Peñas-Lledó E, Fernández-Aranda F, Jiménez-Murcia S, Granero R, Penelo E, Soto A, Gunnard K, Menchón JM. (2009). Subtyping eating disordered patients along drive for thinness and depression. ***Behaviour Research and Therapy, 47,*** **513-519. doi: 10.1016/j.brat.2009.03.003.**

Abstract

Subtyping individuals who binge eat by ‘‘diet-DT’’ and ‘‘depression’’ has yielded two valid and clinically useful subtypes that predict eating severity, comorbid psychopathology and outcome. The present study aimed to find four subtypes based on these dimensions and test their validity. Besides, it explored the distribution of eating disorder (ED) diagnoses across subtypes given their known heterogeneity, crossover and binge-eating fluctuation. Cluster analysis grouped 1005 consecutively admitted ED adult women into four subtypes, those previously described ‘‘DT’’ (22%), ‘‘DT-depressive’’ (29%), and ‘‘mild DT’’ (25%) and ‘‘depressive-moderate DT’’ (24%). Overall ‘‘mild DT’’ presented lower and ‘‘DT-depressive’’ greater eating and comorbid psychopathology than the rest, whereas ‘‘pure DT’’ and ‘‘depressive-moderate DT’’ presented no differences on bulimic symptoms but in psychopathology ($p < .01$). Finally, while BN–P patients were mostly and similarly distributed in the ‘‘DT’’ and ‘‘DT-depressive’’ subtypes than in the other, AN were in the new ‘‘mild DT’’ and ‘‘depressive-moderate DT’’ ($p < .01$). However, BN–NP, BED and EDNOS were similarly represented across subtypes. Results are discussed with regard to 1) the newly emerged subtypes that may explain cases in which DT prevents or does not predict binge eating; 2) the confluence of DT-depression that signaled greater eating and comorbid pathology, particularly self-control problems; 3) ED-DSM-diagnostic criteria.

Keywords: Subtyping, Eating disorders, Diet Negative affect, Depression, Drive for thinness

Introduction

Binge-eating behavior is the most common criterion across eating disorder (ED) diagnostic categories with the exception of the comparatively small number of restrictive anorexia nervosa patients (AN–R). However, even in AN–R, there is a strong likelihood that they end up crossing to another eating disorder diagnostic category over time (e.g., Eddy et al., 2008, 2002), which puts into question the clinical utility and validity of the current scheme established in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychological Association). Existing concerns about the validity of current DSM diagnoses could be partially remedied if the DSM were used in conjunction with alternative subtyping schemes that prove clinical utility in predicting features such as risk of binge-eating and related pathology. For example, Stice’s etiologic and maintenance model of binge eating (Stice, 2001), which posits the importance of two factors, dietary restraint and affect dysregulation, has received extensive support. Cluster analytic studies have consistently and reliably yielded two ‘‘dietary’’ subtypes, a pure ‘‘dietary’’ and a mixed ‘‘dietary-depressive’’, in clinical populations of children with loss of control over eating (Goldschmidt et al., 2008), adolescent females with Bulimia Nervosa (BN) or eating disturbances (Chen & Le Grange, 2007; Grilo, 2004), and adult women with BN (Grilo, Masheb, & Berman, 2001; Stice & Fairburn, 2003) or binge-eating disorder (BED) (Grilo, Masheb, & Wilson, 2001; Stice et al., 2001). In addition, this subtyping scheme has been replicated in non-clinical undergraduate females showing that it is also useful to capture individuals at risk of binge-eating and related behaviors (PeñasLledó, Loeb, Puerto, Hildebrandt, & Llerena, 2008). The ‘‘dietarydepressive’’ type appears representative of about one third of ED patients and signals not only greater binge-eating severity, but also greater comorbid psychopathology and a poorer outcome than the other.

However, there is evidence that indirectly supports that two other differentiated groups could emerge from this ‘‘dietary’’– ‘‘depression’’ subtyping scheme to predict severity of bulimic and comorbid psychopathology. Firstly, dietary restraint may not be a necessary precursor of binge eating for a percentage of BN (Bulik, Sullivan, Carter, & Joyce, 1997; Haiman & Devlin, 1999; Pederson Mussell et al., 1997; Vanderlinden et al., 2004) and BED (Grilo & Masheb, 2000) patients. Then, it is likely to assume that these individuals might be categorized within a third subtype characterized mostly by ‘‘depressive’’ pathology in confluence with ‘‘mild to moderate dietary restraint’’ levels, which may have appeared later to avoid consequent binge eating related weight gain (Stice, 1998). This hypothesized subtype might be similar to the ‘‘dietary’’ subtype with regard to binge eating but more severe than this one in relation to comorbid

