

## **The Role of Depression and Anxiety in Impulsive and Obsessive-Compulsive Behaviors Among Anorexic and Bulimic Patients**

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*Eating disorders are believed to range across a spectrum of varying degrees of obsessive-compulsive and impulsive behavior. Sixty anorexic (mean age = 19.8; sd = 5.9) and 109 bulimic (mean age = 26.9; sd = 11.3) female patients completed self-report questionnaires assessing obsessive-compulsiveness, impulsivity, depression and anxiety, as well as two eating disorder scales. Results yielded significantly higher levels of impulsivity and negative body image in the bulimic compared to the anorexic group. Regression analysis predicting impulsivity showed that bulimia and negative body image were the main contributors. Regression analysis for predicting obsessive-compulsive behavior suggested that depression and anxiety obscure the link between anorexia and obsessive-compulsive behavior, and a high BMI intensifies the association between anxiety and obsessive-compulsive behavior.*

*The high rates of both impulsivity and obsessive-compulsiveness found in both groups, and their association with the severity of the eating disorder, may suggest that impulsivity and obsessive-compulsiveness are not mutually exclusive and can both be found among anorexic and bulimic patients.*

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## INTRODUCTION

An abundance of research within the last two decades has contributed to an understanding of the etiology and characteristics of eating disorders (ED).

Besides biological characteristics (e.g., genetic predisposition), some studies view eating disorders as a somatic mode of emotional regulation due to a lack of capacity for self-soothing (Westen & Hamden-Fischer, 2001), or an inability to comfort oneself when feeling sad, angry, unhappy or alone (Ackard, Croll, & Kearney-Cooke, 2002; Polivy & Herman, 2002; Rezek & Leary, 1991). Overton et al. (2005) have suggested that their eating disordered female participants used deviant eating behaviors to manipulate negative emotions, while reporting pleasant emotions in relation to eating-disorder themes.

A cognitive-behavioral model (Fairburn, Shafran & Cooper, 1999) postulated that anorexic and bulimic symptoms are maintained by a characteristic set of overvalued ideas about the personal implications of body shape and weight. These attitudes have their origins in the interaction of stable individual characteristics (such as perfectionism, obsessionality, asceticism, and difficulties in affect regulation) with sociocultural ideals for female appearance. Once formed, the beliefs influence the individuals who hold them to engage in stereotypic eating and elimination behaviors, to be responsive to eccentric reinforcement contingencies, to process information in accordance with predictable cognitive biases, and, eventually, to be affected by physiological sequelae that also serve to sustain disordered beliefs and behaviors.

A large body of recent research has attempted to define risk factors for the development of eating disorders (O'Brien & Vincent, 2003). In general, studies report that patients with anorexia nervosa (AN) show obsessive-compulsive behaviors and perfectionism, (Cassidy, Allsopp & Williams, 1999; Sohlberg & Strober, 1994; Vitousek & Manke, 1994), whereas patients with bulimia nervosa (BN) are characterized more by impulsiveness and affective dysregulation (Casper, Hedeker & McKlough, 1992; Pryor & Wiederman, 1996; Vitousek & Manke, 1994).

### Anorexia Nervosa, Obsessive-Compulsive Behavior, Depression and Anxiety

Developmental and psychodynamic theories suggest that anorexia nervosa is an attempt to gain control as a part of the separation-individuation process in puberty (Chassler, 1994). Bruch (1978) has suggested that patients with anorexia nervosa suffer from major ego deficiencies resulting from chronically disturbed mother-child interactions. Palazzoli (1978) has suggested that the ego deficiencies are a result of symbiotic-like attachments the anorectic patients had with their parents, and the incompleteness of the separation-individuation process. Bachar (2005), from the self psychology

perspective, views adolescent girls who develop eating disorders as experiencing failures in selfobject relations with the parents, making them unable to rely on human beings for the fulfillment of their selfobject needs, and causing them to resort to food instead. In his view the anorectic girl, by avoiding food, obtains a sense of control and supernatural power.

