

## Clinical, Psychopathological and Personality Correlates of Interoceptive Awareness in Anorexia nervosa, Bulimia nervosa and Obesity

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### Key Words

Eating disorders · Hunger · Personality · Emotions · Food · Obesity · Temperament

### Abstract

**Objective:** To determine the levels of interoceptive awareness (IA), which measures the ability of an individual to discriminate between sensations and feelings, and between the sensations of hunger and satiety, in eating disorder patients and to identify the clinical, psychopathological and personal variables correlated with IA. **Sampling and Methods:** Sixty-one restrictor anorexics, 61 binge-purging anorexics, 104 purging bulimics, 49 obese subjects with binge eating disorder (BED) and 47 obese subjects without BED were compared. They were assessed with the Eating Disorder Inventory-2, the Temperament and Character Inventory, and the Beck Depression Inventory, and their clinical and sociodemographic features were recorded. **Results:** In all patients, the levels of IA were higher than the 'normal' ones; in bulimia nervosa, they were higher than in anorexia nervosa and obesity. Similar personal features and eating attitudes are shared by patients with bulimia nervosa and BED. In the total sample, the following variables independently correlate with IA: the Beck Depression Inventory, self-

directedness and persistence. **Conclusions:** The importance of an altered IA in eating disorders is supported. Both depression and a perfectionist and poorly self-directive personality can lead to greater difficulties in discriminating hunger and satiety.

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### Introduction

Eating disorders (EDs) and obesity are illnesses whose frequency has greatly increased in the last decades [1, 2], representing a real challenge for physicians of different specialties (psychiatrists, dieticians, endocrinologists, internists).

Anorexia nervosa (AN), with the two subtypes of binge-purging (AN-BP) and restrictor (AN-R) AN, and bulimia nervosa (BN), with the two subtypes of purging and not purging BN, are classified in the DSM-IV [3] among the EDs, while obesity is not included in the DSM-IV; therefore, the current diagnosis of obesity is made according to a single clinical criterion suggested by recent clinical guidelines developed by the National Heart, Lung and Blood Institute. A body mass index (BMI = kg/m<sup>2</sup>) between 25 and 29.9 defines 'overweight', and a BMI higher than 30 defines obesity [4].

However, in the DSM-IV, there is a diagnostic category named binge eating disorder (BED) included in the EDs not otherwise specified: subjects with BED are often obese, and according to the opinion of several authors, in the absence of overweight, it is difficult to discriminate between nonpurging BN patients and patients with BED [5]. Some authors indeed maintain that those disorders characterized by an altered eating behavior and by an altered body experience should be considered on a continuum [6].

As regards EDs and obesity, clinical [7, 8], psychological [9–11], psychopathological [12–15] and personality features [16–19] specific to these disorders have been identified, as well as some other psychological traits shared by more than one disorder [20]. Several authors have contributed to the description of the psychological features of subjects with EDs. A fundamental role has been played by Garner [21]. His studies led to the development and validation of a questionnaire which has become a standard in the studies on EDs, and which has also been used for the assessment of obese patients [12, 21], that is the Eating Disorder Inventory (EDI) [10]. The EDI and the revised version [21] allow the measure of some psychological traits, such as drive for thinness (DT), bulimia (BU), body dissatisfaction (BD), and interoceptive awareness (IA).

The most studied among these psychological traits in EDs and obesity have been DT [22, 23] and BD [24, 25].

Only poor attention has been paid to IA, which measures the ability of an individual to discriminate between sensations and feelings, and between the sensations of hunger and satiety [10]. The confusion and uncertainty in recognizing emotional states and the ability to discriminate hunger and satiety sensations are often core psychopathological elements playing an important role in the relation with food [26]. In the literature, a rich body of evidence exists that not only the psychopathological aspects of mental disorders can lead to changes in the physiological mechanisms regulating appetite, but also that emotional states and the ability to cope with stress can influence the relation of individuals with food and eating [27, 28].

IA can be altered in AN, BN and obesity [10]. Despite the growing interest in the interaction between emotions and food [24], the role of personality features in the regulation of the ability to discriminate the physical sensations of hunger and satiety is still not clear.

The objective of the study was to investigate the relation between this trait, playing such an important role in the onset and maintenance of EDs, and clinical, psycho-

pathological and personality features, assessed according to the psychobiological model suggested by Cloninger et al. [29].

In more detail, the first aim of this study was to compare the five subgroups (AN-R, AN-BP, BN, BED, obesity without BED) on some selected EDI-2 scales (particular attention being paid to IA) and on the 7 dimensions of the Temperament and Character Inventory (TCI).