psychopathology since BED women with mild dietary restraint scores and depression presented more comorbid psychopathology but no differences in frequency of subjective binge eating than those in the dietary group (Stice et al., 2001). Secondly, successful dietary restraint (high restraint accompanied by a 10% decrease in body weight) shows a protective effect against binge-eating and related psychopathology including depression (Stice, Martinez, Presnell, & Groesz, 2006). By extension, traditional dietary restraint scales do not appear to correlate with restriction of energy intake (Stice, Fisher, & Lowe, 2004) but with weight gain (Stice, 2001). In keeping with, the Eating disorder Inventory (EDI; Garner, 1998) drive for thinness (DT) scale (Ricciardelli & McCabe, 2001), which has been also used to test Stice's model due to its high correlation with common dietary restraint measures (Williamson, Barker, Bertman, & Gleaves, 1995), appears to measure preoccupation with weight. A fear of weight gain, a diagnostic criterion for anorexia nervosa (AN) also met by many ED patients, leads to the consequent drive for and pursuit of thinness. However, previous evidence suggests that DT may not apply to those ED individuals that are not preoccupied with weight possibly because they are as thin as they desire and present a successful history at maintaining such thinness. In support of it there are studies showing ED patients without drive for thinness, mostly AN that have less pathology and a more self-directive character (Abbate-Daga, Pierò, Gramaglia, Gandione, & Fassino, 2007; Ramacciotti et al., 2002). Therefore, a fourth cluster might be expected from the present subtyping scheme consisting of low scores on both DT and depression, which it will be characterized by lower bulimic and related psychopathology as well as a stronger character (self-directedness) than the abovementioned subtypes.

The present study firstly examines if a large population of ED patients can be categorized into four different subtypes along drive for thinness and depression: the two ''dietary'' types previously found, ''pure DT'' and ''DT-depressive'', as well as two other characterized by lower scores on DT, ''mild DT'' and ''depressive-mild/ moderate DT''. Secondly, it analyses the validity of this subtyping scheme by comparing these subtypes on different measures of bulimic behaviors, eating and comorbid psychopathology. Finally, it explores if there are differences in the distribution of DSM-ED diagnoses types across these newly emerged empirical subtypes in order to further understand ED within-diagnostic heterogeneity and crossover.

Methods

Participants

All case reports from female patients consecutively admitted to the Outpatient Clinic of the Eating Disorders Unit in the Department of Psychiatry at the University Hospital of Bellvitge, between January-2002 and December-2006, that completed the relevant measures considered for the present study were included. The final sample included 1005 female patients who met DSM-IV criteria for an ED (American Psychiatric Association, 2000) as determined by an SCID-I (First, Spitzer, Gibbon, & Williams, 1997) conducted by experienced research clinicians. Of these, 114 were AN–R, 80 anorexia nervosa-binge-eating/purging (AN–BP), 450 BNPurging (BN–P), 54 BN-Non Purging (BN–NP), 251 EDNOS and 56 BED. The mean age of the participants was 26.1 years (SD¼ 7.3). The mean age of onset of the eating disorder was 19.3 yr (SD ¼ 6.4) and the mean duration was 6.9 yr (SD ¼ 5.8). The Ethics Committee of our Institution approved this study and informed consent was obtained from all participants.

Measures

Weekly binge-eating and purging frequencies. Throughout the duration of the study, patients kept a food diary (Fernandez-Aranda & Turon, 1998), which also recorded episodes of binge eating and purging. Patients were trained by the therapists on the fulfillment of these diaries on a previous session before starting treatment. Weekly binge and purge frequency was determined by examination of the food diaries by the assessing clinicians by face to face interviews.

Eating Disorders Inventory-2 (EDI-2; Garner, 1991). This is a 91-item multidimensional self-report questionnaire that assess characteristics related to AN, and BN disorders subdivided into 11 different subscales: drive for thinness (DT), bulimia, body dissatisfaction, ineffectiveness, perfectionism, interoceptive awareness, interpersonal distrust, maturity fears, social insecurity, impulsivity and ascetism. The Spanish version of the EDI-2 has shown good psychometric properties (Garner, 1998). The scores on the DT subscale that specifically looks at preoccupation with weight were submitted to cluster analysis.

This scale has been useful for differentiating clinical and non-clinical groups. A cut-off score of 14 in this subscale has been used to detect individuals at risk of an eating disorder (Garner, Olmsted, Polivy, & Garfinkel, 1984).

