

On the Relation of Dieting and Bingeing in Bulimia Nervosa

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The continuum model of bulimia nervosa suggests that dieting plays a major role in the etiology and maintenance of bulimia. However, a previous study (M. R. Lowe et al., 1996) recently found no relationship between dieting intensity and binge eating problems in nonclinical participants differing widely in eating and weight concerns. The present study extended these findings by examining the relationship between dieting and bingeing among individuals with bulimia. Three samples of individuals diagnosed with bulimia were divided into frequent and infrequent weight-loss dieters and were compared on multiple measures of binge eating. No diet-binge relationship was found in 1 sample, whereas in the other 2 samples frequent dieters binged *less* than infrequent dieters. These results raise new questions about the continuum model of bulimia and suggest that weight-loss dieting may not play as prominent a role in the maintenance of bulimia as it does in its initiation.

In most cases of bulimia nervosa, weight-loss dieting precedes the development of binge eating (Polivy & Herman, 1985). Studies of nonclinical populations have also indicated that voluntary or involuntary weight loss increases the probability of binge eating (Keys, Brozek, Henschel, Mickelsen, & Taylor, 1950; Polivy, Zeitlin, Herman, & Beal, 1994; Telch & Agras, 1993). These findings have produced a consensus that weight-loss dieting plays a major role in the etiology of bulimia nervosa (Hsu, 1990; Polivy & Herman, 1985; Striegel-Moore, 1993). Once binge eating begins, most individuals with incipient bulimia learn to purge to rid themselves of the large quantity of food (and calories) ingested during a binge. Eventually, the diet-binge-purge cycle becomes self-perpetuating and resistant to change (Fairburn, Marcus, & Wilson, 1993).

Less is known, however, about the role of weight-loss dieting in the *maintenance* of bulimia nervosa. The self-perpetuating diet-binge-purge cycle mentioned above implies that dieting continues to instigate binge eating in established bulimics. As Fairburn (1995) has noted in discussing factors maintaining bulimia, individuals with bulimia are “continually attempting to maintain strict control over their eating. This dieting creates a vulnerability to binge eating through several interacting physiological and psychological mechanisms” (p. 344). However,

the weight-control tactics that individuals with established bulimia may use—dieting, self-induced vomiting, intensive exercise, and diuretic and laxative abuse—could all be used to prevent weight gain following binges or to produce a reduction in weight (even in the absence of a binge). The possibility therefore exists that in some people with bulimia, weight-loss dieting becomes less important in the maintenance of binge eating than it was in its development. For instance, when a person who is developing bulimia first engages in self-induced vomiting, the purging may be entirely motivated by the desire to undo the effects of a preceding binge. However, because all food intake represents a potential threat to bulimic individuals’ weight-loss aspirations, self-induced vomiting could eventually be used to purge nonbinge intakes as well. The possibility that bulimic individuals sometimes use purging to try to *lose* weight—not just to compensate for binges—is supported by studies showing that bulimic individuals’ frequency of purging is higher than their frequency of bingeing (Fairburn & Cooper, 1982; Hetherington, Altemus, Nelson, Bernat, & Gold, 1994; Ortega, Waranch, Maldonado, & Hubbard, 1987).

Given the prominent role that body and weight dissatisfaction play in theories of bulimia (Fairburn et al., 1993), it is curious that there is no mention of weight loss tactics in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., *DSM-IV*; American Psychiatric Association, 1994) criteria for diagnosing bulimia. That is, dieting, purging, and exercise are viewed as means of compensating for the effects of a binge, not as methods for promoting weight loss. Therefore, there appears to be a discrepancy between the way that bulimia is usually conceptualized (as a disorder involving intense body dissatisfaction and a drive for thinness) and the way it is diagnosed (where weight-loss practices are not considered).

These observations suggest that the influential role of weight-loss dieting in the etiology of bulimia nervosa (Polivy & Her-

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man, 1985) cannot necessarily be extended to its perpetuation. In fact, in unpublished data from a previous study (Lowe et al., 1996), we were surprised to find that 8 of 21 bulimic participants said that they were not currently dieting to lose weight. This was surprising because we assumed that virtually all bulimic individuals want to weigh less, and that dieting is a ubiquitous means by which they try to lose weight. One purpose of the present study, therefore, was to more thoroughly examine the prevalence of weight-loss dieting among bulimic individuals. If weight-loss dieting is not being regularly practiced by a significant fraction of bulimic individuals, it may suggest that dieting is not as influential in the maintenance of bulimia as it is in its development.

Furthermore, if a sizable fraction of those with bulimia diet infrequently or not at all, it would suggest that revisions may be needed in the prevailing models for conceptualizing bulimia nervosa. Bulimia is usually viewed as an extreme manifestation of the weight and eating concerns that affect many women in Western cultures (Drewnowski, Yee, Kurth, & Krahn, 1994; Polivy & Herman, 1985; Striegel-Moore, Silberstein, & Rodin, 1986). According to this "continuum" approach, bulimic individuals' chronic and intensive dieting plays a major role in both the development and maintenance of binge eating. Therefore, if a substantial minority of bulimic individuals are not dieting to lose weight, it would raise doubts about the generalizability of the continuum model's assumption that chronic dieting helps drive their binge eating.

In a recent study of the continuum model of bulimia (Lowe et al., 1996), we examined the intensity of binge eating problems across four groups who differed systematically in their degree of weight and eating concerns: unrestrained eaters, restrained eaters who were not currently dieting to lose weight, current weight-loss dieters, and bulimic individuals. We first documented that these groups showed systematic increases in their weight and eating concerns, and then tested the assumption that they would show corresponding increases in the intensity of binge eating problems. However, the latter assumption was not supported; binge eating was virtually absent in all three nonbulimic control groups, whereas the bulimic group showed the expected elevations in binge eating. These findings contradicted the continuum model, because increments in the intensity of weight and eating concerns were not reflected in increased binge eating. Because wide variations in the extent of weight and eating concerns were unrelated to binge frequency in a group of nonbulimic individuals, it raises the question of whether variations in dieting intensity among bulimic individuals will be similarly unrelated to binge eating severity. If dieting and binge eating are unrelated among individuals with bulimia, it would again suggest that factors other than dieting maintain binge eating in such individuals. Thus, a second purpose of this study was to test the relationship between weight-loss dieting and binge eating frequency among those with bulimia.