The second aim was to study with the regression analysis which, among the variables considered, are more correlated with IA.

## Methods

### Subjects

The 327 patients included were recruited from the 465 patients who applied (spontaneously without advertisement or referred cases) to the Eating Disorder Pilot Center of the Psychiatric Clinic of the University of Turin from November 1998 to May 2001. Sixty-one (18.6%) of these patients matched the DSM-IV criteria [3] for AN-R, 61 (18.6%) for AN-BP, 104 (31.8%) for BN, 48 (14.7%) for BED and obesity, and 47 (14.3%) for obesity without BED. All the patients included in the study were women, aged 20–60 years.

A total of 138 patients out of the 465 who had applied to the center were excluded for the following reasons: (a) comorbidity or principal diagnosis of a full-syndrome axis I disorder ( $n = 123$ ), including mood ( $n = 33$ ), anxiety ( $n = 24$ ), ED not otherwise specified ( $n = 55$ ), psychotic disorder (8), and other ( $n = 3$ ); (b) previous treatment in our or other ED specialist centers ( $n = 12$ ), and (c) not good knowledge of the Italian language ( $n = 3$ ). Such an approach was chosen to avoid the excessive heterogeneity of the sample and because personality assessment with TCI can be influenced by axis I disorders [30].

Diagnostic assessment for axis I disorders was carried out with the support of the Structured Clinical Interview for DSM-IV Axis I Disorders – Patient Edition [31]. A psychiatrist and a dietician performed a screening interview with each subject, lasting about an hour, to evaluate the possibility of inclusion in the study.

The selected subjects ( $n = 327$ ) were administered tests to assess eating habits, personality, and depression at intake. None of the patients was treated with psychotropic drugs or with psychotherapy at baseline. None of the patients was following a controlled dietetic regimen at baseline. All subjects were asked for written informed consent to participate in the study and were guaranteed anonymity.

### Assessment of Nutritional State and BED

#### Body Mass Index

The BMI is a good index of the nutritional state of a subject. Female subjects with a BMI between 18.7 and 23.8 are considered to be of a normal weight [32]. A BMI of 30 was used as a cutoff for the diagnosis of obesity [33, 34].

#### Binge Eating Disorder

During the first session, subjects were administered a structured interview by trained interviewers [3] to assess the DSM-IV criteria for BED according to the model suggested by other authors [3, 35].

#### *Assessment of Eating-Related Psychopathology and Mood* EDI-2 Symptom Checklist

The EDI-2 [10] is a 91-item inventory that evaluates symptoms and psychological characteristics of eating behavior disorders. It is composed of 8 subscales and 3 provisional subscales. The EDI-2 has good psychometric properties [21]. The EDI-2 Symptom Checklist [10] is a self-administered questionnaire used to collect clinical data about EDs: age of onset, physical exercise, binges, purges, menses, and use of laxatives and diuretics.

#### *Beck Depression Inventory*

The Beck Depression Inventory (BDI) [36] is a self-report questionnaire with 13 items that is largely used to assess the severity of depression symptoms. The version used showed reliability and internal consistency similar to the original 21-item version [37].

#### *Personality Assessment*

##### *Temperament and Character Inventory*

The TCI [38] is based on a psychobiologic model of personality. The TCI is divided into 7 independent dimensions. Four of these dimensions assess temperament [novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (P)]. Cloninger et al. [29, 39] define temperament as partly heritable emotional responses, stable throughout life, mediated by neurotransmitter functioning in the central nervous system and providing a clinical description of opposite extreme scores.

Briefly, NS expresses the level of activation of exploratory activity. Low NS scores mean low explorative activity, poor initiative, insecurity, and unresponsiveness to novelty and change, whereas high scores on this dimension indicate the opposite characteristics. HA reflects the efficiency of the behavioral inhibition system. Individuals with high HA scores are described as extremely careful, passive, and insecure. RD reflects the maintenance of rewarded behavior. Individuals with high RD scores are described as attached and easily influenced by others. P expresses maintenance of behavior as resistance to frustration. High P expresses the tendency to maintain unrewarded behaviors and correlates with rigidity and obsessiveness.

The other 3 dimensions test character [self-directedness (SD), cooperativeness (C), and self-transcendence (ST)], defined as the overall personality traits acquired through experience. SD expresses the degree to which the self is viewed as autonomous and integrated. C reflects the degree to which the self is viewed as a part of society. ST expresses the degree to which the self is viewed as an integral part of the universe. Low SD and C appear as a common denominator extending across subtypes of personality disorders and the most important predictor of categorical diagnosis of a DSM axis II disorder [40]. The TCI displays a good internal consistency (range, 0.76–0.89) [29].

