



## Predicting group cognitive-behavioral therapy outcome of binge eating disorder using empirical classification



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### ABSTRACT

The purpose of this study was to use empirical classification based on Latent Profile Analysis to identify subgroups of binge eating disorder (BED) and to evaluate the extent to which these subgroups were predictive of treatment outcome in group cognitive-behavioral therapy (CBT). The Eating Disorder Examination (EDE), Structured Clinical Interview for DSM-IV, and Inventory of Depressive Symptomatology-Self-Report were administered to 259 participants at baseline in a 15-session CBT trial (190 of whom received active treatment). The best fitting model included three profiles: dietary restraint only (DRO;  $n = 96$ ; 51%); low dietary restraint (LDR;  $n = 52$ ; 27%); and dietary restraint plus psychopathology (DRP;  $n = 42$ ; 22%). Regression analyses revealed that after controlling for baseline score and treatment condition, EDE Global scores were lower for the DRO compared to the LDR profile at one year follow-up ( $p = .047$ ). Class assignment was not predictive of EDE binge eating frequency or abstinence at end of treatment or follow-up. These results suggest that meaningful empirical classes based on eating disorder symptoms, psychopathology, dietary restraint, and BMI can be identified in BED and that these classes may be useful in predicting long-term group CBT outcome.

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Binge eating disorder (BED), an eating disorder characterized by the periodic consumption of large amounts of food accompanied by the subjective experience of loss of control, is associated with significant psychiatric and medical comorbidity (Hudson, Hiripi, Pope, & Kessler, 2007; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009) as well as elevated mortality risk (Crow et al., 2009). Although psychological, pharmacological, and self-help interventions have shown some promise for the treatment of BED (Brownley, Berkman, Sedway, Lohr, & Bulik, 2007; NICE, 2004; Reas & Grilo, 2008; Wilson, Grilo, & Vitousek, 2007), treatment outcome data for BED have also been characterized by significant rates of attrition, relapse, and treatment non-response (Bulik, Brownley, & Shapiro, 2007; Wonderlich, de Zwaan, Mitchell, Peterson, & Crow, 2003). Because of these limitations, strategies to improve available treatments as well to develop more effective interventions are needed to facilitate enduring recovery for patients with BED.

One strategy that can be used to potentially enhance treatment outcome is to identify clinically meaningful subtypes or subgroups within a broader category of psychopathology. Subgroupings can be utilized to improve treatment effectiveness in several ways. First, understanding patterns of heterogeneity within a diagnostic category can help determine whether a specific type of treatment is differentially effective for a specific subtype of patient. If a certain subgroup has relatively better or poorer outcome in response to a specific treatment, matching strategies can be utilized in which baseline predictors are used to select (or avoid) a specific treatment (Kraemer, Wilson, Fairburn, & Agras, 2002). In addition, subgroupings can be used to guide treatment development and specific modules within interventions can be designed to target specific patterns of symptoms. Finally, subgrouping and subtyping strategies can be utilized to identify etiological and maintenance mechanisms, which can lead to the development of more effective treatments (Rieger et al., 2010; Strauman & Merrill, 2004).

As reviewed recently by Grilo, Masheb, and Crosby (2012) and Sysko et al. (2010), several subgrouping strategies and their prognostic capacity have been examined in BED. For example, several studies using cluster analysis have differentiated individuals with BED who report high levels of dietary restraint combined with high

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levels of negative affect from those with high levels of dietary restraint and relatively lower levels of negative affect on a number of clinical and psychopathological variables (Grilo, Masheb & Wilson, 2001; Masheb & Grilo, 2008; Stice et al., 2001). The “pure” dietary restraint group with relatively lower levels of negative affect has also been found to have better treatment outcome on some measures than the negative affect/dietary restraint group in cognitive–behavioral therapy (CBT) delivered using guided self-help materials (Masheb & Grilo, 2008), behavioral weight loss (Masheb & Grilo, 2008), and dialectical behavior therapy (Stice et al., 2001). More recently, the negative affective/dietary restraint subtype was found to be a moderator of CBT outcome on several measures of eating disorder psychopathology and depression (Grilo et al., 2012). A second BED subtyping strategy, classification based on presence or absence of overvaluation of shape and weight, has yielded significant differences between these two groups on a several psychopathological and clinical measures (Grilo, Hrabosky, Allison, Stunkard, & Masheb, 2008; Grilo, Masheb & White, 2010; Grilo et al., 2009, 2012; Hrabosky, Masheb, White, & Grilo, 2007; Masheb & Grilo, 2000, 2008). For example, those endorsing overvaluation have poorer outcome on measures of eating disorder psychopathology in guided self-help CBT and behavioral weight loss (Masheb & Grilo, 2008). In addition, a more recent examination of moderators and predictors of treatment outcome for CBT and fluoxetine treatment found that overvaluation of shape and weight was a robust moderator and predictor of poorer outcome, particularly for participants who received medication only (Grilo et al., 2012).