Several studies have discussed the role that psychiatric symptoms may play in the etiology of anorexia nervosa. Girls characterized by perfectionism or obsessive-compulsive behavior, or those who have poor body image or low self-esteem, may be at particularly elevated risk for anorexia nervosa following the onset of puberty, which forces them to deal with a stressful array of physical and psychosocial challenges (Halmi, 2003). Bruch characterized young anorexia nervosa patients as fulfilling “every parent’s and teacher’s idea of perfection” and demonstrating “pleasing superperfection” (Bruch, 1978, p. 59). The emotional gratification of weight loss and food avoidance among anorexics serves as a powerful reinforcer due to the sense of euphoria that results from experiencing success and control (Vitousek, Watson & Wilson, 1998). Fairburn, Cooper, Doll and Welch (1999) reported perfectionism and obsessive-compulsive behavior as being an especially common antecedent of anorexia nervosa. Several studies reported that perfectionism and obsessive-compulsive behavior appear prior to the onset of the eating disorder (Bulik, Sullivan, Fear & Joyce, 1997; Thornton & Russel, 1997).

Obsessive-compulsive behavior among anorexics may serve to control and inhibit impulses and negative emotions such as depression, anxiety, anger and resentment (Perkins, Klump, Iacono & McGue, 2005; Wiederman & Pryor, 1996). Some studies have hypothesized a role for premorbid depression and anxiety during early adolescence, which may create elevated risk for the onset of eating disorders during middle adolescence or early adulthood (for a review, see O’Brien & Vincent, 2003). These researches indicate that negative affect and depressive symptoms predict onset of eating disorder symptoms (Deep, Nagy, Weltzin, Rao & Kaye, 1995; Johnson, Cohen, Kotler, Kasen & Brook., 2002; Kaye, Bulik, Thornton, Barbarich & Masters, 2004; Strober, Freeman, Lampert & Diamond, 2007).

### Bulimia Nervosa, Impulsiveness, Affective Disregulation, Depression and Anxiety

Difficulty in regulating negative moods has been linked almost entirely with bulimia nervosa (Cooper et al., 1988; Leon, Fulkerson, Perry & Cudeck, 1993; Stice, 1999; Telch, 1997). The association between emotional regulation difficulties and bulimia nervosa is based on the bingeing-purging cycles characteristic of this disorder, as the bingeing and purging episodes are seen as methods of regulating negative affect (such as depression and anxiety). Specifically, these cycles might enable a lowering of consciousness to painful mental and cognitive states (Everill, Waller & Macdonald, 1995; Heatherton & Baumeister, 1991).

Bulimic patients are described as lacking a clearly defined sense of self, and subsequently they utilize their bodies as a means of self-definition and regulation. The binge/purge phenomena among bulimic patients exemplify a disturbance in self-regulatory processes, demonstrated in primitive use of the body. Bulimic patients reported greater amounts of identity confusion, enmeshment, and overall instability in self-concept than non-clinical controls. The binge leads to an escape from self-awareness, and the purge serves to manage negative affect (Schupak-Neuberg & Nemeroff, 1993). In their review Heatherton and Baumeister (1991) suggested that binge eating might often arise as part of a motivated attempt to escape self-awareness, and at the same time to fulfill the need for sensation in the immediate present and remove inhibitions. The awareness of the self's shortcomings creates negative affects, such as anxiety or depression. Eating binges might therefore occur during or following a period of negative affect and unhappy mood, which are brought on by the comparison of self against ideal standards in general and body shape in particular; thus the engagement in binge-purge episodes are viewed as a way to regulate the moods. This theory, postulating that bulimic symptomatology is a mode of escaping awareness, suggests that the role of purging is to deal with the negative feelings and anxiety that arise following the binge when self-awareness returns.

Dawe and Loxton (2004), based on clinical observations, proposed that the component of impulsivity and reward sensitivity/drive might play a part in the initiation of binge cravings and desire to binge, and that the component incorporating rash-spontaneous impulsiveness contributes to disinhibited behavior and loss of control during a binge-episode, and/or the inability to resist binge cravings. Bulimic patients are described as impulsive, affectively unstable, and emotionally deregulated (Westen & Hamden-Fischer, 2001). Research reports a positive relationship between measures of bulimic behavior and a component of impulsivity, defined as a predisposition to act rashly in response to negative affect and as impulsive behavior (e.g., self-mutilation, suicidal thoughts, excessive drinking and drug abuse; Fischer, Smith & Anderson, 2003; Kane, Loxton, Staigera & Dawe, 2004; Pidcock, Fischer, Forthun & West, 2000). The literature describes two types of bulimics: "multi-impulsive" and "uni-impulsive." The first type display various impulsive behaviors (e.g., stealing, substance abuse) in addition to bingeing and purging behaviors; the latter present binge eating as the only symptom or behavior that could be described as impulsive (Fichter, Quadflieg & Rief, 1994; Steinberg, Tobin & Johnson, 1990).