Method

Overview

This study included three samples of bulimic individuals. Dieting status was assessed somewhat differently in each sample. There were

three analyses of interest within each sample. First, the frequency of dieting was determined to see what proportion of bulimics engaged in little or no weight-loss dieting. Second, subgroups of bulimics who frequently or infrequently dieted to lose weight were identified. To test the validity of this frequent-infrequent dieter (FD-ID) designation within each sample, these subgroups were then compared on standard measures of eating and weight concerns. Finally, the degree of binge eating problems among IDs and FDs was tested by comparing the two groups on several measures of binge eating.

Participants

Sample 1 consisted of 21 women (8 IDs and 13 FDs) recruited from the community for another study (Lowe et al., 1996). Of this group, 13 were diagnosed with bulimia (using the criteria in the Eating Disorders Examination; Fairburn & Cooper, 1993), and 8 were diagnosed with subclinical bulimia because their binge frequency during the prior 3 months did not meet diagnostic criteria. (No relationship was found between dieting status and diagnostic status.) The subclinical participants were retained for analysis because they did not differ from the 13 bulimic participants on any of 25 dependent measures included in Lowe et al.'s (1996) study, and because their self-monitoring records showed that they binged an average of 3.9 times during 6 days of food recordings. Demographic data for Sample 1 participants are shown in Table 1. The participants were mostly in their mid-20s, in the low normal range in relative weight, predominantly single, and well educated. Four Sample 1 participants reported a history of anorexia nervosa.

Sample 2 and Sample 3 were both drawn from new admissions to a residential treatment facility specializing in eating disorders. Sample 2 individuals were admitted to the facility from 1992 to 1993, whereas Sample 3 individuals were admitted from 1994 to 1996. The basis for differentiating the two samples was the method used to assess dieting status. The data for Sample 2 participants had already been collected when the hypotheses tested in this study were first proposed. Thus, a post hoc method (described in the *Measures* section) was used to assign these participants to dieting categories. The question used to define dieting status for Sample 3 participants, on the other hand, was specifically designed to test the present hypotheses. The demographic characteristics of Sample 2 and Sample 3 participants are shown in Table 1. As can be seen, these participants were similar to the bulimic individuals in Sample 1 in age, relative weight, and marital status, but were somewhat less well educated.

Participants in Samples 2 and 3 underwent an intake interview during which diagnostic status was determined by a master's-level clinician. This clinician shared the diagnostic information with a psychiatrist or doctoral-level clinical psychologist to verify the assigned diagnosis. When disagreements occurred, the final diagnosis was made by the psychiatrist or doctoral-level psychologist. *DSM-III-R* (*DSM*, 3rd ed., rev., American Psychiatric Association, 1987) criteria were used to diagnose the participants in Sample 2 and Sample 3. The intake clinician also inquired about history of anorexia nervosa. Only individuals with a bulimia diagnosis and no history of anorexia were included in Samples 2 and 3. This exclusion criterion was used to avoid interpretive ambiguities that might exist if some bulimic participants had a history of anorexia.

There were 132 bulimic individuals in the participant pool from which Sample 2 was created and 116 bulimic individuals in the participant pool from which Sample 3 was created. Bulimic participants were included in the final sample analyzed here on the basis of their status as either infrequent or frequent weight-loss dieters. Of those completing the dieting assessment questions, there were 31 IDs (23%) and 70 FDs (53%) in Sample 2, and 35 IDs (30%) and 35 FDs (30%) in Sample 3. Because of missing data, the sample sizes for different analyses ranged from 81 to 95 in Sample 2 and from 66 to 67 in Sample 3 (except for the

Table 1
Demographic Data on the Three Groups of Participants

Demographic data	Sample 1 (<i>n</i> = 21)	Sample 2 (<i>n</i> = 101)	Sample 3 (<i>n</i> = 70)
Age (in years)			
<i>M</i>	25.05	24.40	26.10
<i>SD</i>	5.16	7.07	8.21
Range	19–40	14–51	15–46
BMI			
<i>M</i>	22.02	21.75	20.70
<i>SD</i>	3.12	4.61	4.50
Range	17.19–28.87	15.09–41.59	14.11–39.59
Marital status (%)			
Single	86	83	70
Married	0	13	20
Separated–divorced	9	4	10
Highest education level (%)			
Completed high school	38	—	57
Completed college or more	57	—	34

Note. A dash indicates that data were not available. BMI = Body Mass Index (weight in kilograms divided by height in meters²).

analyses involving the Eating Disorders Inventory–2, as described below).

There were three reasons why we chose to study extreme groups of infrequent and frequent dieters, rather than including all bulimic individuals and examining dieting frequency as a continuum. First, as suggested in the introduction, we were interested in studying how many individuals with bulimia were no longer using dieting as a means of losing weight and how the virtual absence of weight-loss dieting might be related to binge eating severity. Second, we were interested in differentiating between bulimic individuals who in the *recent* past were and were not relying on weight-loss dieting to reduce their weight. Although the vast majority of bulimic individuals presumably had dieted to lose weight at some point during the course of their disorder, a recent or ongoing weight-loss diet should have had the greatest impact on levels of binge eating at the time of the study. Therefore, it was important to clearly differentiate between those bulimic individuals who had and had not recently engaged in dieting to lose weight. Third, retrospective reports of dieting frequency are subject to error, and by choosing extreme groups, we increased the likelihood that we were comparing groups that truly differed on the critical dimension of weight-loss dieting.

Measures

There were both similarities and differences among the three samples in how dieting, eating and weight concerns, and binge eating were measured.

