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Validity and Clinical Utility of Subtyping by the Beck Depression Inventory in Women Seeking Gastric Bypass Surgery

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Abstract

Background—The Beck Depression Inventory (BDI) is commonly used in the screening and evaluation process with bariatric surgery candidates despite relatively limited psychometric evidence in this patient group. We examined the validity of the BDI and its clinical utility for subtyping women seeking gastric bypass surgery.

Method—One hundred twenty-four women evaluated for gastric bypass surgery were administered the Structured Clinical Interview for DSM-IV (SCID-I/P) and completed a self-report battery of psychosocial measures including the BDI.

Results—Based on the SCID-I/P, 12.9% (n=16) met criteria for current mood disorder. Receiver operating characteristic (ROC) curve analysis revealed the BDI had a good area under the curve (.788) for predicting SCID-I/P mood disorder diagnosis; BDI score of >15 optimized both sensitivity and specificity. Patients diagnosed with SCID-I/P mood disorders had significantly higher levels of eating-disorder psychopathology, self-esteem, and shame, than those without mood disorders. Based on a BDI cut-off score of >15, 41.9% (n=52) were categorized as High-BDI and 58.1% (n=72) as Low-BDI. Patients characterized as High-BDI also had significantly higher levels of all associated measures than those with Low-BDI; effect sizes for the differences by BDI subtyping were generally 2–3 times greater than those observed when comparing SCID-I/P-based mood versus no mood disorder subgroups.

Conclusions—In women seeking gastric bypass surgery, the BDI demonstrated limited acceptable efficiency for identifying mood disorders with a cut-point score of >15. When

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Conflict of Interest Disclosure Statements

Dr. Ivezaj declares no conflict of interest. Dr. Barnes reports grants from NIDDK.

Dr. Grilo reports no relevant conflicts of interest with respect to this work but more generally reports that he has received grants from the National Institutes of Health, consulting fees from Shire and Sunovion, honoraria from the American Psychological Association and from universities and scientific conferences for grand rounds and lecture presentations, speaking fees for various CME activities, consulting fees from American Academy of CME, Vindico Medical Education CME, and General Medical Education CME, and book royalties from Guilford Press and from Taylor Francis Publishers.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

identifying clinical severity, however, subtyping women by BDI scores of >15 may identify a significantly more disturbed subgroup than relying on a SCID-I/P-generated mood disorder diagnosis.

Keywords

Obesity; Bariatric Surgery; Depression; Mood; Assessment; Gastric Bypass

Introduction

Weight loss surgery candidates are required to obtain a psychiatric evaluation prior to bariatric surgery clearance [1]. During these evaluations, clinicians typically employ interviews and, at times, self-report measures [2,3]. One of the most commonly used self-report measures for depression screening is The Beck Depression Inventory (BDI) [2]. Despite widespread use of the BDI during bariatric psychiatric evaluations, relatively limited psychometric evidence exists [2,4–6]. To date, only two preliminary studies indicate that the BDI and BDI-II total scores can be used as screening tools for depression in patients seeking bariatric surgery. These findings were based on comparisons between the BDI and a semi-structured clinical interview [7] and the BDI-II and the Structured Clinical Interview for DSM-IV (SCID-I/P) [8]. The findings suggest if a bariatric candidate scores 12 or greater on the BDI [7] or greater than 13 on the BDI-II [8], the individual is likely to meet criteria for a current mood disorder. Establishing appropriate BDI cut-off points in bariatric surgery patients is needed, given the variability in optimal cut-points reported across different medical groups. A systematic review concluded that BDI-II cut-points used to predict depression vary widely based on the medical population, ranging from as low as 4 to as high as 20 [9].

In addition to the need for further research to better establish the performance of the BDI for identifying possible mood disorders in patients seeking bariatric surgery, further research is also needed to address broader concerns raised regarding BDI scoring and interpretation in bariatric samples [6]. For example, medical comorbidities and obesity-related symptoms (e.g., loss of interest due to weight-related mobility impairment *versus* loss of interest in activities unrelated to weight) may inflate BDI total scores in this patient group. Therefore, when assessing depressive symptoms in individuals undergoing bariatric surgery, Hayes et al., [6] recommended making broader use of the continuous data produced by the BDI.