### The Present Study

The present study examined two main issues: (1) the comparison between anorexia and bulimia using a comprehensive battery of measures assessing

impulsivity (IM), obsessive-compulsiveness (OC), depression, anxiety, severity of eating disorder and severity of body image distortion; (2) the role of anorexia and bulimia (and the additional role of depression, anxiety, severity of eating disorder and severity of body image distortion distress) in the prediction of impulsivity and obsessive-compulsiveness among these patients.

Attempts to find associations between impulsivity and obsessive-compulsiveness and various types of eating disorders have yielded inconsistent results. Most studies indicate that AN patients tend to exhibit more OC behaviors than BN patients (e.g., Bastiani et al., 1996; Sohlberg & Strober, 1994; Thornton & Russel, 1997), whereas BN patients tend to be more impulsive than AN patients (Fahy & Eisler, 1993; Nagata, Kawarada, Kiriike & Iketani, 2000a; Pryor & Wiederman, 1996). However, other studies have found equal levels of impulsivity (Milos, Spindler, Ruggiero, Klaghofer & Schnyder, 2002; Thiel, Zurger, Jacoby & Shussler, 1998) and obsessive-compulsiveness (for a review, see Cassin & von Ranson, 2005) in both groups. Various studies have shown a consistent relationship between perfectionism (as a sub-scale of OC) and eating disorders (Castro-Formieles et al., 2007; Halmi et al., 2005), especially among patients with AN (Bruce & Steiger, 2005; Lilenfeld, Wonderlich, Riso, Crosby & Mitchell, 2006). This incongruity underlies the first goal of the present study, which was to compare between AN and BN patients regarding levels of IM, OC, depression, anxiety, severity of eating disorder and severity of body image distortion.

Previous theories of the development of eating disorders have stressed the role of psychiatric disorders as representing potentially premorbid predisposing emotional and personality traits. IM due to emotional dysregulation has been proposed as the underlying disorder for bulimia nervosa, and a similar relationship has been suggested between anorexia nervosa and OC behavior (Striegel-Moore, Silberstein & Rodin, 1986). Incongruities can be found in the literature as to whether impulsivity and obsessive-compulsiveness (Engel et al., 2005; Fessler, 2002; McElroy, Phillips & Keck, 1994; Nagata et al., 2000a), or depression (Braun, Dunday & Halmi, 1994; Polivy & Herman, 2002; Troop, Serpell & Treasure, 2001) and anxiety (Godart et al., 2003; Kaye et al., 2004), are the contributing factors in ED. Claes et al. (2002) suggest that impulsivity and obsessive-compulsiveness are two separate axes that can exist simultaneously in both AN and BN patients. Based on the preceding literature review, we assumed that bulimia might be the main contribution to the prediction of impulsivity, while anorexia would contribute to the prediction of obsessive-compulsiveness.

To summarize, the majority of empirical studies have examined the relationships between anorexia nervosa or bulimia nervosa and either obsessive-compulsiveness or impulsivity (Engel et al., 2005). Yet the associations between depression, anxiety, obsessive-compulsiveness and impulsivity on the one hand, and the types and severity of eating disorders on the

other, require further elucidation. Moreover, most studies examined the contribution of impulsivity to bulimia nervosa or the contribution of obsessive-compulsiveness to anorexia nervosa. The present study is aimed at assessing the segregating link between impulsivity and obsessive-compulsiveness and types of eating disorder (bulimia nervosa vs. anorexia nervosa), and to examine the extent to which anxiety and depression account for the prediction of these dependant variables.

## METHOD

### Participants

One hundred and sixty nine female outpatients, comprising all referrals to the Eating Disorder Unit at Shalvata Mental Health Center in Israel in the years 2003–2004 who met the diagnostic criteria for an Eating Disorder according to the DSM-IV-TR (APA, 2000) and the Eating Disorder Examination (EDE, Fairburn & Cooper, 1993), participated in the study. Participants were divided into an anorexic (AN) and a bulimic group (BN) as suggested by Fairburn and Bohn (2005), who include in each group all cases showing characteristics similar to either anorexia nervosa or bulimia nervosa, but whose diagnostic criteria are sub-threshold. The AN group consisted of 60 patients: 37 who met all the criteria for Anorexia Nervosa, and 23 who met the criteria for Eating Disorder Not Otherwise Specified With Anorexic Features. The BN group included 109 patients: 59 who met all the criteria for Bulimia Nervosa and 50 who met the criteria for Eating Disorder Not Otherwise Specified With Bulimic Features. Body mass was calculated for all participants using the BMI index. The average BMI was 25.7 ( $sd = 8.2$ ) for the BN group and 18.1 ( $sd = 1.8$ ) for the AN group. The mean age was 19.8 ( $sd = 5.9$ ) for the AN group and 26.9 ( $sd = 11.3$ ) for the BN group.