Assessment of Dieting Status

In Sample 1, dieting was defined by the question “Are you currently on a diet to lose weight?” (yes or no). In Sample 2, Item 19 from the Bulimia Test–Revised (BULIT-R; Thelan, Farmer, Wonderlich, & Smith, 1991) was used. This item, which is not used in the calculation of the total or subscale BULIT-R scores, reads “I have tried to lose weight by fasting or going on strict diets,” and has response choices of “not in the past year,” “once in the past year,” “2–3 times in the past year,” “4–5 times in the past year,” and “more than 5 times in the past year.” In this study, infrequent dieters were those who chose one of the first two alternatives, and frequent dieters were those who chose the last alternative. (Two groups were included in the ID group to ensure a

reasonable sample size of infrequent dieters. Within the ID group, 74% of IDs had not dieted at all in the past year.) For Sample 3, a question was added to the Intake Questionnaire completed by patients entering the inpatient facility. This question asked how much the respondent had relied on dieting to lose weight during the past month, with response choices of “not at all,” “a little,” “somewhat,” “often,” and “very much.” Again, those who answered “not at all” or “a little” were combined into an ID group (with 54% of IDs answering “not at all”), and those who answered “very much” were selected as FDs.

Validity Measures

The Eating Disorder Inventory–2 (EDI-2; Garner, 1991) is a 91-item multidimensional instrument designed to assess both symptomatic and personality-related dimensions associated with anorexia and bulimia nervosa. The inventory yields 11 scale scores including the Drive for Thinness and Body Dissatisfaction scales, which were used to test the validity of our ID–FD designations. The EDI-2 has been shown to have acceptable reliability and validity (Eberenz & Gleaves, 1994; Garner, 1991; Williamson, Anderson, Jackman, & Jackson, 1995). The two EDI-2 subscales were used in all three samples. However, the residential facility exhausted their supply of EDI-2s during data collection for Sample 3, and they did not replenish them for some time. Therefore, for Sample 3, the sample size (31; 15 IDs and 16 FDs) for the two EDI-2 measures was about half that of other measures collected for Sample 3.

The Eating Disorders Examination (EDE; Fairburn & Cooper, 1993) is a semistructured interview intended to assess a broad range of psychopathologies related to anorexia nervosa, bulimia nervosa, and variants of these disorders. The EDE we used (Edition 11.5 D) provided five subscale scores: Restraint, Overeating, Eating Concern, Shape Concern, and Weight Concern. The reliability and validity of the EDE have been well-established (Fairburn & Cooper, 1993). Four of the five subscales (excluding overeating) were used as validity measures for Sample 1.

The Eating Attitudes Test–26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982) is a 26-item self-report measure of the symptoms of anorexia nervosa. The EAT-26 has three subscales called Dieting, Oral Control, and Bulimia and Food Preoccupation. The former two subscales were used here; the Dieting subscale has obvious relevance, and the Oral Control items (e.g., “cut my food into small pieces” and “display self-control around food”) suggest that this subscale is also an appro-

appropriate validity criterion. The EAT-26 has been found to be a reliable and valid measure of the symptoms of anorexia and bulimia (Garner et al., 1982; Williamson et al., 1995). The EAT-26 was available in Samples 2 and 3.

Binge Eating Measures

Self-monitored binges. Participants in Sample 1 self-monitored all of their food intake for 6 days. After recording the food eaten at a given sitting, participants indicated if they considered the eating bout a binge, defined as "eating more than you think you should have and feeling out of control." The total number of self-monitored binges recorded during the 6 days was tabulated.

Number of binge episodes from the EDE. The version of the EDE used in Sample 1 has an Overeating scale, but this scale measures several types of overeating, not just binge eating. However, the EDE includes an item assessing the total number of binge episodes that occurred during the prior 28 days. This item was used as an additional measure of binge eating for Sample 1 participants.

Average number of binges per week during the past 3 months. The Intake Questionnaire completed by Sample 2 and 3 participants asked how often per week, on average, the respondent binged during the prior 3 months. These scores were used as another means of assessing binge eating severity.

Derived binge eating scale from the BULIT-R (Thelen et al., 1991). The BULIT-R is a widely used and psychometrically sound questionnaire measure of bulimic symptomatology (Williamson et al., 1995). It contains a Binging-Control-Body Image factor consisting of 22 items. As suggested by its name, a number of the items included in this factor do not describe binge eating behavior per se. For example, Item 1 is "I am satisfied with my eating patterns," and Item 4 is "I am satisfied with the shape and size of my body." Because we wanted to assess specific binge eating behaviors, we deleted from the BULIT-R Binging-Control-Body Image factor items that did not explicitly describe binge eating. We then tested the internal consistency and factor structure of the resulting BULIT-R Binge Scale by calculating Cronbach's alpha and conducting a principal-components factor analysis on the 12 items retained. These analyses were done with the combined BULIT-R data from Samples 2 and 3. The internal consistency of the derived scale was high, with a Cronbach's alpha of .95 and corrected item-total correlations that were greater than or equal to .60 for all 12 items. The principal-components analysis produced a single factor that accounted for 65% of the total variance, with all items having factor loadings of .65 or higher. These analyses indicated that our derived BULIT-R Binge Scale constitutes a unidimensional, homogeneous measure of binge eating severity. We therefore used the BULIT-R Binge Scale score (derived by summing the 12 items) as our measure of binge eating for respondents in Samples 2 and 3.

Participants completed two other measures of binge eating which we excluded from the present analyses. These were the bulimia subscales from the EDI-2 and the EAT-26. The reason for excluding these measures was that, like the BULIT-R Binging-Control-Body Image factor mentioned above, both of these bulimia subscales contained numerous items that do not describe binge eating behavior. In the case of the EDI-2 Bulimia scale, only three of seven items describe binge eating. For the EAT-26 Bulimia and Food Preoccupation factor, only one of six items describes bingeing behavior. Therefore, because so few items in each scale directly assessed binge eating, these two subscales were not used as measures of bingeing in the present study.

