ps < 0.001$). Regarding sociodemographic variables, lower age was associated with female sex (small effect, standardized value: -0.18; $p < 0.007$). Age and sex were related to WBI, with higher scores in younger patients and in women (small effects, standardized values: age: -0.14, $p < 0.03$; sex: 0.21, $p < 0.001$). Education and BMI were not significantly associated with any variable ($ps > 0.05$). The model demonstrated a good fit: $\chi^2(8) = 6.45$, $p < 0.60$; CMIN/DF = 0.81; GFI = 0.99; CFI = 1.00; TLI = 1.01; RMSEA = 0.00; and SRMR = 0.02.

The second step included emotion dysregulation (DERS total score) as a mediator between WBI and outcome variables. All significant paths of the resulting model are depicted in Figure 1. Emotion dysregulation had no mediational effect on the relationship between WBI and eating disorder psychopathology ($p > 0.05$). However, greater WBI predicted higher levels of emotion dysregulation (large effect), which in turn predicted higher levels of Food Addiction (small effect), Emotional Eating (large effect), and Eating in the Absence of Hunger (medium effect), respectively. In addition, greater WBI directly predicted higher levels of Food Addiction (small effect). Thus, emotion dysregulation partially mediated the relationship between WBI and Food Addiction, and fully mediated the associations between WBI and Emotional Eating and Eating in the Absence of Hunger, respectively. Again, lower age and female sex were correlated and predicted greater WBI (small effects), while education and BMI did not yield significant effects ($ps > 0.05$). The model demonstrated a

good fit: $\chi^2(13) = 16.28, p < 0.24$; CMIN/DF = 1.25; GFI = 0.98; CFI = 1.00; TLI = 0.99; RMSEA = 0.03; and SRMR = 0.04.

In the third step, six dimensions of emotion dysregulation (DERS subscales) were included as mediators on the relationship between WBI and non-normative eating behaviors. As emotion dysregulation did not yield a mediational effect on eating disorder psychopathology in the second step, the latter variable was not included in this model. Greater WBI again predicted higher levels of Food Addiction (small effect, standardized value: 0.23; $p < 0.001$) and of all emotion dysregulation dimensions (small to large effects, standardized values: Nonacceptance: 0.57, Goals: 0.46, Impulse: 0.37, Awareness: 0.21, Strategies: 0.53, and Clarity: 0.40; $ps < 0.001$). However, only four dimensions were significantly related to the outcome variables. Nonacceptance predicted higher levels of Food Addiction, Emotional Eating, and Eating in the Absence of Hunger, respectively (small to medium effects, standardized values: 0.23, 0.27, and 0.34; $ps < 0.001$). Further, Goals and Clarity predicted higher levels of Emotional Eating (small effects, standardized values: Goals: 0.21, $p < 0.001$; Clarity: 0.12, $p < 0.008$) and Strategies predicted higher levels of Eating in the Absence of Hunger (small effect, standardized value: 0.20; $p < 0.002$). In addition to the effects of age and sex on WBI, greater BMI predicted lower levels of Goals, Awareness, and Strategies (small effects, standardized values: -0.10, -0.13, and -0.07; $ps < 0.03$) and higher education predicted higher levels of Impulse and Clarity (small effects, standardized values: Impulse: 0.12, $p < 0.006$; Clarity: 0.10, $p < 0.04$). All fit measures indicated a good model fit: $\chi^2(53) = 48.95, p < 0.67$ (bootstrap corrected); CMIN/DF = 0.92; GFI = 0.97; CFI = 1.00; TLI = 1.01; RMSEA = 0.00; and SRMR = 0.04.

DISCUSSION

This study was the first to examine the impact of emotion dysregulation as a mediator between WBI and eating disorder psychopathology, and between WBI and various forms of

non-normative eating behaviors in prebariatric patients. Confirming previous results, WBI and food addiction as well as emotional eating were found to be related^{6,7}. In addition, our results provide evidence for a relationship between WBI and eating in the absence of hunger, a construct that has rarely been studied in adults, but has been discussed as a measure of hedonic hunger in children²⁵. Finally, we replicated findings of gender- and age-related WBI, with greater WBI in women and higher age being associated with lower WBI⁴.