The study complied with the World Medical Association Code of Ethics (Helsinki Declaration) and followed the guidelines of the local ethics committee.

### Instruments

Various established instruments were used in this study to assess the characteristics and severity of the eating disorders, as well as self-report questionnaires assessing IM and OC, depression, and anxiety.

1. The Eating Disorder Examination (EDE; Fairburn & Cooper, 1993). The EDE is a semi-structured psychiatric interview assessing current diagnostic criteria for all three DSM-IV eating disorders (AN, BN and NOS). Its subscales assess the objective bingeing and purging frequency (i.e., vomiting, diuretic misuse, laxative misuse, fasting), concerns about shape, weight,

- and eating, and dietary restraint. Studies with community and clinical samples have reported test-retest reliability correlations for diagnostic items ranging from 0.83 to 0.97 and interrater reliability kappa coefficients ranging from 0.83 to 0.99 (Fairburn & Cooper, 1993). Studies have also found that the EDE diagnostic items and subscales are able to discriminate individuals with eating disorders from overweight individuals, dieters, and normal control individuals (Cooper, Taylor, Cooper & Fairburn, 1987; Fairburn & Cooper, 1993).
2. The Eating Attitudes Test (EAT-26; Garner, Olmstead, Bohr & Garfinkel, 1982). The EAT-26 is a 26-item 6-point scale comprising 3 subscales: the Diet subscale, containing items indicative of a pathological avoidance of fattening foods and a preoccupation with thin body shape; the Bulimia and Food Preoccupation subscale, containing items related to thoughts about food as well as bulimic behaviors including bingeing and vomiting; and the Oral Control subscale tapping self-control of eating and perceived social pressure to gain weight. Higher scores on the EAT-26 indicate greater body-weight preoccupation or an eating disturbance. The score for each item is tabulated and summed with other item scores to produce a total EAT-26 value. The EAT-26 has been validated with anorexic and bulimic patients and has been used to identify eating disturbances in non-clinical adolescent and adult samples, and has been reported to have high internal reliability (Garner, Olmstead, Polivy & Garfinkel, 1984; Mazzeo, 1999).
  3. The Body Shape Questionnaire (BSQ; Cooper et al., 1987). The BSQ is designed to assess body image preoccupation. It measures desire to lose weight, body dissatisfaction, feelings of low self-worth in connection with weight and shape, feelings of fatness after eating, self-consciousness about weight in public, and distressing thoughts about weighing too much or being too big in certain body regions. The BSQ contains 34 items rated on a 6-point scale, with higher scores indicating greater body-image preoccupation. The BSQ has acceptable validity and reliability in samples of obese persons (Rosen, Jones, Ramirez & Waxman, 1996).
  4. The Impulse Control Scale (ICS; Plutchik and VanPraag, 1990). The ICS is a self-report questionnaire containing 15 items rated on a 3-point scale, assessing the tendency towards impulsive behavior (e.g., ability to postpone gratification, tantrums, difficulties in self-control). The ICS has also shown satisfactory internal reliability ( $\alpha = 0.76$ ) and external validity in adolescents (Apter et al., 1995).
  5. The Maudsley Obsessional-Compulsive Inventory (MOCI; Hodgson and Rachman, 1977). The MOCI is a true-false scale composed of 30 items designed to assess obsessive-compulsive symptoms: overt rituals and their related OC behaviors. It consists of a total score and four subscale scores: Checking, Washing, Slowness/Repetition, and Doubting/Conscientiousness. It has strong factorial validity and internal reliability ( $\alpha = 0.75-0.89$ ; Emmelkamp, Kraaijkamp & van den Hout, 1999).