Results

IDs and FDs were initially compared on demographic variables (see Table 1) to see if any differences existed between

them. Using *t* tests, no significant differences were found between the two groups on age or Body Mass Index (BMI; weight in kg/height in m²) in any of the three samples. (BMIs for IDs and FDs, respectively, in Sample 1 were 20.6 and 22.9; in Sample 2, BMIs were 21.3 and 21.9, respectively; and in Sample 3, BMIs were 20.8 and 20.6, respectively.) For marital status, the proportion of IDs and FDs in each sample who were single versus currently or previously married did not differ (all chi-squares were nonsignificant). Similarly, when the proportion of IDs and FDs in Samples 1 and 3 with less than a college education was compared with the proportion with at least a college education, no differences were found. (Data on education were unavailable for Sample 2.)

To test the validity of our ID-FD distinctions in each sample, multivariate analyses of variance (MANOVAs) were used to compare the two dieting groups on the validity measures within each sample. When a significant result was obtained, analyses of variance (ANOVAs) were used to compare groups on the individual measures included in the MANOVA. The follow-up ANOVAs were calculated separately for each measure because the follow-up ANOVAs generated by the MANOVA routine are based on listwise deletion of missing values and would therefore result in lowered sample sizes for Samples 2 and 3.

The MANOVAs produced significant group differences on the validation measures within each sample: for Sample 1, $F(6, 13) = 4.96, p < .01$; for Sample 2, $F(4, 76) = 10.23, p < .001$; for Sample 3, $F(4, 21) = 6.50, p < .001$. The results of the ANOVAs for the individual measures in each sample, along with the means, standard deviations, and 95% confidence intervals for the means, are shown in Table 2.

These results show that group differences in the predicted direction were found on all measures. All but two of these differences were significant. The exceptions occurred in Sample 1, in which the sample sizes were quite small. Furthermore, the greatest differences were found on those measures that most directly reflect motivations and behaviors related to weight-loss dieting (EDI-2 Drive for Thinness, EDE Restraint, and EAT-26 Dieting). Thus, within each sample, there was clear-cut evidence that the single-item measures of dieting status we used were valid measures of dieting status.

The first substantive question of interest was simply whether there are appreciable numbers of established bulimics who do not regularly engage in weight-loss dieting. The percentages of infrequent weight-loss dieters in the three samples were 38%, 23%, and 30%, respectively. These figures are not directly comparable because weight-loss dieting was defined somewhat differently in each sample. Furthermore, the latter two percentages provide more meaningful data than the first, because they are based on larger numbers of diagnosed, hospitalized bulimics. Nonetheless, it appears that a significant fraction of established bulimics are not engaged in regular weight-loss dieting.

The relation of dieting status and binge status was then tested by comparing the ID and FD groups on measures of binge eating. These results are shown in Table 3. In Sample 1, for the EDE item measuring number of binge episodes during the prior 28 days, IDs reported bingeing twice as often as FDs, but the combination of small sample sizes and large standard deviations rendered this outcome nonsignificant. There was a large and statistically significant difference between IDs and FDs on self-

Table 2
Results of Individual Analyses of Variance for Validity Measures in the Three Samples

Sample, scale, and subscale	IDs		FDs		95% confidence interval		F	df
	M	SD	M	SD	IDs	FDs		
Sample 1								
EDI-2								
Drive for Thinness	10.3	4.9	17.1	2.2	5.7-14.8	15.8-18.4	18.5***	1, 19
Body Dissatisfaction	12.9	8.6	20.8	6.9	4.9-20.8	16.6-24.9	5.1*	1, 19
EDE								
Eating Concern	2.7	1.4	3.4	0.9	1.5-3.9	2.8-3.9	1.7	1, 20
Restraint	2.3	1.4	4.5	0.6	1.2-3.5	4.1-4.9	23.8***	1, 20
Shape Concern	3.5	1.7	4.5	0.7	2.1-4.9	4.0-4.9	3.4	1, 20
Weight Concern	2.2	1.4	3.9	0.7	0.9-3.4	3.5-4.4	15.4***	1, 20
Sample 2								
EDI-2								
Drive for Thinness	12.5	5.1	18.2	6.4	10.4-14.6	16.5-19.8	15.4***	1, 87
Body Dissatisfaction	14.4	8.4	22.2	5.3	10.9-17.9	20.8-23.5	27.1***	1, 87
EAT-26								
Oral Control	3.2	5.4	5.6	4.8	1.1-5.3	3.8-5.9	4.5*	1, 92
Dieting	18.2	7.5	26.5	7.0	15.3-21.1	24.8-28.2	26.2***	1, 92
Sample 3								
EDI-2								
Drive for Thinness	12.5	5.4	17.6	2.5	9.5-15.5	16.3-18.9	11.9**	1, 30
Body Dissatisfaction	16.5	8.8	23.4	5.1	11.6-21.3	20.7-26.1	7.3*	1, 30
EAT-26								
Oral Control	2.1	3.1	7.1	4.9	1.0-3.2	5.4-8.9	24.9***	1, 66
Dieting	15.4	8.7	28.5	8.1	12.3-18.4	25.7-31.4	41.1***	1, 66

Note. For comparison purposes, norms reported for female college students on the two EDI (Williamson et al., 1995) and EAT-26 (Garner et al., 1982) subscales used here are as follows: EDI Drive for Thinness = 5.5; EDI Body Dissatisfaction = 12.2; EAT-26 Oral Control = 1.9; EAT-26 Dieting = 7.1. IDs = infrequent dieters; FDs = frequent dieters; EDI-2 = Eating Disorder Inventory (2nd ed.); EDE = Eating Disorders Examination; EAT-26 = 26-item version of the Eating Attitudes Test.