Symptom Check-List revised (SCL-90-R; Derogatis, 1983). This questionnaire is widely used for the measurement of self-reported overall psychological distress and psychopathology. It is comprised of 90 items, each rated on a five-point scale of distress. The Global Severity Index (GSI), which is a widely used as an overall measure of distress, was used for the present study. The Spanish version of the SCL-90-R has shown good psychometric properties (González de Rivera, 2001). Additionally, the scores on the SCL subscale of Depression were submitted to cluster analysis. This scale highly correlates (r ¼ .89) with another common measure of depression, the Beck Depression Inventory (Steer, Ball, Ranieri, & Beck, 1997). The depression subscale has been shown useful to differentiate non-clinical, mild to moderate depression (scores from 1 to 2) from severe depression (scores greater than 2) (Aben, Verhey, Lousberg, Lodder, & Honig, 2002; Walker et al., 2000).

Eating Attitudes Test (EAT-40; Garner & Garfinkel, 1979). This questionnaire contains 40 items, including symptoms and behaviors common to individuals with AN, and provides a global index of the severity of the disorder. The higher the scores, the more disturbed the eating behavior. The Spanish version of this questionnaire has shown good psychometric properties (Castro, Toro, Salamero, & Guimerá, 1991).

Bulimic Investigatory Test Edinburgh (BITE; (Henderson & Freeman, 1987)). This questionnaire contains 33 items that measure presence and severity of bulimic symptoms. There are two subscales: the symptomatology scale (30 items), that determines the seriousness of the symptoms, and the severity scale (3 items) that offers a severity index (i.e., the higher the scores, the greater the severity). The Spanish translation of this questionnaire has shown good psychometric properties (Rivas, Bersabé, & Jiménez, 2004).

Social Avoidance Distress Scale (SADS; Watson & Friend, 1969). This 28-item scale was designed to measure the degree of distress, discomfort, anxiety, and avoidance of social situations. Higher scores indicate greater social avoidance and distress. The Spanish version of the present scale has shown good psychometric properties (Bobes et al., 1999).

Temperament and Character Inventory–revised version-(TCI-R; Cloninger, 1999). The TCI-R is a 240-item, five-point Likert scale, questionnaire that measures, as in the original TCI version (Cloninger, 1987), seven dimensions of personality: four temperament (Harm Avoidance, Novelty Seeking, Reward Dependence and Persistence) and three character dimensions (Self-Directedness, Cooperativeness and Self-Transcendence). The Spanish version of the original questionnaire and the revised version (Gutiérrez-Zotes et al., 2004) have both shown good psychometric properties.

Evaluation of lifetime substance use and suicidal behavior was assessed by using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (First et al., 1997). Suicidal behavior and ideation were assessed by structured clinical face to face interview. The time frame for these questions was lifetime. A suicide attempt was defined as a selfdestructive act with some degree of intent to end one's life.

Statistical analysis

Analyses were carried out with SPSS 15.0.1 for Windows. With the aim to verify if the two previously described ''dietary'' subtypes coexist with two other characterized by ''mild DT'', a cluster analyses was carried out based on scores in the EDI-II Drive for Thinness (DT) subscale and the SCL-90-R Depression scale. The Two StepCluster procedure was used, which creates empirical groups based on a nearness criterion into a hierarchical agglomerative clustering (Fraley & Raftery, 1998; Theodoridis & Koutroumbas, 1999). In this study, the distance measure was likelihood function and it was selected the normal density for continuous variables due the metrical scale of income variables. The best cluster solution was selected between the results obtained automatically by the system and other solutions based either on a fewer or a larger number of groups. The comparison of different groupings was based on clinical criteria with the aim to obtain the best final classification with a clear theoretical interpretation and to prevent for the superposition of patterns.

Next, analysis of variance (ANOVA) and chi-square tests were carried out to compare the empirical derived

subtypes on clinical phenotypes (income variables of cluster analysis, frequency of bulimic behaviors, eating related pathology, comorbid psychopathology and personality characteristics) and on outcome measuring the response to treatment. Effect size and association measures were based on eta-squared in ANOVA procedures (for quantitative criteria) and odds ratios coefficients and Nagelkerke's R2 in logistic regressions (for binary criteria). Type-I error inflation was controlled through Finner's adjustment (Domènech, 2008), a sequential procedure to adjust the p-values to control the FamilyWise Error Rate (FWER) while retaining better power than Bonferroni's method (Brown & Russell, 1997).