6. The Beck Depression Inventory (BDI; Beck, Rush, Shaw & Emery, 1979). The BDI is a 21-item self-report questionnaire widely used to measure depression in adolescents and adults. Each item consists of four statements regarding depressive symptoms or attitudes in increasing degrees of severity, of which the subject must endorse one. Each item is then scored on a Likert scale from 0 to 3. Scores range from 0 to 63. Numerous studies have established the validity and reliability of the BDI (Beck, Steer & Garbin, 1988).
7. The State and Trait Anxiety Inventory (STAI; Spielberger, Gorsuch & Lushene, 1970). The STAI is a 40-item self-report scale designed to measure both state and trait anxiety. The 20-item Trait Anxiety subscale of the STAI (STAI-T) was used to measure anxiety in the current study. Trait anxiety is conceptualized as a stable individual's proneness to anxiety. Items are rated on a 4-point scale. Total scores range from 20 to 80, with higher scores indicating higher levels of anxiety. The STAI has adequate psychometric properties (Spielberger, 1983), including internal consistency and concurrent validity.

## DATA ANALYSES

To examine the first question of the study, i.e., the differences between the AN and BN groups, multivariate analyses of variance (MANOVA) and univariate analyses of variance (ANOVA) were performed in order to assess the differences in eating disorder measures (eating disorder severity and body image distortion) and clinical measures (depression, anxiety, OC and IM).

To answer the second question, Pearson analyses were conducted to examine the correlations between the independent variables (groups AN and BN, depression and anxiety, severity of eating disorder symptoms, severity of body image distortion) and the dependent variables (IM and OC). Then, two stepwise hierarchical regressions were performed, in order to examine the prediction of IM and OC by the independent variables: AN vs. BN, depression and anxiety, severity of eating disorder and the severity of body image distortion.

## RESULTS

### Differences Between the Anorexic and Bulimic Groups

A MANOVA analysis (Wilks Lambda) was calculated in order to examine the differences between the AN and BN groups in the dependent variables of eating disorder measures (eating disorder severity and body image distortion) and clinical measures (depression, anxiety, OC and IM), yielding significant differences between the groups ( $F(6,163) = 3.28; p < .01; \text{Eta}^2 = .13$ ).



**TABLE 1** Means (and *sd*'s) of Research Variables

	Group 1	Group 2	<i>F</i> (1,168)	Eta <sup>2</sup>
	Anorexia	Bulimia		
	M ( <i>sd</i> )	M ( <i>sd</i> )		
Severity of ED (EAT)	33.42 (14.87)	34.92 (12.60)	0.42	.00
Body image (BSQ)	116.61 (41.34)	135.18 (39.88)	6.98***	.06
Depression (BDI)	18.08 (11.32)	20.07 (11.04)	0.95	.01
Anxiety (STAI)	51.03 (12.79)	52.81 (12.99)	0.62	.01
Obsessive-compulsiveness (MOCI)	12.79 (5.88)	12.89 (5.30)	0.04	.00
Impulsivity (ICS)	26.51 (5.29)	29.88 (4.79)	14.34***	.11

\*\*\**p* < .001.

Table 1 presents the means and *sd*'s of the research variables and a univariate ANOVA for each variable separately. As shown in the table, significant differences were found in levels of body image distortion and IM, with the BN group obtaining higher scores than the AN group.

#### Associations Between IM and OC and Depression, Anxiety, Severity of Eating Disorder and Severity of Body Image Distortion

Pearson correlations indicated significant correlations between IM and body image distortion as measured by the BSQ ( $r = .36$ ;  $p < 0.001$ ); significant but low correlations with severity of eating disorder symptoms as measured by the EAT ( $r = .20$ ;  $p < 0.05$ ); and significant correlations between IM and anxiety ( $r = .31$ ;  $p < 0.01$ ), and depression ( $r = .29$ ;  $p < 0.001$ ). Significant correlations were also obtained between OC and body image distortion ( $r = .25$ ;  $p < 0.01$ ); severity of eating disorder symptoms ( $r = .18$ ;  $p < 0.05$ ); anxiety ( $r = .17$ ;  $p < 0.05$ ); and depression ( $r = .29$ ;  $p < 0.001$ ).

#### Prediction of Impulsivity and Obsessive-Compulsiveness

Two stepwise hierarchical regressions were conducted for predicting IM and OC. In the first step, age and diagnosis (AN vs. BN) were entered into both regressions. Based on the conceptual model (presented in the review of the literature) in which depression and anxiety might be primary underlying conditions for IM and OC among ED patients, depression and anxiety were then introduced in the

second step. The behavioral variables relating to the eating disorder, i.e., vomiting, laxative misuse, body image and BMI were introduced in the third step. The interactions were entered in the fourth step, including the links between diagnosis, eating disorder characteristics and depression and anxiety. In both hierarchical regression analyses the variables entered in the first three steps were mandatory (namely, the stepwise method), whereas in the fourth step, variables were entered according to the significance of their contribution ( $p < .05$ ).