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

monitored binges, with IDs again reporting substantially more binges than FDs. In Sample 2, comparisons of IDs and FDs on the BULIT-R Binge Scale and on average weekly binges produced no differences between the two groups. In Sample 3, comparisons of the two groups on the same two measures produced large and statistically significant differences, with the IDs

again scoring much higher on binge eating than the FDs. It is interesting that the observed differences in binge eating were in the opposite direction to those predicted by restraint theory (Polivy & Herman, 1985).

It is also noteworthy that sizable group differences in binge eating were found for the comparisons in Samples 1 and 3,

Table 3
Comparisons of Binge Eating Severity in Infrequent and Frequent Dieters in the Three Samples

Sample and measure	IDs		FDs		95% confidence interval		F	df
	M	SD	M	SD	IDs	FDs		
Sample 1								
EDE, bulimic episodes	3.4	2.3	2.5	2.2	1.5-5.3	1.1-3.8	0.8	1, 20
Self-monitored binges	7.9	2.6	3.5	2.5	5.7-10.0	1.9-4.9	15.3***	1, 20
Sample 2								
BULIT-R Binge Scale	50.2	13.6	48.9	13.4	45.0-55.3	45.7-52.3	0.2	1, 94
M weekly binge frequency	12.2	11.9	11.9	12.7	6.1-18.3	7.5-16.5	0.0	1, 87
Sample 3								
BULIT-R Binge Scale	51.9	8.0	40.7	14.4	49.0-54.9	35.7-45.6	14.9***	1, 65
M weekly binge frequency	15.6	12.5	7.2	7.4	11.1-20.1	4.6-9.8	11.2***	1, 66

Note. IDs = infrequent dieters; FDs = frequent dieters; EDE = Eating Disorders Examination; BULIT-R = Bulimia Test-Revised.

*** $p < .001$.

whereas no hints of group differences were found for Sample 2. These divergent results are particularly surprising because Sample 2 and Sample 3 participants were drawn from the same inpatient population and were compared on the same dependent measures. However, there was a potentially important difference in the way IDs and FDs were defined in the two samples. In Sample 2, we used Item 19 from the BULIT-R, which inquires about frequency of weight-loss dieting during the past year. In Sample 3, participants were asked how much they had relied on dieting to lose weight in the past month. In terms of identifying bulimic individuals whose binge eating was being affected by current (as opposed to past) dieting, the method used to identify IDs and FDs in Sample 3 was superior to the method used in Sample 2. That is, because of difficulty remembering diets during the past year, and because there may be only a rough correspondence between historical dieting frequency and current dieting behavior, the Sample 2 classification approach may have been a much less sensitive measure of current weight loss dieting than the Sample 3 classification approach. Also consistent with this viewpoint is the fact that a large difference in current binge eating frequency (assessed through self-monitoring) was found between IDs and FDs in Sample 1, in which participants were classified on the basis of their contemporaneous status as weight-loss dieters.

Fortunately, we had a means of studying this issue because of a question that had been added to the Intake Questionnaire completed by Sample 3 (but not by Sample 2) bulimics. This question asked, "During the past year, how often were you engaged in dieting to lose weight?" If the difference in ID-FD binge eating findings between Sample 2 and Sample 3 was due to the different time spans used to assess dieting status in the two samples, then the binge eating differences found between IDs and FDs in Sample 3 should be reduced or eliminated if the item measuring year-long dieting frequency was used to classify bulimic participants into ID and FD groups. This analysis was done by classifying those who answered "not at all" or "occasionally" to this item as IDs and those who answered "all of the time" as FDs. When IDs and FDs were reclassified in this way, a significant difference between the groups was still found on the BULIT-R Binge Scale, $F(1, 66) = 4.72, p < .05$, but the magnitude of the difference between the groups dropped considerably (from 11 points to 6 points). When the reclassified IDs and FDs were compared on average weekly binge frequency, the large (eight binges per week) and highly significant difference found using the original classification was greatly reduced (to three binges per week) and was no longer significant, $F(1, 64) = 1.53, ns$. These results support the hypothesis that the absence of ID-FD differences in binge eating in Sample 2 (as opposed to Sample 3) participants was due to the fact that dieting history, rather than current dieting status, was used to classify Sample 2 participants.

Discussion

The purpose of this study was twofold. The first purpose was to estimate the proportion of individuals diagnosed with bulimia who do not rely on weight-loss dieting to become thinner. The second purpose was to examine binge eating severity among bulimic individuals who do or do not regularly use dieting to

achieve a reduction in their weight. For the first goal, the proportion of bulimic participants who were not relying on weight-loss dieting was roughly 25%. Given the ubiquitous assumption that dieting is highly influential in both the etiology and maintenance of bulimia (Fairburn et al., 1993; Heatherton & Polivy, 1992; Hsu, 1990; Polivy & Herman, 1985), this figure is surprisingly high. The fact that IDs do not practice dieting and binge more while weighing the same as FDs suggests that they more often use other means of compensating for binge eating or achieving weight loss. Indeed, when respondents in Sample 3 were asked what their average vomiting frequency per week was during the past 3 months, the ID and FD groups' vomiting frequency—14.1 and 7.9, respectively, $t(58) = 2.68, p < .01$ —closely matched the difference in their reported bingeing frequency.

We can only speculate on why some bulimic individuals did not engage in regular dieting behavior. One obvious possibility, given the results of the validity analyses, is that IDs are closer than FDs to their personal goal weights and so are not as motivated to lose weight. Some data were available to examine this hypothesis. First, a question on the face page of the EDI asks respondents "how much would you like to weigh?" Although we only had data on this item for 31 participants (15 IDs and 16 FDs), a comparison of their responses provided some evidence that FDs had lower goal weights ($M = 111.5$ lb or 50.68 kg) than IDs ($M = 117.1$ lb or 53.23 kg), $t(30) = 1.64, p < .06$, one-tailed. Because the relative weights of IDs and FDs were virtually the same, this suggests that IDs were closer to their goal weights than FDs. Second, an examination of the mean EDI Body Dissatisfaction scores for IDs in Samples 2 and 3 (14.4 and 16.5, respectively) indicated that these participants did not score much higher than female college students in body dissatisfaction (whose mean score in one study was 12.2; see note in Table 2). In fact, when one considers that the restrained eaters in this normative college sample undoubtedly scored well above the mean of 12.2, it is likely that IDs' level of discontent differed little if at all from that of non-eating-disordered restrained eaters.