#### *Data Analysis*

Data analysis was carried out with SPSS 10.0 for Windows 95 [41]. A one-way analysis of variance (ANOVA) and the post hoc *t* test (Duncan) were used to compare the means of five groups (AN-R, AN-BP, BN, BED, obesity) on age, illness duration, age of onset, schooling, BMI, EDI-2 (only 3 subscales, i.e. IA, DT and BD), BDI score and TCI subscales. A General Linear Model (GLM) was used to control the differences in EDI-2 and TCI scores and BMI, age and illness duration (covariates). Thus, significant and independent *p* values were obtained, since they were still significant after controlling

for the other variables included in the model.  $\alpha < 0.05$  was considered significant.

Corrective measures for the *t* test and post hoc test (e.g. the Bonferroni correction) were not used for two reasons: (1) cogent arguments against the practice for exploratory studies have been put forward by the epidemiologist Rothman [42] and (2) data dredging was avoided by conducting only preplanned analysis [43].

Finally, a multiple linear regression was performed to identify the independent statistical predictors of the levels of IA. This allowed to avoid the risk of biases due to the internal correlations among the variables which might determine the correlation between the two variables studied.

## **Results**

### *Sample Description*

In table 1, the sociodemographical features (age, age of onset, illness duration, schooling) of the five subgroups of subjects (ANOVA) are shown.

### *Mood, Eating Attitudes and Personality*

In table 1, the BDI total score obtained for the five groups of patients (ANOVA) is shown.

The results of the comparison performed with ANOVA among the five subgroups of patients on the IA, BU, BD and DT subscales of the EDI-2 and on the TCI dimensions are reported in table 2. The *p* value has been computed with a GLM controlling for age, BMI and illness duration (table 2).

The results obtained from the comparison highlight two main evidences: (1) all the five groups score higher than the normal range on IA [10]; however, bulimics scored higher than anorectic and obese patients on IA; a similar result emerges also as regards DT and BU, whereas BD is higher in obese patients than in bulimics and anorectics, and higher in bulimics than in anorectics. (2) Bulimic patients differ from BED patients on BD and BU (table 2). It is important to remember that higher IA scores are related to a poorer ability to discriminate between sensations and feelings, and between the sensations of hunger and satiety.

Other EDI-2 subscale scores were not presented because they were beyond the aim of the study (these data will be sent to interested readers upon request). The choice of the BU, BD and DT scales is congruent with the study of IA. Those EDI-2 scales measuring general psychological issues were left out, and the study focused on those regarding the relation with body and food.

**Table 1.** Description of the sample: personal, clinical and mood features

	AN-R <sup>1</sup> (n = 61)	AN-BP <sup>2</sup> (n = 66)	BN <sup>3</sup> (n = 104)	BED <sup>4</sup> (n = 49)	OB <sup>5</sup> (n = 47)	ANOVA <sup>a</sup>		Post hoc <sup>b</sup>
						F	p	
Age	24.1±6.1	23.6±6.1	24.8±4.6	34.9±9.9	36.2±9.6	44.7	<i>&lt;0.000</i>	5>1, 2, 3 4>1, 2, 3
BMI	16.0±1.7	15.7±1.6	21.4±3.4	35.9±5.7	38.6±5.9	442.1	<i>&lt;0.000</i>	5>1, 2, 3, 4 4>1, 2, 3 3>1, 2
Illness duration, months	69.0±58.8	61.3±40.0	87.6±52.9	177.5±121.9	197.9±131.9	34.1	<i>&lt;0.000</i>	5>1, 2, 3 4>1, 2, 3
Age of onset	18.4±4.7	18.5±5.3	17.5±3.2	20.2±5.9	19.7±7.0	3.08	<i>&lt;0.016</i>	4>3
Schooling	11.9±2.4	12.0±2.1	11.3±2.3	11.7±2.2	12.0±2.3	1.6	<i>&lt;0.168</i>	-
BDI	11.0±8.1	11.7±6.6	10.2±8.0	11.2±5.0	11.9±6.9	0.64	<i>&lt;0.621</i>	-

OB = Obesity without BED. Figures in italics are significant.

<sup>a</sup> d.f. = 326; p < 0.05 was significant.

<sup>b</sup> Significant post hoc comparisons with Duncan test (p < 0.05).