Research with patients meeting criteria for overweight/obese [10,11] and with patients with comorbid binge eating disorder (BED) and obesity [12,13] has demonstrated the clinical utility and superiority of subtyping by depressive/negative affect scores on the BDI over subtyping by categorical mood disorders. Such findings, which are consistent with Hayes et al. [6] suggestion regarding a broader dimensional approach to assessing depressive symptoms and/or depression among patients undergoing bariatric surgery, is especially appealing in light of potential challenges when performing time-limited psychosocial evaluations in bariatric surgery centers. Grilo and colleagues [13] emphasized that the BDI performs well as a marker for severity and associated distress in patients with obesity and

BED but whether such findings generalize to candidates seeking bariatric surgery remains unknown.

This study aimed to examine the efficiency of the BDI as a screening measure for identifying mood disorders and its clinical utility for subtyping women seeking gastric bypass surgery. Thus, in addition to replicating previous studies of BDI [7,8] for screening of clinical depression, this study aimed to also examine the clinical utility of using elevated BDI scores to subtype individuals by depressive/negative affect. We hypothesized that subtyping by BDI scores would provide useful clinical severity information beyond or greater than the information provided by reliance on a categorical mood disorder diagnosis.

Materials and Methods

Participants were 124 women who were being evaluated for gastric bypass surgery. Participants' mean age was 41.8 ($SD=11.0$) years and mean BMI was 49.9 ($SD=8.6$) kg/m². Over two-thirds identified as White ($n=82$; 67.2%); 19.7% ($n=24$) identified as African American, 8.2% ($n=10$) identified as Hispanic, 0.8% ($n=1$) identified as Native American, 4.1% ($n=5$) identified as "Other", and 2 had missing race/ethnicity data. Three-quarters (74.8%; $n=92$) reported completing at least some college. Over half of the participants (57.7%; $n=71$) were married, 25.2% ($n=31$) were never married, and 17.1% ($n=21$) were divorced or widowed, and 1 had missing data on relationship status.

Procedures

Participants were administered the Structured Clinical Interview for DSM-IV (SCID-I/P) to assess for axis I psychiatric disorders, including mood disorders, and completed a self-report battery of psychosocial measures. Participants' height was measured using a tape measure and weight was measured using a high-capacity digital scale and these measured values were used to calculate *body mass index* (BMI) using the standard formula (weight [kg] divided by height [m²]). Study procedures were IRB approved and all participants provided written informed consent.

Psychosocial Measures

The *Beck Depression Inventory* (BDI) [14], a 21-item measure of current depression symptoms and levels, is used widely in clinical evaluations of bariatric surgery patients [2,15]. The *Eating Disorder Examination-Questionnaire* (EDE-Q) [16] assesses binge-eating and eating-disorder psychopathology during the past 28 days and comprises four subscales: Restraint, Eating Concern, Weight Concern, Shape Concern, and an overall Global scale. The EDE-Q has good convergence with semi-structured interviews [17]. The *Body Shape Questionnaire* (BSQ) [18] measures body dissatisfaction and associated features. The *Rosenberg Self-Esteem Scale* (RSES) [19] is a well-established measure of global self-esteem. Items are rated on a scale from 1 (strongly agree) to 4 (strongly disagree), with higher scores indicating higher self-esteem. The *Internalized Shame Scale* (ISS) [20,21] is a well-established measure of shame, including inferiority, inadequacy, alienation, and worthlessness.

Results

Mood Disorders: Frequency and Clinical Severity

On the SCID-I/P, 13% of participants met criteria for current mood disorders (non-bipolar mood disorders). Analyses revealed that patients diagnosed with SCID-I/P mood disorders had significantly greater eating disorder psychopathology, worse body image, lower self-esteem, and greater internalized shame than those not meeting criteria for mood disorders (Table 1).

BDI Predicting SCID-I/P Mood Disorders

When examining the BDI as a predictor of SCID-I/P current mood disorders, ROC curve analysis (Figure 1) revealed the BDI had good accuracy (AUC=.788, $p<.0001$, 95% CI: 0.681–0.896) for predicting SCID-I/P diagnosis of current mood disorders. A BDI score of >15 optimized sensitivity (83.1) and specificity (63.9) and yielded a positive predictive value of 25.0 and a negative predictive value of 95.8.