Conversely, it is possible that FDs are more motivated than IDs to diet because they have a greater history of being overweight. Because Sample 3 participants were asked what their weight was at its highest point ever, we were able to address this question as well. The difference between FDs' and IDs' highest and current weights (28.8 lbs or 13.09 kg, and 17.1 lbs or 7.77 kg, respectively) was greater for FDs than for IDs, $t(65) = 1.8, p < .05$, one-tailed. Taken together, the foregoing results are consistent with the hypothesis that FDs' greater frequency of dieting (relative to IDs) may result from a combination of an increased fear of gaining weight and an increased desire to be thin, a conclusion that is consistent with past research on the determinants of body image dissatisfaction (Gleaves, Williamson, Eberenz, Sebastian, & Barker, 1995).

A second possible explanation for the relative absence of dieting in IDs is that they represent a subgroup for whom dieting never played a significant role in generating binge eating (as is apparently true for a substantial percentage of obese binge eaters; cf. Marcus, Moulton, & Greeno, 1995). This group may have never relied on dieting to lose weight or to compensate

for overeating; rather, they may have relied on purging for these purposes.

A third possibility is that IDs are burned-out dieters, who have relinquished dieting because it was too demanding or too slow in reversing the effects of binge eating. Alternatively, it may be that some bulimic individuals do not tire of dieting, but find purging so much easier than dieting as a means of eliminating unwanted calories that purging gradually replaces dieting as the preferred means of doing so.

Finally, we should mention the possibility that the relatively high percentage of nondieters was due to participants stopping dieting as a result of treatment. This seems unlikely for two reasons. First, most of the participants in Sample 1, where the percentage of nondieters was the highest, were not in treatment. Second, participants in Samples 2 and 3 completed their Intake Questionnaire within the first few days of entering the residential center, and the dieting period assessed covered the prior year (in Sample 2) or prior month (in Sample 3). In any case, the documentation of a significant fraction of nondieters among bulimic patients indicates that although dieting may frequently be a part of a self-perpetuating diet-binge-purge cycle among bulimic individuals, it is not a necessary part.

The results of the validity analyses provided strong support for the use of the single-item measures of dieting status. Although it was unremarkable that IDs and FDs differed on the EAT-26 Oral Control and Dieting scales, the consistency and magnitude of ID-FD differences on the EDI-2 Drive for Thinness and Body Dissatisfaction scales were noteworthy. Infrequent dieters not only were not dieting to lose weight but, in spite of having relative weights similar to those of FDs, were apparently generally more accepting of their body weight and shape than FDs.

The analyses examining binge eating severity among IDs and FDs indicated that far from dieting intensifying binge eating, dieting was associated with a reduction in the frequency of binge eating. In the field of eating disorders, it is generally assumed that bulimic individuals are chronic dieters and that the biological and psychological consequences of constant dieting help set the stage for binge eating episodes (Fairburn et al., 1993; Polivy & Herman, 1993). Presumably, if some individuals with bulimia did not regularly engage in weight-loss dieting, this would decrease the psychobiological pressures driving binge eating. However, in the comparisons made here, no relation was found between dieting and bingeing in three analyses, and a strong inverse relation was found in three other analyses. Furthermore, our reanalyses of the Sample 3 data, on the basis of the item that assessed weight-loss-dieting frequency during the past year (rather than the past month), showed that the change in time frame was associated with a substantial reduction in the size of the ID-FD binge eating difference found in the original analyses for Sample 3. This suggests that the dramatic difference found in the nature of the dieting-bingeing relationship in Sample 2 and Sample 3 may have been due to the fact that dieting status was assessed historically in Sample 2 and contemporaneously in Sample 3. In other words, in studying the relation between dieting and binge eating, there appears to be a major difference between assessing dieting as a chronic behavior pattern and assessing it as a current practice. This was precisely the conclusion reached by Lowe (1993) in regard to the relation-

ship of chronic and acute dieting to several other relevant outcomes (counterregulatory eating, emotional eating, etc.). He reviewed studies that found striking differences in the relationship between these measures and chronic dieting (assessed with Herman & Polivy's Restraint Scale) on one hand and current dieting behavior on the other.

Because most current models of bulimia nervosa view intensive dieting as a primary source of bulimic individuals' binge eating, it is not immediately apparent how to reconcile the present findings with these models. A possible answer to this question may lie in the fact that the great majority of bulimic individuals have *previously* engaged in intensive weight-loss dieting. As noted above, Sample 3 participants had lost an average of more than 20 lb (9.09 kg) relative to their previous highest weights. This substantial weight loss appears to be a prime instigator of the binge eating shown by bulimic individuals when they initially develop the disorder (Polivy & Herman, 1985). However, given that a significant weight loss has already occurred, some individuals with incipient bulimia may not be highly motivated to lose additional weight. Those who are not as motivated to lose additional weight would presumably be less dissatisfied with their bodies and would therefore be less likely to try to diet to become thinner—a characterization that fits our IDs well. Those who are motivated to lose additional weight would presumably still be very dissatisfied with their bodies, would be driven to become thinner, and would likely continue dieting to lose weight. This characterization, of course, describes the FDs studied here.