Most importantly, we provided first evidence for emotion dysregulation as a mechanism linking WBI with non-normative eating behaviors. The full mediational effect indicates that emotion dysregulation seems to be of more proximal relevance for non-normative eating behaviors (i.e., emotional eating and eating in the absence of hunger) in prebariatric patients than WBI. Thus, WBI may only increase the risk of overeating in response to emotional cues and in the absence of hunger if emotion regulation skills are impaired. A strong association between emotion dysregulation and emotional eating has been supported across various samples^{15,26}. Further, emotion dysregulation partially mediated the relationship between WBI and food addiction, i.e. higher WBI may contribute both directly and indirectly (through impaired emotion regulation skills) to an increased risk of addictive eating behavior.

The mediational effects were based on certain dimensions of emotion dysregulation, specifically nonacceptance of emotional responses, difficulties engaging in goal-directed behavior, lack of emotional clarity, and limited access to emotion regulation strategies. Relations between DERS subscales and non-normative eating behaviors have rarely been examined. However, nonacceptance of emotional responses (i.e. negative secondary reactions to negative emotions¹⁸) which was most strongly related to non-normative eating behaviors in this study also emerged as the strongest cross-sectional predictor of eating disorder psychopathology in individuals with obesity¹¹. Further, our results are in line with previous findings showing a relationship between lack of emotional clarity (i.e. not knowing the

experienced emotions¹⁸) with emotional overeating in individuals with obesity¹¹ as well as an association between difficulties in identifying feelings with emotional eating in prebariatric patients²⁷.

Emotion dysregulation did not yield an effect on the strong association between WBI and eating disorder psychopathology that was also found in previous studies^{5,9}. Internalizing hurtful experiences of weight stigmatization may directly increase vulnerability to eating disorder psychopathology in individuals with obesity. The relationship between emotion dysregulation and non-normative eating behaviors might be explained by the conceptual correspondence between the instruments assessing emotion dysregulation and eating behaviors (i.e., food addiction, emotional eating, and eating in the absence of hunger) as all measure specific behaviors that might serve to directly regulate negative emotions. In contrast, the conceptual correspondence between emotion dysregulation and eating disorder psychopathology assessments might be rather low as the latter measures attitudinal features and cognitive evaluations related to eating, weight, and shape. Thus, emotion dysregulation may not mediate the strong association between WBI and eating disorder psychopathology.

Clinically, although the cross-sectional nature of the data does not imply temporal causality, our results suggest that WBI may increase non-normative eating behaviors in prebariatric patients, especially if patients have difficulties to understand or accept their emotions, to concentrate in reaction to negative emotions, or to flexibly use appropriate emotion regulation strategies. Specifically, individuals with obesity may experience intense negative emotions due to the internalization of negative weight-based stereotypes, may lack effective strategies (such as positive self-talk or social support¹⁶) to cope with these emotions²⁸, and may thus engage in non-normative eating behaviors (i.e., eating in reaction to negative feelings, eating when not being hungry, and addictive eating) to relieve negative emotions²⁹.

Strengths of this study include the large sample of prebariatric patients in a multicenter registry with data collection unrelated to clinical procedures, thus, likely decreasing social desirability. Limitations include the reliance on self-reported weight and height for 12.50% of the patients, which might have resulted in an underestimation of BMI³⁰. Furthermore, the cross-sectional design precludes causal inferences regarding the impact of WBI and emotion dysregulation on eating disorder psychopathology and non-normative eating behaviors. Prospective studies are needed to determine the nature of these associations in more detail.

Altogether, this study has important implications for the understanding of the consequences of weight bias. The present findings suggest that WBI increases vulnerability to non-normative eating behaviors (i.e., food addiction, emotional eating, and eating in the absence of hunger) through emotion dysregulation. Thus, prebariatric patients with high levels of WBI and emotion dysregulation could be identified by screening at admission and could be offered preoperative counseling to reduce WBI and enhance emotion regulation skills. In doing so, preoperative non-normative eating behaviors might be reduced and as a consequence, the rate of postoperative complications (e.g., vomiting or dumping syndrome as consequences of non-normative eating behavior) could be decreased and postoperative weight loss and long-term maintenance could be improved. Previous longitudinal studies suggested that non-normative eating behaviors have a negative impact on weight loss, as both emotional eating and eating in the absence of hunger were found to predict weight gain in community samples^{25,31}. Developing and evaluating interventions to improve emotion regulation skills and to reduce WBI^{32,33} might be considered as a complementary psychological approach within treatment of bariatric patients.