Subtyping by BDI Scores

Using the BDI cut-off of 15, 42% were categorized as High-BDI and 58% as Low-BDI. The High-BDI group had significantly higher scores on all clinical measures (eating disorder psychopathology, self-esteem, body image, and internalized shame) than the Low-BDI group (Table 2). Inspection of the effect sizes for the BDI subtyping (Table 2) reveals consistently larger effect sizes than those resulting from the SCID-I/P subgroupings (Table 1). As summarized in Table 2, BDI scores were significantly positively correlated with all of the other clinical measures (eating disorder psychopathology, self-esteem, body image, and internalized shame) except for BMI.

Conclusion

To our knowledge, this is only the second study to compare the utility of a cut point score with the self-report BDI to the SCID I/P with bariatric surgery patients [8]. The study yielded three primary findings. First, the BDI had limited efficiency as a screening measure for current mood disorders. Second, patients diagnosed with current mood disorders were characterized by significant elevated psychosocial problems relative to patients without current mood disorders. Third, using a cut-point greater than 15 on the BDI, a greater number of participants with elevated psychosocial problems were identified than would have been identified solely with the categorical mood disorder diagnosis. Most importantly, the patient group subtyped by high-BDI scores differed significantly and robustly relative to the patient group subtyped by low BDI scores. Subtyping candidates seeking bariatric surgery by high BDI scores identified a substantially more broadly-disturbed group (based on larger effect sizes) than subtyping by the presence or absence of clinical mood disorders generated by SCID-I/P diagnostic interviews.

The BDI demonstrated limited acceptability as a screening instrument for current mood disorders in women seeking bariatric surgery with a cut-point greater than 15. Previous studies suggested optimal BDI cut points ranging from 12 (BDI) [7] to >13 (BDI-II) [8]

for current mood disorders. Differences in cut points may be due, in part, to sex differences in participant groups. Given that our participant group consisted of women only, whereas the aforementioned studies included both sexes, it is possible our cut point was higher as female candidates report higher BDI scores than male candidates seeking bariatric surgery [22].

As expected, individuals with a current mood disorder diagnosis (on the SCID-I/P interview) had greater associated disturbance than patients without a current mood disorder diagnosis. Our study, consistent with previous studies of persons with overweight/obesity [10,11] and BED comorbid with obesity [12,13], found that subtyping by high BDI scores identified: (a) a larger number of patients with heightened broad-ranging psychosocial problems, and (b) a more clinically-meaningful and disturbed subgroup of patients as evidenced by substantially larger effect sizes compared to categorical findings based solely on presence/absence of current mood disorder using the SCID-I/P. When examining the BDI continuously, the BDI was significantly associated with eating disorder psychopathology, self-esteem, and internalized shame, suggesting that greater depressive symptoms are related to greater disordered-eating, lower self-esteem, and greater internalized shame. The BDI was not, however, associated with BMI in this group.

These findings should be interpreted in light of impression management research in this patient population which has suggested that candidates seeking bariatric surgery may minimize symptoms in attempting to present favorably during pre-surgical psychiatric evaluations. Greater social desirability has been linked to underreporting of depressive and anxiety symptoms among bariatric surgery candidates [23]. In addition, Fabricatore and colleagues [24] found that about one third of patients seeking bariatric surgery reported significant changes in BDI-II scores after receiving clearance to undergo bariatric surgery, with more cases involving *worsening* of depressive symptoms following clearance. While other explanations are plausible, (e.g., actual changes in depressive symptoms, measurement error [24]), impression management measures should be incorporated in both clinical and research evaluations with bariatric surgery candidates, particularly due to the variability in impression management scores within and across bariatric surgery samples [23, 25].

Despite potential impression management effects, collectively, these findings suggest the predictive validity and clinical utility of the BDI as an efficient screening instrument for broad clinical disturbance among women seeking bariatric surgery. While this study has important clinical applications, the limitations must also be noted. First, impression management was not assessed in the present study; therefore the most optimal or “valid” assessments and cut-points are uncertain to some degree. Second, our findings were cross-sectional and did not evaluate the prognostic significance of the BDI with this bariatric group. We note, however, that White and colleagues [26] recently reported prospective findings suggesting the predictive utility of BDI scores throughout the post-bariatric period. Third, this study included only female adults as sufficient number of men did not participate in the present study and were excluded from analyses. Thus, findings from the present study may not generalize to men nor to adolescents seeking bariatric surgery. It is possible that optimal BDI cut points for predicting mood and general distress vary based on age and sex. Fourth, despite longstanding research on use of the BDI [27], practitioners may elect to use

the newer version based on emerging research and merits of the BDI-II. Within that context, replication and extension with the BDI-II is an important avenue for future research.