From this perspective, it is the weight loss produced by *past* dieting (and weight loss) that is sustaining bulimic individuals' current binge eating—or at least the binge eating of IDs. However, there is also growing evidence that the same conclusion may hold even for bulimic individuals who are currently dieting to lose weight. That is, although generally viewed as axiomatic, the conclusion that binge eating among bulimic individuals is driven by current dieting has been challenged by several recent findings. The first finding came from Lowe et al.'s (1996) study. They found gradual increases in the strength of restraint and weight concerns across four groups (unrestrained nondieters, restrained nondieters, current dieters, and bulimic individuals) who had been predicted to show this pattern. However, although the increase in the bulimic individuals' Restraint and Weight Concern factor scores was modest (i.e., it was similar in magnitude to the increases in these scores between the first three groups), the change in binge frequency between the three nonbulimic control groups and the bulimic group was dramatic (see Figures 1B and 1C in Lowe et al., 1996). This suggests that the increased restraint and weight concerns of the bulimic group are not sufficient to explain the dramatic increase in their binge eating. Second, in further analyses of the food self-monitoring records collected in Lowe et al.'s study (unpublished data), we examined the daily caloric intake of the three nonbulimic groups and the *nonpurged* intake of the bulimic group (i.e., their consumption after subtracting all caloric intake that was subsequently purged). These analyses revealed that the bulimic individuals' nonpurged intakes were indistinguishable from those of the comparison groups, which indicates that the bulimic individuals' nonpurged intake did not reflect restricted energy consumption, let alone a state of semistarvation. (Indeed, this con-

clusion is strengthened further when one takes into account that much of the food consumed during binges is retained in the body following self-induced vomiting; see Kaye, Weltzin, Hsu, McConaha, & Bolton, 1993). A final study that raises questions about the role of dieting in bulimic individuals' binge eating was recently reported by Leonard et al. (1996). These authors put individuals hospitalized for bulimia on a supervised weight maintenance diet (of approximately 2,000 kcal or 478.01 J per day) and prevented them from bingeing and vomiting. Surprisingly, these bulimic patients *lost* 3 lb (1.36 kg) during their 1-week hospitalization. Leonard et al. (1996, p. 230) concluded that prior to their admission to the hospital, their bulimic patients "appeared to be overnourished rather than semistarved."

Thus, regardless of their professed desire to weigh less, most bulimic individuals may be functionally *maintaining* their lowered weights rather than dieting vigorously to lower their weights further. According to this scenario, the strict hypocaloric dieting and rapid weight loss that typically precede the initial development of binge eating (Polivy & Herman, 1985) may also constitute the primary psychobiological source of chronic binge eating; that is, regardless of their self-described dieting status, ongoing weight-loss dieting may not be necessary to sustain binge eating in bulimic individuals. Indeed, from this perspective, the ongoing efforts of FDs to restrict their eating may actually be helping them suppress their binge eating relative to the level they would experience if the psychobiological pressures created by past weight loss were not countered by volitional efforts to control eating. By contrast, IDs represent a group that does not try very hard to counter these psychobiological pressures, leaving them more susceptible to bingeing (and more dependent on purging because they have relinquished dieting as a weight-control method). Finally, the absence of a relationship between *chronic* dieting frequency and binge eating (seen in Sample 2) may indicate that once substantial weight loss occurs, frequency of going on and off diets does not have any further impact on binge frequency.

A limitation of the present study was that its independent and dependent variables—dieting and bingeing—were both defined using self-report measures. Though the psychometric soundness of the single-item dieting questions was supported by the validity analyses, one cannot be sure what reports of current weight-loss dieting mean in behavioral terms. Individuals who deny dieting to lose weight may still be dieting to maintain their weight, and those who affirm dieting to lose weight may differ widely in what their diet consists of (e.g., occasionally skipping dessert vs. fasting for prolonged periods). Furthermore, although self-described weight-loss dieters may all be trying to lose weight, the degree of success achieved may vary widely. As for binge eating, the meaning patients ascribe to this term may differ from its professionally sanctioned meaning. Thus, bulimic patients often refer to relatively small intakes of forbidden foods as binges (Rosen, Leitenberg, Fisher, & Khazam, 1986), whereas in the *DSM-IV* (American Psychiatric Association, 1994), an eating bout must both clearly exceed a normal intake and involve feelings of loss of control to qualify as a binge. Therefore, in future research on dieting and binge eating in bulimia, it would be desirable to use improved methods for assessing dieting (e.g., using recent weight loss or self-monitor-

ing of food intake) and binge eating (using the EDE; Fairburn & Cooper, 1993).

Finally, the present results are relevant to the issue of whether bulimia is continuous or discontinuous in nature (Lowe et al., 1996; Ruderman & Besbeas, 1992). In addition to the multigroup comparison studies that have investigated this question (Laessle, Tuschl, Waadt, & Pirke, 1989; Lowe et al., 1996; Rossiter, Wilson, & Goldstein, 1989; Ruderman & Besbeas, 1992), there is a second method for examining this issue. This method is called taxometrics (Meehl, 1995; Meehl & Golden, 1982). In taxometrics, the determination of whether a disorder is continuous (dimensional) or discontinuous (taxonic) in nature is based on an examination of the relationship between indicators of a disorder. These relationships are studied among individuals with and without the disorder. In our previous study (Lowe et al., 1996), we found no relation between two indicators of bulimia (dieting and bingeing) in three groups of nonbulimic individuals. In the present study, there was not a positive relationship (indeed, in some instances there was a negative relationship) between dieting and bingeing within three samples of bulimic individuals. Finally, it is well known that there is a relationship between dieting intensity and binge eating in mixed samples of bulimic individuals and normal eaters (Lowe et al., 1996; Ruderman & Besbeas, 1992). The lack of a relationship between indicators of a disorder in groups with and without the disorder, along with the presence of a relationship between the indicators in a mixed group, is consistent with the assumption that the disorder is taxonic rather than dimensional in nature (cf. Waller, Putnam, & Carlson, 1996).

The assumption that bulimia is taxonic in nature is consistent with the common observation that dieting is necessary but not sufficient for the development of bulimia (Wilson, 1993). It is also consistent with the assumption that bulimia develops only in individuals who have predisposing characteristics (e.g., depression, a dysfunctional family background) that qualitatively alter the nature and consequences of weight-loss dieting. Nonetheless, a definitive assessment of the taxonicity of bulimia awaits studies that exploit the several taxometric methods (Meehl & Golden, 1982; Meehl, 1995) available for this purpose.