As shown in Tables 2 and 3, the predictors explained 27% of the variance for IM and 30% of the variance for OC, respectively. The regression predicting IM (Table 2) shows that in the first step, a diagnosis of bulimia (according to the  $\beta$  coefficient) contributed 13% to the explained variance of IM, while in the second step, depression and anxiety did not contribute significantly, explaining only 1% of the variance. The contribution of a diagnosis of bulimia decreases, according to the  $\beta$  coefficient, when depression and anxiety enter the regression. In the third step only body image made a significant contribution, adding 10% to the explained variance. According to the  $\beta$  coefficient, the more negative the body image the higher the IM score. In the fourth step, only the Anxiety x Laxative Misuse interaction was significant, adding 3% to the prediction.

To clarify this interaction, participants were divided into two groups: those who use laxatives and those who do not. Higher correlations between anxiety and IM were found among those who use laxatives ( $r = .58$ ;  $p < .001$ ) than among those who do not ( $r = .27$ ;  $p < .05$ ). Thus, the higher the level of anxiety, the stronger the prediction of IM among laxative users.

The regression predicting OC (Table 3) showed that age and diagnosis added no significant contribution to the prediction of OC when entered in the

**TABLE 2** Hierarchical Regression Analysis for Predicting Impulsivity ( $\beta$  Coefficient)

Predicting variables	Step			
	1	2	3	4
Age	-0.08	-0.02	0.06	-0.06
Diagnosis (bulimia/anorexia) <sup>1</sup>	0.38***	0.27*	0.28*	0.29*
Depression		0.12	0.08	0.08
Anxiety		0.03	0.05	0.05
Severity of ED			0.05	0.04
Body image			0.30**	0.22*
Vomiting			0.01	0.00
Laxative misuse			-0.06	-0.05
BMI			0.03	0.06
Anxiety X Laxative				0.18*
$R^2$	0.13***	0.14***	0.24***	0.27***
$\Delta R^2$	0.13***	0.01	0.10***	0.03**

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

<sup>1</sup>+ bulimia; - anorexia.

**TABLE 3** Hierarchical Regression Analysis for Predicting Obsessive-Compulsive Behavior ( $\beta$  Coefficient)

Predicting variables	Step			
	1	2	3	4
Age	-0.06	0.01	-0.05	0.02
Diagnosis (bulimia/anorexia) <sup>1</sup>	-0.03	-0.27*	-0.26*	-0.26*
Depression		0.15*	0.16*	0.16*
Anxiety		0.07	0.10	0.09
Severity of ED			-0.03	0.01
Body image			0.29**	0.12
Vomiting			0.33***	0.33***
Laxative misuse			-0.14	-0.16
BMI			0.11	0.09
Diagnosis X Vomiting				-0.29*
Anxiety X BMI				0.39***
$R^2$	0.01	0.03	0.19*	0.30***
$\Delta R^2$	0.01	0.02	0.16**	0.11**

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

<sup>1</sup>+ bulimia; - anorexia.

first step of the regression. In the second step, when depression and anxiety (which had no significant contribution) were entered, a diagnosis of anorexia (according to the  $\beta$  coefficient) made a significant contribution, explaining 2% of the variance. In the third step body image and vomiting significantly contributed, adding 16% to the explained variance. In the fourth step, three significant interactions were revealed, adding 11% to the explained variance.

To clarify the Diagnosis  $\times$  Vomiting interaction, participants were divided into their diagnosis group, AN or BN. Higher correlations between vomiting and OC were obtained in the AN ( $r = .35$ ;  $p < .01$ ) than the BN ( $r = .15$ ;  $p < .05$ ) group, indicating that vomiting was a much better predictor of OC among anorexics than among bulimics.

To clarify the Anxiety  $\times$  BMI interaction, participants were divided along the BMI median into a high- and a low-BMI group, and correlations were calculated. Correlations between anxiety and OC were higher ( $r = .49$ ;  $p < .001$ ) in the high-BMI group than in the low-BMI group ( $r = .13$ ;  $p > .05$ ), indicating that high levels of anxiety predict OC among those with a high BMI. This finding suggests that high BMI intensifies the link between anxiety and OC.