**Table 2.** Comparison among the five groups: eating attitudes and personality

	AN-R <sup>1</sup> (n = 61)	AN-BP <sup>2</sup> (n = 61)	BN <sup>3</sup> (n = 104)	BED <sup>4</sup> (n = 49)	OB <sup>5</sup> (n = 47)	GLM <sup>a</sup>					Post hoc <sup>b</sup>
						F	I	II	III	IV	
<i>EDI-2</i>											
IA	8.5±5.9	7.3±6.6	10.9±6.3	8.0±5.9	7.5±6.3	4.76	<i>0.001</i>	n.s.	n.s.	n.s.	3>2, 5
BU	3.9±5.4	3.5±4.8	9.8±5.4	7.9±5.9	6.4±4.9	19.6	<i>0.000</i>	n.s.	n.s.	n.s.	3>1, 2, 4, 5 4, 5>1, 2
DT	9.4±6.9	9.1±7.5	15.0±6.0	12.5±6.4	11.7±6.5	10.9	<i>0.000</i>	<i>0.018</i>	<i>0.025</i>	n.s.	3>1, 2, 5
BD	9.0±6.5	8.9±5.9	15.0±7.8	20.1±6.0	19.7±6.3	36.0	<i>0.003</i>	<i>0.032</i>	<i>0.021</i>	<i>0.000</i>	5>1, 2, 3 4>1, 2, 3 3>1, 2
<i>TCI</i>											
NS	17.6±6.3	17.6±6.6	21.7±6.5	19.7±4.8	19.4±4.9	6.32	<i>0.000</i>	n.s.	n.s.	n.s.	3>1, 2
HA	21.4±7.0	21.7±7.0	21.3±7.6	22.0±7.7	18.7±8.0	1.54	n.s.	n.s.	n.s.	n.s.	
RD	14.8±4.1	14.6±4.4	15.7±3.9	15.1±3.3	15.6±4.1	1.07	n.s.	n.s.	n.s.	n.s.	
P	4.7±2.0	4.8±1.9	4.2±2.1	4.3±2.1	4.1±2.1	1.41	n.s.	n.s.	n.s.	n.s.	
SD	23.5±9.8	23.2±9.1	18.9±8.1	20.3±7.3	24.6±8.7	5.43	<i>0.000</i>	n.s.	n.s.	n.s.	3<1, 2, 5 4<5
C	31.5±6.2	29.6±7.2	29.5±6.9	29.9±6.5	30.1±5.7	1.04	n.s.	n.s.	n.s.	n.s.	
ST	13.2±6.6	13.4±6.2	15.8±6.4	15.1±7.3	15.9±5.9	2.75	n.s.	n.s.	n.s.	n.s.	

OB = Obesity without BED; GLM I = p for diagnosis factor; II = p for age; III = p for illness duration; IV = p for BMI. Figures in italics are significant.

<sup>a</sup> d.f. = 327; p < 0.05 was significant.

<sup>b</sup> Significant post hoc comparisons with Duncan test (p < 0.05).

### *Factors Associated with IA*

A multiple linear regression ( $R = 0.519$ ;  $R^2 = 0.270$ ;  $F = 10.55$ ;  $F$  significance 0.000) identified, among all the variables considered in the study, 3 independent variables in linear correlation with the IA level: one psychopathological and two personality variables.

Particularly, two major evidences emerge: (a) the personal (age, schooling) and clinical (illness duration, BMI, onset) features of the patients are not correlated with the decreased ability to discriminate hunger from satiety and the emotional awareness; (b) IA independently correlates with depression levels (BDI) and to 2 personality dimensions (SD and P). In fact, the BDI total score ( $\beta = 0.192$ ;  $p < 0.000$ ) directly correlates with IA, and higher scores on P ( $\beta = 0.160$ ;  $p < 0.029$ ) and lower scores on the SD scale of TCI ( $\beta = -0.356$ ;  $p < 0.000$ ) predict a greater IA level.

### **Discussion**

The study was performed on a sample of patients with 5 different types of eating disturbances: AN (both subtypes), BN (purging subtype), obesity with BED, and obesity without BED. Since the five groups were different in age, illness duration and BMI (table 1), these variables were considered as possible confounding factors. On the other hand, the five groups were not significantly different as regards schooling and depression degree (table 1). The lack of differences in the depression levels among the five groups of patients, particularly among the several subtypes of the 2 main diagnoses (EDs and obesity), which is a different result from those obtained by other authors [15, 44], might be explained on the basis of the selection criteria and of the exclusion of those subjects with an axis I comorbidity. The absence of differences in the depression levels, which however are moderate in all the five groups of patients [36], protects the comparisons later performed from the risk of confounding factors due to the depression level itself.