An increasing number of studies have used empirical classification to examine subgroups within eating disorders by utilizing latent class analysis (LCA), latent profile analysis (LPA), and latent transition analysis (LTA; see reviews by Crow et al., 2011; Wonderlich, Joiner, Keel, Williamson & Crosby, 2007). More recently, empirical classification has also been used to determine subgroupings that are then used to predict eating disorder treatment outcome (e.g. Wildes et al., 2011) and mortality (Crow et al., 2012). Sysko and colleagues (2010) used empirical classification procedures with 205 BED participants who received interpersonal therapy (IPT), behavioral weight loss, or guided self-help CBT in a multisite randomized trial (Wilson, Wilfley, Agras, & Bryson, 2010) and found a four class solution: the first class was characterized by lower BMI, higher levels of physical activity, and the highest rate of past eating disorders in addition to BED; the second class had the highest self-reported levels of binge eating, eating disorder psychopathology, and negative affect; the third class resembled the second class but had relatively lower levels of exercise and compensatory behaviors; the fourth class was characterized by the relatively highest level of BMI, overeating (but fewer binge eating episodes), an absence of compensatory behaviors, and the lowest rate of past co-occurring eating disorders. LTA indicated a higher probability of binge eating remission for IPT in the second class and guided self-help CBT in the third class. These findings support the use of empirical classification procedures in identifying meaningful subtypes within BED as well as the potential utility of these subgroupings in determining differential treatment response.

In summary, empirical subtyping or classifying within eating disorder diagnoses can help differentiate meaningful subtypes within symptom heterogeneity as well as determine the extent to which these empirically derived groups are predictive of treatment outcome. However, limited research has been conducted in which empirical classification strategies have been used to predict treatment outcome in BED. The prognostic capacity of subgroupings determined by empirical classification for group CBT has not been examined, a notable omission given that CBT is considered one of the most efficacious treatments of BED (NICE, 2004; Wilson et al.,

2007) and that most CBT for BED has been conducted using group treatment (Brownley et al., 2007). The primary purpose of this study was to conduct empirical classification of baseline psychopathology and obesity severity using LPA in a treatment outcome sample of individuals with BED to examine the extent to which these subgroupings predict meaningful clinical outcomes in group CBT.

## Method

### Participants

Participants included 259 adults (average age = 46.9, SD = 10.3, range = 18–66; average BMI = 38.8, SD = 7.8, range = 24.5–72.6; 96.1% Caucasian; 87.6% female; 54.9% college degree or higher) recruited from community and clinical settings from two USA sites: Fargo, North Dakota and Minneapolis, Minnesota (see Table 2). Participants met DSM-IV (American Psychiatric Association, 2000) criteria for BED as diagnosed by the Eating Disorder Examination (EDE; Fairburn & Cooper, 1993; see below) and were excluded if they were pregnant or nursing, had a past or present diagnosis of psychosis or bipolar disorder, had a current diagnosis of substance abuse or dependence, were receiving current psychotherapy, were enrolled in a commercial weight loss program, were medically unstable, or were at acute risk of self-injury. Participants on antidepressant medications were allowed to enroll if they had been on a stable dose for the past six weeks (79.5%; see Table 2).

### Assessment and measures

The Eating Disorder Examination (EDE; Fairburn & Cooper, 1993) is an investigator-based interview to assess eating disorder symptoms. It includes four subscales (restraint, eating concern, shape concern, weight concern) and a global severity score. The EDE also includes frequency measures of several types of binge eating including objective bulimic (binge eating) episodes (OBEs), in which an investigator-rated large amount of food is consumed and accompanied by a sense of loss of control (corresponding with the binge eating criteria described in the DSM-IV), subjective bulimic (binge eating) episodes (SBEs) in which the participant believes that they have overeaten and reports a sense of loss of control but the amount of food is not considered objectively large by the assessment interviewer, and objective overeating episodes (OOEs), in which the amount consumed is considered objectively large but was not accompanied by a subjective experience of loss of control. The EDE has extensive psychometric data supporting its reliability and validity, including its use with BED samples (Berg, Peterson, Frazier, & Crow, 2012; Fairburn, 2008; Grilo, Masheb, Lozano-Blanco, & Barry, 2004). Masters and doctoral level clinical interviewers were trained initially using didactics and role playing; teleconferencing and frequent communication on an e-mail listserv

**Table 1**  
Latent profile analysis model fit indices (N = 259).

Classes	Log likelihood	Para-meters	BIC	aBIC	cAIC	Entropy
1	−4360.66	26	8865.79	8783.37	8891.79	1
2	−4282.90	41	8793.63	8663.64	8834.63	0.5848
3	−4224.53	56	8760.23	8582.69	8816.23	0.7017
4	−4190.34	71	8775.21	8550.11	8846.21	0.7373
5	−4172.93	86	8823.74	8551.09	8909.74	0.7290
6	−4155.72	101	8872.68	8552.48	8973.68	0.7243
7	−4127.54	116	8899.67	8531.91	9015.67	0.7746
8	−4116.23	131	8960.40	8545.09	9091.40	0.7973

BIC = Bayesian information criterion; aBIC = the sample adjusted BIC; cAIC = consistent Akaike information criterion; AIC = Akaike information criterion.

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