## DISCUSSION

The results of the present study indicate that the main differences between individuals suffering from anorexia nervosa and bulimia nervosa were

manifested in impulsivity and negative body image (higher scores for the BN group). It is interesting to note that the two groups did not differ in levels of anxiety, depression and obsessive-compulsive behavior. Both the AN and the BN groups obtained high scores on the anxiety and depression measures. Anxiety exceeded Israeli norms (ranging between  $M = 37.4-37.2$ ; Teichman & Melink, 1984). Although the BDI does not provide a clinical diagnosis of depressive disorders, nor are any Israeli norms available, Beck et al. (1988) have suggested that scores between 14 and 20 may indicate an average level of depression. These results support the majority of empirical findings, reported in the literature, of high levels of depression and anxiety among bulimic (Braun et al., 1994; Bulik, Sullivan, Carter & Joyce, 1996; Duncan et al., 2005; Gilboa-Schechtman, Avnon, Zubery & Jeczmiem, 2006) and anorexic patients (Amettler, Castro, Serrano, Martinez & Toro, 2005; Butler & Montgomery, 2005; Holtkamp, Muller, Heussen, Remschmidt & Herpartz-Dahlmann, 2005; Zeeck, Hartmann, Buchholz & Herzog, 2005).

As mentioned above, the BN group obtained higher scores on negative body image and impulsivity than the AN group. Likewise, in the regression for predicting IM the main contributors were the diagnosis of bulimia and negative body image. These results converge with other research findings showing that bulimics obtain significantly higher scores on measures of IM (Cassin & von Ranson, 2005; Claes, Walter Vandereycken & Vertommen, 2005; Diaz, Carrasco & Saiz, 2000; Thomas, Schroeter, Dahme & Nutzinger, 2002). It is worth mentioning that the  $\beta$  coefficients of bulimia decrease when anxiety and depression and later the eating disorder variables are entered into the equation predicting IM. This may suggest the mediating role of bulimia, thus supporting the notion postulated in the literature that bulimic behaviors are impulsive behaviors aimed at controlling negative emotions (Heatherton & Baumeister, 1991). The binge/purge behaviors typical of bulimic patients are a result of the disturbance in self-regulatory processes and in awareness of their problematic body image (Heatherton & Baumeister, 1991; Schupak-Neuberg & Nemeroff, 1993). Russel (1997) suggests that the affective instability and impulsivity manifested by the binge eating of bulimic patients lead to negative body image. Marcus (1997) suggests that bulimic patients assess themselves harshly on the basis of weight and shape. They show disparagement and disgust towards their own body. Moreover, the association between bulimia and negative body image was reported in the meta-analysis done by Cash and Deagle (1997), who suggested that the distortion in body image perception is more severe among bulimics than among anorexics, due to their body weight and their more negative body evaluation.

Several studies suggest that affective instability and emotional deregulation are core characteristics of bulimia (Thompson-Brenner & Westen, 2005; Vitousek & Manke, 1994; Westen & Hamden-Fischer, 2001; Wilfley et al., 2000). Both Jacobi et al. (2004) and Striegel-Moore et al. (1986) stated in

their reviews that inability to regulate negative feelings, an urge for immediate need gratification, and poor impulse control are underlying disorders in bulimia nervosa. Fernández-Aranda et al. (2006) reported that bulimic patients with lifetime impulse control disorders exhibit more severe eating disorder symptoms and greater general psychopathology than bulimics without comorbidity of an impulse control disorder.

The second hierarchical regression analysis predicting OC showed that a diagnosis of anorexia nervosa contributed to prediction only when the contribution of depression and anxiety was controlled. This finding suggests that depression and anxiety obscure the link between OC and anorexia. Extensive research indicates that OC features such as rigidity, neatness, conscientiousness and preoccupation with rules and ethics are common among AN. In reviewing studies on personality and personality disorders in anorexia nervosa, Sohlberg and Strober (1994) conclude that obsessive-compulsive symptoms appear to be related to the state of starvation and are stable personality features, which are maintained after weight gain. We may suggest that when OC fails to provide anorexics with a sense of control (Claes et al., 2002), depression and anxiety prevail. Godart et al. (2006) reported that the obsessive compulsive symptomatology increased the risk of depression among their AN subjects. Other studies have also pointed to obsessive-compulsiveness as the central feature of anorexia (Rastam, Gillberg & Gillberg, 1996; Toner, Garfinkel & Garner, 1986), and as a lifetime characteristic (Bastiani et al., 1996; Halmi et al., 2003) that may predate its onset and persist after recovery (Cassin & von Ranson, 2005; Halmi et al., 2003; Jacobi et al., 2004; Rastam, 1992; Srinivasagam et al., 1995). Bruce and Steiger (2005) claim that obsessionality, perfectionism and rigidity appear to be clear-cut risk and maintenance factors for anorexia nervosa. These findings contradict Sugarman and Quinlan's (1991) view of anorexia as a defense against depression, as well as other studies suggesting that depression and anxiety are at the root of anorexic symptomatology (McElroy, Kotwal, Keck & Hagop, 2005; Tchanturia et al., 2004) and persist long after recovery (Holtkamp et al., 2005).