The study meant to perform first of all a comparison among the five groups of patients on 4 EDI-2 scales (IA, BD, DT, BU), with a specific focus on IA, and on the 7 TCI dimensions; second, a transnosographic assessment of the association among IA, personality and clinical features (depression, BMI, illness duration). This was possible because IA is a transnosographic psychological eating-related aspect and the instruments used for the study of personality (TCI) and of eating attitudes (EDI-2) are independent from axis I diagnosis [10, 29].

Regarding the first step, the comparison among the five clinical groups for IA leads to interesting results (see Results section).

These results suggest that patients with a more unstable eating behavior are also those scoring higher on IA [12]; indeed in bulimic patients the cycles of binges and vomiting are frequent and tend to self-maintenance [32]; thus, if further studies were to support this evidence, IA and the difficulties in the emotional awareness might play a core pathogenic role for bulimic behaviors, also on the basis of what had already been underscored about the relation between emotional state and food [45]. It is a widespread knowledge that overeating, bingeing and vomiting are often associated with difficulties in managing emotions [45, 46], and that negative affect might influence eating behavior [47]. Moreover, IA is a trait strongly related to alexithymia [10, 48]. Alexithymia, described as a diminished capability to verbally describe and identify emotional states [49], is a common finding in EDs [46, 49] and obesity [50, 51]. In the present sample, all patients showed an altered IA and alexithymic traits, but this evidence is even more marked in bulimics, who usually also display a greater degree of eating-related psychopathology (DT and BU). The bulimic patients of this sample are thus patients whose ED is more severe or, alternatively, easier to be detected: these patients may be the more conflictual ones along the hypothetical continuum of EDs [6, 18]: their wish to slim is greater than that of anorectic and obese patients (DT), but they also have a greater tendency to binge (BU), and a poor ability to relate their emotions to eating behavior (IA).

The analogy between BN and BED as regards eating-related psychopathology has also been described by other authors [52] and suggests that the two disorders differ in the eating behavior much more than they do as regards the psychological aspects related.

As regards the TCI, some of the findings strongly support what had already been reported in the literature: in more detail, it reveals a higher NS score in bulimics than in anorectics [13, 17] and a lower SD score in bulimics than in anorectics [13] and in obese patients with BED than in those without BED [9]. On the other hand, data about the study of personality performed with the TCI in obese patients are still few [18], so a comparison of some of the results found and the literature cannot be performed. The absence in the five groups of patients of significant differences among 3 temperament (HA, RD and P) and 2 character (C and ST) dimensions seems to support the hypothesis that these disorders are a common final pathway of coping with several familial, environ-

mental and intrapsychical factors [53]. On the other hand, these data do not deny the importance of a precise diagnostic assessment in EDs and obesity [54].

Two groups of patients in particular among the 5 studied are similar to each other on the 7 TCI dimensions: bulimic and BED patients. It can be hypothesized that a shared personality vulnerability might predispose to eating behaviors, which however are only in part overlapping.

As regards the transnosographic study of the association among IA and specific personality, psychopathological and clinical traits, the results underscore once again that both psychopathological and personality features might influence the way subjects with EDs experience their relation with food. However, though the relation between depression and eating patterns had been deeply investigated in the past years [47], little is known about the personality features related to IA.

A relevant fact emerging from the present study is that the greater difficulties in discriminating between emotions and sensations and between hunger and satiety are found in those subjects with a personality tending toward perfectionist and rigid goals (high P on the TCI), which, however, they are not able to achieve, or which they abandon in an impulsive way (low SD on the TCI). Such a personality structure [29] might be a predisposing factor to the development of an altered relation among stress-related emotions – coping with stress – eating patterns and behavior. On the other hand, previous studies have

revealed the personality substrate of alexithymia, showing an association between low SD scores and high degrees of alexithymia [49].

The limits of this study include sample selection and lack of data about previous nonspecialist treatments and about weight fluctuation patterns. Moreover, the transnosographic study of the association among IA and other variables, though justified by the study design, might be biased by the fact that diagnosis might play an important role in determining this association.

## Conclusion

Treating patients with an altered eating behavior of the bulimic type, a multi-modal and multi-disciplinary approach [55] should also consider those aspects related to the altered IA. These treatment approaches should also consider the personality features which might contribute to the onset and maintenance of these symptoms. The need of interventions able to modify the patients' self-directing ability in the context of a multi-modal treatment [13] is once again supported [13, 56].

Assessing IA might allow to plan both dietologic and nutritional rehabilitation interventions; moreover, if these data were to be further supported, it would be useful to study drugs acting not only on the sensation of satiety (e.g. sibutramine) [57], but also being able to act directly on the unbalanced IA.

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