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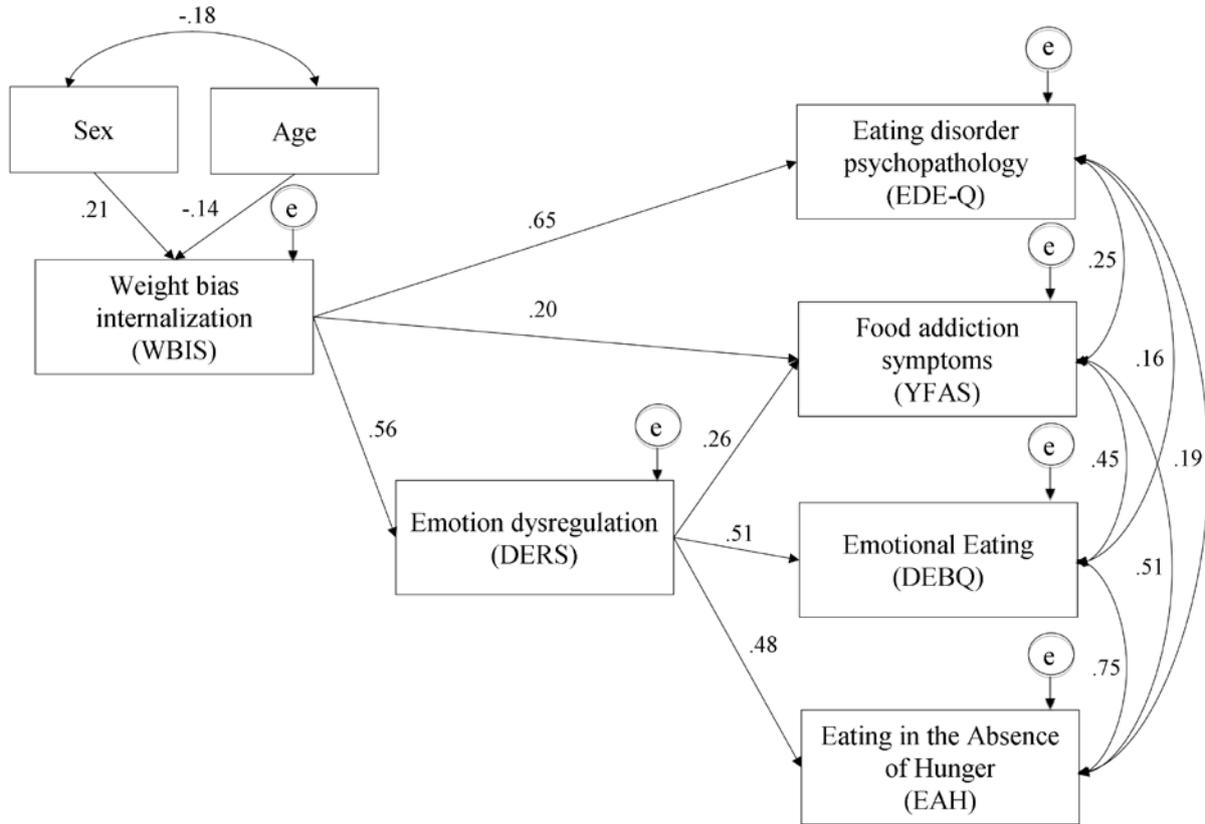


Figure 1. Structural equation model on the mediating role of emotion dysregulation on the relationship between weight bias internalization and eating disorder psychopathology and non-normative eating behaviors ($N = 240$).

Notes. Standardized values are depicted (all $p < 0.05$). WBIS, Weight Bias Internalization Scale; DERS, Difficulties in Emotion Regulation Scale; EDE-Q, Eating Disorder Examination-Questionnaire (global score); YFAS, Yale Food Addiction Scale (symptom count); DEBQ, Dutch Eating Behavior Questionnaire; EAH, Eating in the Absence of Hunger Questionnaire. For all measures, higher scores indicate higher levels of psychopathology.

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Conflict of interest statement

The authors declare no conflict of interest.