Results

Cluster analyses: subtypes along drive for thinness and depression

Table 1 shows the results obtained for the four-factor solution in cluster analyses. The empirical groups correspond to the two previously described ''dietary restrained'' subtypes, ''pure DT'' (n¼ 220, 22% of the sample) and ''DT-depressive'' (n¼ 290, 29%), as well as two other new grouping (1 and 3), the ''mild DT'' (n ¼ 253, 25%) and the ''depressive-moderate DT'' (n ¼ 242, 24%) subtypes. The former two subtypes endorsed similar and higher DT over the cut-off score of 14, which is considered of clinical significance (Garner et al., 1984), than the latter groups, whose scores were within the range of normality with ''mild'' or ''moderate'' risk. Additionally, the ''DT-depressive'' subtype reported more depressed mood than the ''depressive-moderate DT'' type. These two types had more depression (severe depression over the cut-off score of 2) than the other two groups (that had a mean score within the range of mild to moderate depression). However, the groups with a mild to moderate depressive level could be also considered of clinical relevance and to cause some distress and functional impairment.

Subtype comparisons on sociodemographic, eating and general pathology

Table 1 shows all variables that presented significant effects from this subtyping scheme. It also shows significant differences between subtypes, which are hereby summarized.

The ''DT-depressive'' subtype vs. the other subtypes

The ''DT-depressive'' subtype showed greater severity of binge-eating behavior than the rest of subtypes. Similarly, it showed greater scores of eating pathology on all dimensional measures and of general psychopathology in most measures including alcohol abuse but social anxiety and dysfunction. Additionally, it is highlighted that the confluence of DT and depression was in particular related to self-control problems such as greater EDI-ineffectiveness and impulsivity, and lower interoceptive awareness and TCI-R selfdirectedness than the rest.

The new ''mild DT'' subtype vs. the other subtypes

The ''mild DT'' subtype showed in general lower scores than the rest in most measures. In particular with regard to eating variables, it showed lower current and past minimum BMI as well as a greater percent of women with history of anorexia nervosa than the other types. Additionally, the ''mild DT'' had a lower percent of women who engaged in binge-eating and purging behaviors. However, in those who did these behaviors, there were no differences between the ''mild DT'' and ''pure DT'' group in binge eating, vomiting or laxative use frequency. Finally, it showed lower general psychopathology and percent of women with suicide ideation, and higher self-directedness than the rest.

The new ''depressive-moderate DT'' vs the ''pure DT'' subtype

These subtypes did not differ in age of onset, current BMI, maximum or minimum BMI and years of evolution. However, the ''depressive-moderate DT'' subtype presented a greater percent of women with both history of AN and current obesity than the ''pure DT'' type, which suggests greater weight gain. In addition, these subtypes did not differ in the percent of women who engaged in binge eating and purging as well as in the frequency of use of bulimic behaviors or attitudes such as those measured by the scales of the ''BITE'' and ''EDI-Bulimia''.

Nevertheless, while the ''depressive-moderate DT'' showed lower scores than the ''pure DT'' subtype on the EAT-40 and EDIBody Dissatisfaction measures, it presented greater levels of psychopathology on the EDI (interceptive awareness, ineffectiveness, impulsivity, maturity fears and social insecurity), SCL-90-R,

SADS, social dysfunction, suicide ideation and attempts, and on the personality traits of harm avoidance and lower self-directedness.

Finally, the dimension of depression appeared particularly linked to comorbid psychopathology, in particular to maturity fears, social insecurity, TCI-R harm avoidance and suicide attempts.

Distribution of DSM-eating disorder diagnostic types across subtypes

Significant differences appeared with regard to representation of diagnostic types across the different empirical clusters as shown in Table 2. Most AN–R women were in the ‘‘mild DT’’ subtype than in the rest ($p < .001$). Also, AN–R were more in the ‘‘depressivemoderate DT’’ than in the ‘‘pure DT’’ ($p ¼ .01$) and ‘‘DT-depressive’’ ($p < .05$). AN–BP were mostly located in the ‘‘mild DT’’ and ‘‘depressive-moderate DT’’ than in the rest ($p < .01$) but there were no differences between them ($p ¼ .57$). BN–P were mostly located in ‘‘pure DT’’ and ‘‘DT-depressive’’ than in the rest ($p< .001$) with no differences between them either. The rest were similarly distributed across cases.