As to the relations between OC and depression and anxiety among ED patients, the interaction Anxiety x BMI (in the regression for predicting OC) suggests that high BMI intensifies the link between anxiety and OC in both groups and strengthens the association between eating disorders, OC and anxiety.

The results regarding equal levels of OC in both the anorexic and bulimic groups concur with those of Claes et al., (2002), Engel et al. (2005) and Halmi et al. (2003). As mentioned above, an abundance of research pointed to the relations between AN and OC. As to the bulimic group, Aragona and Vella (1998) have suggested that the food preoccupation of bulimic patients is similar to obsessive-compulsive symptomatology, while Rothenberg (1986) has suggested that the high rates of OC among eating-disorder patients reflect

their attempts to gain control over their impulses, anxieties, wishes and fantasies.

The high rates of both IM and OC found in our study in both groups, and the association between the severity of the eating disorders and IM and OC (according to the correlations), are similar to those found by Raymond et al. (1999), suggesting that IM and OC are not mutually exclusive and can both be found among anorexic and bulimic patients. We may suggest that both anorexic and bulimic patients employ IM and OC as a means of gratifying or regulating various impulses and needs (Aragona & Vella, 1998; Claes et al., 2002; Fahy & Eisler, 1993). These findings may also support the view that these behaviors vary along two separate continuums in eating-disorder patients (McElroy et al., 1994; Tylka & Subich, 1999; Wade, Bergin, Martin, Gillespie & Fairburn 2006), and are independent dimensions that can co-exist in both anorexics and bulimics and within the same individual (Claes et al., 2002; Davis & Karvinen, 2002; Raymond et al., 1999).

### Limitations

The results of this study should be considered with certain reservations. To begin with, the participants were divided into an anorexic and a bulimic group as suggested by Fairburn and Bohn (2005), who include in each group all cases showing characteristics similar to either Anorexia Nervosa or Bulimia Nervosa even if their diagnostic criteria are sub-threshold. Perhaps a further division into subgroups, namely, anorexia restricting type, anorexia binge-eating/purging type (which were excluded from our sample), and bulimia purging and non-purging type, could produce more precise results as to impulsive traits in anorexic subjects (particularly the binge-purging subtype). Nonetheless, our results concur with those of other studies investigating depression, anxiety, IM and OC, thus perhaps supporting Fairburn and Bohn's (2005) suggestion regarding the use of only two study groups, anorexia and bulimia.

A further limitation relates to the fact that our study is cross-sectional and of an exploratory nature; the chronology of the eating disorder and OC was not examined, nor were the histories of impulsive behaviors such as suicide attempts, self-mutilation, sexual promiscuity, alcohol abuse, gambling or shop-lifting.

Furthermore, a healthy control group is missing. Further studies are necessary, and should be conducted using control groups of depressed and impulse-control disorder subjects without ED, to find out whether the results obtained here are specific to subjects with ED.

Studies raise the question whether impulsivity is a personality trait constituting a predispositional risk factor or whether it operates as an intensifying and maintaining factor of bulimia, and also whether obsessive-compulsive traits are the predisposing factors of anorexia or whether they

constitute a comorbid symptomatology (Jacobi et al., 2004; Lilienfeld et al., 2006; Striegel-Moore et al. 1986). These questions merit exploration in further longitudinal studies.

## Conclusions

The main findings of this study were, first, the more severely negative body image of the BN group (compared with the AN group), which was linked to impulsivity. The regression for predicting IM suggests that the depression and anxiety involved in negative body image increase impulsivity among BN patients. Second, the regression for predicting OC suggests that depression and anxiety obscure the link between anorexia and OC. Our findings strengthen the assumption that anorexic and bulimic symptomatology are both regulation mechanisms. Bulimic symptoms are mostly an expression of impulsive behavior and maladaptive coping strategies with negative mood (Gilboa-Schechtman et al., 2006; Nagata, Matsuyama, Kiriike, Iketani & Oshima, 2000b); and anorectic patients obsessively obtain a sense of control by strict food restriction (Rezek & Leary 1991).

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