Finally, additional caution in using the BDI as a screen for clinical mood disorders is indicated given some of the relatively weak diagnostic efficiency statistics (e.g., a cut-point greater than 15 did not have strong positive predictive value). Nonetheless, while a cut-point greater than 15 has some efficiency as a screen for clinical depression, we emphasize that the major and novel finding is that categorizing or subtyping patients with severe obesity who seek bariatric surgery by increased BDI scores (cut-off greater than 15) appears to clearly identify a subgroup characterized by broad negative affect and psychosocial problems including eating disorder pathology, body dissatisfaction, shame, and poor self-esteem.

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Figure 1.
ROC curve for current mood disorder using the Beck Depression Inventory

Descriptive statistics and effect sizes for BMI, eating disorder features, self-esteem, body image, mood, and internalized shame by current mood disorder status.

Table 1

	Current Mood Disorder		<i>p</i> value	η^2	η^2 Interpretation
	Yes n=16	No n=108			
BMI	52.8 (10.8)	49.5 (8.3)	.308	.02	Small
BDI	23.8 (10.5)	13.7 (8.4)	<.001	.13	Small
EDE-Q					
Global Score	3.8 (0.8)	3.04 (1.0)	.005	.06	Small
Restraint	2.6 (1.3)	2.4 (1.4)	.742	.001	Small
Shape concern	5.5 (1.1)	4.4 (1.4)	.005	.06	Small
Weight concern	4.1 (0.9)	3.4 (1.0)	.011	.05	Small
Eating concern	3.0 (1.5)	1.9 (1.2)	.002	.08	Small
RSES	27.1 (4.8)	20.4 (5.3)	<.001	.15	Small
BSQ	147.8 (24.6)	125.3 (33.4)	.003	.05	Small
ISS	49.0 (22.4)	19.3 (16.1)	<.001	.26	Medium

Note. BMI=Body Mass Index; EDE-Q=Eating Disorder Examination-Questionnaire; RSES=Rosenberg Self-Esteem Scale; BSQ=Body Shape Questionnaire; BDI=Beck Depression Inventory; ISS=Internalized Shame Scale

Table 2

Descriptive statistics and effect sizes for BMI, eating disorder features, self-esteem, body image, mood, and internalized shame by BDI cut-off of 15.

	BDI (Cut-off = 15)		p value	η^2	η^2 Interpretation	r	p value (r)
	High (BDI > 15) n=52	Low (BDI ≤ 15) n=72					
BMI	48.2 (8.6)	50.9 (8.5)	.200	.03	Small	-.047	.706
BDI	24.1 (7.0)	8.5 (3.1)	<.001	.70	Medium	-	-
EDE-Q							
Global Score	3.7 (0.8)	2.7 (1.0)	<.001	.22	Medium	.518	<.001
Restraint	2.6 (1.3)	2.4 (1.4)	.359	.01	Small	-.017	.851
Shape concern	5.3 (1.0)	4.0 (1.4)	<.001	.22	Medium	.534	<.001
Weight concern	4.0 (0.9)	3.0 (0.9)	<.001	.23	Medium	.575	<.001
Eating concern	2.7 (1.2)	1.6 (1.2)	<.001	.19	Small	.548	<.001
RSES	25.2 (5.0)	18.3 (4.2)	<.001	.36	Medium	.723	<.001
BSQ	150.3 (20.3)	112.6 (31.6)	<.001	.32	Medium	.642	<.001
ISS	38.6 (18.9)	12.0 (10.5)	<.001	.45	Medium	.778	<.001

Note. BMI=Body Mass Index; EDE-Q=Eating Disorder Examination-Questionnaire; RSES=Rosenberg Self-Esteem Scale; BSQ=Body Shape Questionnaire; BDI=Beck Depression Inventory; ISS=Internalized Shame Scale