Discussion

The current study provides further support for the reliability and validity of the two dietary clusters yielded by the dietarydepressive subtyping model of eating pathology. Moreover, in the present study, an extension of this model to four subtypes is proposed in order to account for those cases in which dieting may prevent binge-eating and related pathology (Stice et al., 2006) or may not be a necessary precursor to bulimic pathology (Bulik et al., 1997; Grilo & Masheb, 2000; Haiman & Devlin, 1999; Pederson Mussell et al., 1997).

Cluster analyses: subtypes along drive for thinness and depression

For that aim, the scores on two measures of diet and depression (drive for thinness, DT, and SCL-depression) in a large group of adult females meeting criteria for any eating disorder diagnosis were submitted to cluster analyses. As expected, the two previously described subtypes with high scores on DT, the ‘‘pure DT’’ and ‘‘DTDepression’’, were found as well as two new subtypes characterized by low DT and depression (‘‘mild DT’’), and by mild to moderate DT in confluence with depression (‘‘depressive-moderate DT’’). In addition, the proportion of individuals in the ‘‘DT-Depression’’ cluster was similar (29%) to that found in the dietary-depression subtyping literature (Chen & Le Grange, 2007; Goldschmidt et al., 2008; Grilo, Masheb, & Wilson, 2001; Peñas-Lledó, Loeb, Puerto, Hildebrandt, & Llerena, 2008; Stice & Fairburn, 2003; Stice et al., 2001).

Subtype comparisons on sociodemographic, eating and general pathology

a) The ‘‘DT-depressive’’ cluster exhibited overall greater eating and comorbid psychopathology not only than the ‘‘pure DT’’ subtype, as suggested in previous studies (Chen & Le Grange, 2007; Goldschmidt et al., 2008; Grilo et al., 2001; Peñas-Lledó et al., 2008; Stice & Fairburn, 2003; Stice et al., 2001), but also than the other two new types. In particular, this subtype showed greater scores on measures of self-control related problems, such as ineffectiveness, impulsivity, and lower interceptive awareness as well as lower scores on the character trait of self-directedness. Considering that this type of individuals, have previously been associated with poorer response to treatment, than the ‘‘pure DT’’, these results are also in keeping with previous findings in BED (Stice et al., 2001), BN (Agras et al., 2000, Fassino, Abbate-Daga, Pierò, Leombruni, & Rovera, 2003) and AN (Bulik, Sullivan, Fear, & Pickering, 2000, Fassino, Daga, Pierò, & Rovera, 2002; Sholberg, Norring, Holmgren, & Roosmark, 1989), where dropout or poor response to treatment was related to lower self-directedness or self-awareness and greater impulsivity and ineffectiveness, (Fernandez-Aranda et al., 2008; Fernández-Aranda et al., 2006; Krug, Treasure, et al., 2008).

b) Additionally, the ‘‘mild DT’’ subtype presented overall lower eating and comorbid psychopathology than the rest, as well as greater self-directedness. In particular, this cluster showed lower current and minimum BMI values than the other subtypes. This finding appears compatible with our prediction about a lower DT or a desire to be thinner in those ED individuals who presented a successful lifetime history at achieving and maintaining lower body weight levels than the other groups. These individuals may resemble those successful dieters from prior research who presented decreases in binge-eating and related

psychopathology after a 10% decrease in body weight (Stice et al., 2006) and may be opposed to those who increased bulimic pathology after having gained weight (Stice, 2001). Furthermore, the ‘‘mild DT’’ subtype included a greater percentage of women with a history of AN. This result appears also in keeping with previous research since the frequency of patients without DT seems greater in a population of AN (Abbate-Daga, Pierò, Gramaglia, Gandione, & Fassino, 2007) than in an unselected population of ED patients (Ramacciotti et al., 2002). These studies discussed whether the absence of negative feelings about having an eating disorder and a poor physical condition, characterized by a low body weight, could be the result of an ego-syntonic functioning in these patients.

c) As also hypothesized, the ‘‘pure DT’’ and ‘‘depressivemoderate DT’’ subtypes did not differ in the percent of women who engaged in binge eating and purging, as well as in the frequency of use of these bulimic behaviors or on self-report measures of bulimic attitudes. However, the latter showed greater psychopathology (Fernandez-Aranda et al., 2007). These results suggest that the ‘‘pure DT’’ and ‘‘depressive-moderate DT’’ subtypes appear to have a similar likelihood to engage in bulimic behaviors. This finding is in keeping with results showing that dietary restraint may not predict binge eating in patients who binge eat (Bulik et al., 1997; Grilo & Masheb, 2000; Haiman & Devlin, 1999; Pederson Mussell et al., 1997; Vanderlinden et al., 2004). It is difficult to speculate the different mechanisms of action that may explain equivalent bulimic behaviors in those with high DT and those with mild to moderate DT levels in confluence with depression (Fernandez-Aranda et al., 2007). However, both risk factors dieting and depression may predict bulimic behaviors and mediate the relationship between bulimia and body dissatisfaction (Stice, 1998). However, since body dissatisfaction was greater in ‘‘pure DT’’ than in the ‘‘depressive-moderate DT’’ type, other weight related factors might be involved in increasing bulimic behaviors in the latter subtype. In this regard, while no differences emerged between these subtypes in current BMI, maximum or minimum BMI, the ‘‘depressive-moderate DT’’ subtype presented a greater percent of women with history of anorexia nervosa but also with current obesity than the pure ‘‘DT’’ type. This result indirectly suggests that there may be a greater proportion of women with history of weight gain problems, which it has been shown to predict increases in bulimic pathology (Stice, 2001). The longitudinal relationship between AN and depression could possibly explain these findings (Fernandez-Aranda et al., 2007). Additionally, it is also possible that the relationship between bulimic psychopathology and the confluence of high depression and moderate DT, may be mediated by a number of factors related to problems of self-control or regulation. In keeping with, this subtype has shown greater scores on factors that measure these problems such as interoceptive awareness, ineffectiveness or impulsivity and lower on selfdirectedness, which have all been related to bulimic pathology as discussed above for the ‘‘DT-depressive’’ subtype. Additionally, it is also possible to speculate that this group presented just depression and self-regulatory problems in their origins leading to bulimic behaviors (and possibly to weight gain), and that those bulimic behaviors (plus weight changes) led to future dieting behavior (Stice, 1998). As previously stated, depression and self-control related psychopathology have been related to worse outcome in eating disordered patients.

Distribution of DSM-eating disorder diagnostic types across subtypes

The distribution of DSM-ED subtypes was similar between the two previously described dietary subtypes ‘‘DT’’ and ‘‘DT-depressive’’ but different than in the new ‘‘mild to moderate DT’’ subtypes. The first two subtypes clearly presented a greater proportion of BN–P cases, whereas the latter were mostly characterized by an overrepresentation of AN cases. On the other hand, BN–NP, BED and EDNOS were similarly represented across all these subtypes.

These results may have some implications for discussing current DSM criteria. Firstly, fear of weight gain, which is one of the criteria for the diagnosis of AN, may not apply to almost half of AN patients (47.9%) that scored within the ‘‘mild DT’’ subtype. This result is also consistent with the finding, previously discussed, about a greater percent of women with history of anorexia nervosa in this subtype, as well as women with past and current lowest body weight, and with prior research reporting denial of fat phobic thoughts in AN (Lee, Chan, & Hsu, 2003), or suggesting that other physiological factors could better explain low weight rather than obesity fear (Hebebrand, Casper, Treasure, & Schweiger, 2004). In addition, the fact that AN–R and AN–BP were similarly distributed across subtypes, is also consistent with prospective research suggesting that this distinction may not be necessary (Eddy et al., 2008, 2002) and

that AN–BP may be an advanced phase of the AN syndrome.

BN–P cases were mostly located in the DT and ‘‘DT-depressive’’ subtype than in the other groups. However, for BN–NP and BED women, this pattern was different. This suggests that the distinction between BN subtypes may be appropriate, whereas the distinction between BN–NP and BED might be not, as also suggested in a recent study (Núñez-Navarro et al., submitted for publication).

EDNOS was the second most frequent diagnosis after BN–P in this clinical population, and as BN–NP and BED, it was equally represented across empirical subtypes. This finding may suggest that EDNOS categorical classification in the DSM is limiting, making difficult to elucidate its etiology. It also seems that EDNOS (Fairburn et al., 2007; Krug, Casasnovas, et al., 2008) as well as BN–NP and BED, may include an array of heterogeneous eating disorders ranging from less to more clinically significant.

Future studies in different populations should externally validate the generalizability of the present best cluster solution obtained in this exploratory study. Further longitudinal research is also needed to determine the prognostic validity of this empirical subtyping scheme (Stice & Fairburn, 2003) based on dimensions of DT and depression since the use of a cross-sectional design does not allow any statement regarding causality. Besides, further research about this subtyping scheme should assess whether DT, which has been less often used, is equivalent to other most widely used dietary restraint measures (Stice et al., 2004). If further research proved the test–retest reliability and predictive validity of this subtyping scheme, it could be used as a complementary tool to DSM-IV criteria to detect ED patients at risk of bulimic pathology. This subtyping scheme might also help us in understanding severity of bulimic pathology, comorbidity, treatment needs and diagnostic crossover. For example, a patient with current AN–R and high scores on DT and depression could be anticipated to present a greater risk to develop binge-eating related disorders and weight gain than those AN–R with low DT and depression. The former could benefit from more intensive forms of treatment focused on well-being and healthy eating instead of weight recovery than the latter, and may need serotonin reuptake inhibitors or have their fluid and electrolyte balance assessed in case they start using laxatives or vomits during refeeding to prevent potential complications.

To summarize, our findings suggest that a) while the measures of drive for thinness and depression were different than those used in previous studies, the similarity of results with the ‘‘pure DT’’ and ‘‘DT-depressive’’ may be taken to suggest that the reliability of this subtyping scheme might not be limited to specific assessment instruments b) that this scheme might be extended to two additional subtypes; c) any eating disordered individual may be subtyped based upon ‘‘DT’’ and depression dimensions regardless of meeting binge-eating behavior criterion to potentially detect individuals at greater risk of binge-eating or comorbid psychopathology.

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Table 1

	Mean (SD) for quantitative criteria and percentage for binary								Comparison between clusters
	Mild (1) (N = 253)		Pure DT (2) (N = 220)		Dep-ModDT (3) (N = 242)		DT-Dep (4) (N = 290)		[a]p-value/[b]Effect size	Contrasts
EDI-II - Drive for Thinness (DT)	4.79	(3.62)	17.7	(2.33)	11.8	(3.03)	18.3	(1.93)	<.005/.796	1 < 3<(2 = 4)
SCL-90-R Depression (Dep)	1.53	(.78)	1.57	(.52)	2.71	(.47)	3.10	(.39)	<.005/.612	(1 = 2)<3 < 4
Demographic & Clinical Variables										
Age	26.5	(7.71)	24.9	(7.74)	27.0	(7.25)	25.9	(6.59)	.013/.011	2 < 3
Age onset	20.2	(6.62)	18.7	(6.59)	20.0	(7.02)	18.4	(5.29)	.005/.015	1 > 4
Evolution (Years)	6.43	(5.59)	6.10	(5.49)	7.02	(5.84)	7.65	(6.03)	.021/.11	2 < 4
Current BMI	20.7	(6.67)	22.7	(4.91)	22.9	(7.52)	23.5	(5.82)	.001/.028	1<(2 = 3 = 4)
% of current obesity (BMI>30)	10.2%		7.3%		18.1%		13.5%		.005/.027	1 < 3; 2 < 3; 2 < 4
Maximum BMI	24.7	(6.40)	25.9	(5.86)	27.1	(6.96)	27.7	(6.30)	<.005/.032	1 < 3; 1 < 4; 2 < 4
Minimum BMI	17.7	(3.48)	19.1	(3.20)	18.7	(4.19)	19.1	(3.08)	<.005/.027	1<(2 = 3 = 4)
% of patients with previous AN	55.8%		25.6%		45.7%		30.4%		<.005/.079	1 > 3>(2 = 4)
Eating Related Psychopathology										
% of patients with binge eating	46.8%		73.2%		70.1%		79.8%		<.005/.096	1 < 2; 1 < 3<4
Frequency Binge Eating	3.04	(5.30)	4.64	(6.55)	4.86	(6.34)	6.54	(7.80)	<.005/.036	1 < 3<4; 2 < 4
% of patients with vomits	43.9%		65.6%		56.7%		69.8%		<.005/.055	1 < 2; 1 < 3<4
Frequency Vomit	3.41	(6.44)	5.43	(7.58)	5.09	(8.24)	6.75	(8.38)	<.005/.025	1 < 4
% of laxatives users	11.8%		27.9%		32.9%		40.9%		<.0001/.088	1 < 2<4; 1 < 3
Frequency Laxatives	1.42	(6.57)	3.16	(9.74)	3.53	(8.42)	5.48	(10.83)	<.005/.026	1 < 4
% of diuretics users	1.7%		15.3%		8.2%		18.1%		<.0001/.101	1 < 3<(2 = 4)
Frequency Diuretics	.21	(1.97)	1.94	(6.44)	.91	(4.33)	2.42	(7.84)	<.005/.024	1 < 2; 1 < 4; 3 < 4
BITE – Severity	5.92	(5.19)	12.1	(6.92)	11.1	(6.49)	14.8	(7.41)	<.005/.202	1<(2 = 3)<4
BITE – Symptoms	14.3	(8.11)	21.8	(5.93)	20.9	(5.99)	23.4	(5.65)	<.005/.225	1 < 2; 1 < 3<4
EAT-40	28.0	(14.7)	54.5	(16.5)	50.0	(16.9)	63.5	(18.1)	<.005/.390	1 < 3<2 < 4
EDI-II-Body Dissatisfaction	9.41	(6.31)	18.8	(6.67)	15.7	(6.99)	22.1	(5.48)	<.005/.365	1 < 3<2 < 4
EDI-II-Interoceptive Awareness	5.83	(4.29)	10.9	(5.78)	12.8	(5.25)	16.2	(5.97)	<.005/.341	1 < 2<3 < 4
EDI-II-Bulimia	3.40	(4.26)	7.50	(5.35)	7.44	(5.25)	10.1	(5.79)	<.005/.185	1<(2 = 3)<4
EDI-II-Interpersonal Distrust	4.45	(3.76)	5.50	(4.56)	6.52	(4.35)	7.68	(4.92)	<.005/.072	1 < 3<4; 2 < 4
EDI-II-Ineffectiveness	6.06	(4.59)	9.01	(5.58)	12.2	(5.99)	17.0	(6.00)	<.005/.363	1 < 2<3 < 4
EDI-II-Maturity Fears	5.95	(4.13)	6.77	(5.12)	9.01	(5.35)	10.7	(6.40)	<.005/.113	(1 = 2)<3 < 4
EDI-II-Perfeccionismo	3.57	(3.70)	5.00	(3.99)	5.84	(4.05)	7.59	(4.75)	<.005/.116	1<(2 = 3)<4
EDI-II-Impulsivity	3.13	(3.59)	5.72	(4.97)	8.04	(5.34)	11.5	(6.25)	<.005/.273	1 < 2<3 < 4
EDI-II-Ascetism	3.65	(2.77)	6.85	(3.44)	7.32	(3.73)	10,16	(3.93)	<.005/.317	1<(2 = 3)<4
EDI-II-Social Insecurity	5.63	(4.16)	6.67	(4.50)	9.04	(4.81)	11,19	(4.34)	<.005/.200	(1 = 2)<3 < 4
General Psychopathology										
SCL-90-R: GSI	1.16	(.64)	1.32	(.48)	2.08	(.55)	2.51	(.48)	<.005/.522	1 < 2<3 < 4
SADS-Social Anxiety	10.7	(7.56)	12.7	(7.94)	16.5	(7.05)	18.4	(7.05)	<.005/.147	(1 = 2)<(3 = 4)
% of alcohol consumption		8.5%		7.6%		10.0%		21.2%	<.005/.052	(1 = 2 = 3)<4
% of suicide ideation		27.4%		37.9%		52.1%		70.8%	<.005/.146	1 < 2<3 < 4
% of suicide attempts		12.8%		15.6%		25.4%		33.7%	<.005/.063	(1 = 2)<3 < 4
Degree Social Dysfunction (0-8)	3.99	(2.61)	4.28	(2.52)	5.27	(2.26)	5.81	(2.08)	<.005/.091	(1 = 2)<(3 = 4)
Personality										
TCI-R: Harm-avoidance	106.7	(17.4)	110.1	(18.3)	121.4	(17.1)	128.6	(17.0)	<.005/.206	(1 = 2)<3 < 4
TCI-R: Self-directedness	129.5	(20.3)	121.0	(19.7)	112.5	(15.8)	100.7	(16.9)	<.005/.270	1 > 2>3 > 4
TCI-R: Cooperativeness	137.7	(14.9)	136.3	(17.5)	133.3	(17.7)	130.8	(20.6)	<.005/.023	1 > 4; 2 > 4

Table 2

Eating disorder subtype (N = 1005)	Mild DT (1)	Pure DT (2)	Dep-ModDT (3)	DT-Dep (4)	p-value	[a]Contrasts
Anorexia restrictive (AN–R)	6124.1%	94.1%	2811.6%	165.5%	<.0005	1 > 3>(2 = 4)
Anorexia bulimic-purgative (AN–BP)	3212.6%	73.2%	2610.7%	155.2%		(1 = 3)>(2 = 4)
Bulimia purgative (BN–P)	6324.9%	11351.4%	10844.6%	16657.2%		1 < 2,3,4; 3 < 4 2 = 3; 2 = 4
Bulimia non-purgative (BN–NP)	135.1%	167.3%	114.5%	144.8%		Non-differences
EDNOS	6726.5%	6529.5%	5321.9%	6823.4%		Non-differences
Binge eating disorder (BED)	176.7%	104.5%	16 6.6%	113.8%		Non-differences