References

- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Drewnowski, A., Yee, D. K., Kurth, C. L., & Krahn, D. D. (1994). Eating pathology and *DSM-III-R* bulimia nervosa: A continuum of behavior. *American Journal of Psychiatry*, *151*, 1217–1219.
- Eberenz, K. P., & Gleaves, D. H. (1994). An examination of the internal consistency and factor structure of the Eating Disorder Inventory-2 in a clinical sample. *International Journal of Eating Disorders*, *16*, 371–379.
- Fairburn, C. G. (1995). Short-term psychological treatments for bulimia nervosa. In K. D. Brownell & C. G. Fairburn (Eds.), *Eating and its disorders: A comprehensive handbook* (pp. 344–348). New York: Guilford Press.
- Fairburn, C. G., & Cooper, P. J. (1982). Self-induced vomiting and bulimia nervosa: An undetected problem. *British Medical Journal*, *284*, 1153–1155.

- Fairburn, C. G., & Cooper, Z. (1993). The Eating Disorder Examination (12th ed.). In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment, and treatment* (pp. 317–357). New York: Guilford Press.
- Fairburn, C. G., Marcus, M. D., & Wilson, G. T. (1993). Cognitive-behavioral therapy for binge eating and bulimia nervosa: A comprehensive treatment manual. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment, and treatment* (pp. 361–404). New York: Guilford Press.
- Garner, D. M. (1991). *EDI-2: Eating Disorder Inventory professional manual*. Odessa, FL: Psychological Assessment Resources, Inc.
- Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine*, *9*, 273–279.
- Gleaves, D. H., Williamson, D. A., Eberenz, K. P., Sebastian, S. B., & Barker, S. E. (1995). Clarifying body image disturbance: Testing a multidimensional model using structural equation modeling. *Journal of Personality Assessment*, *64*, 478–493.
- Heatherton, T. F., & Polivy, J. (1992). Chronic dieting and eating disorders: A spiral model. In J. Crowther, S. E. Hobfall, M. A. P. Stephans, & D. L. Tennenbaum (Eds.), *The etiology of bulimia nervosa: The individual and familial context* (pp. 133–155). Washington, DC: Hemisphere.
- Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. J. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia: Saunders.
- Hetherington, M. M., Altemus, M., Nelson, M. L., Bernat, A. S., & Gold, P. W. (1994). Eating behavior in bulimia nervosa: Multiple meal analyses. *American Journal of Clinical Nutrition*, *60*, 864–873.
- Hsu, G. (1990). *Eating disorders*. New York: Guilford Press.
- Kaye, W. H., Weltzin, T. E., Hsu, L. K. G., McConaha, C. W., & Bolton, B. (1993). Amount of calories retained after binge eating and vomiting. *American Journal of Psychiatry*, *150*, 969–971.
- Keys, A., Brozek, K., Henschel, A., Mickelsen, O., & Taylor, H. L. (1950). *The biology of human starvation*. Minneapolis: University of Minnesota Press.
- Laessle, R. G., Tuschl, R. J., Waadt, S., & Pirke, K. M. (1989). The specific psychopathology of bulimia nervosa: A comparison with restrained and unrestrained (normal) eaters. *Journal of Consulting and Clinical Psychology*, *57*, 772–775.
- Leonard, T., Foulon, C., Samuel-Lajeunesse, B., Melchior, J., Rigaud, D., & Apfelbaum, M. (1996). High resting energy expenditure in normal-weight bulimics and its normalization with control of eating behavior. *Appetite*, *27*, 223–233.
- Lowe, M. R. (1993). The effects of dieting on eating behavior: A three-factor model. *Psychological Bulletin*, *114*, 100–121.
- Lowe, M. R., Gleaves, D. H., DiSimone-Weiss, R. T., Feurgueson, C., Gayda, C. A., Kolsky, P. A., Walden-Neal, T., Nelsen, L. A., & McKinney, S. (1996). Restraint, dieting, and the continuum model of bulimia nervosa. *Journal of Abnormal Psychology*, *105*, 508–517.
- Marcus, M. D., Moulton, M. M., & Greeno, C. G. (1995). Binge eating onset in obese patients with binge eating disorder. *Addictive Behaviors*, *20*, 747–755.
- Meehl, P. E. (1995). Bootstraps taxometrics: Solving the classification problem in psychopathology. *American Psychologist*, *50*, 266–275.
- Meehl, P. E., & Golden, R. (1982). Taxometric methods. In P. Kendall & J. Butcher (Eds.), *Handbook of research methods in clinical psychology* (pp. 127–181). New York: Wiley.
- Ortega, D. F., Waranch, H. R., Maldonado, A. J., & Hubbard, F. A. (1987). A comparative analysis of self-report measures of bulimia. *International Journal of Eating Disorders*, *6*, 301–311.
- Polivy, J., & Herman, C. P. (1985). Dieting and bingeing: A causal analysis. *American Psychologist*, *40*, 193–201.
- Polivy, J., & Herman, C. P. (1993). Etiology of binge eating: Psychological mechanisms. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment, and treatment* (pp. 173–205). New York: Guilford Press.
- Polivy, J., Zeitlin, S. B., Herman, C. P., & Beal, A. L. (1994). Food restriction and binge eating: A study of former prisoners of war. *Journal of Abnormal Psychology*, *103*, 409–411.
- Rosen, J. C., Leitenberg, H., Fisher, C., & Khazam, C. (1986). Binge-eating episodes in bulimia nervosa: The amount and type of food consumed. *International Journal of Eating Disorders*, *5*, 255–267.
- Rossiter, E. M., Wilson, G. T., & Goldstein, L. (1989). Bulimia nervosa and dietary restraint. *Behaviour Research and Therapy*, *27*, 465–468.
- Ruderman, A. J., & Besbeas, M. (1992). Psychological characteristics of dieters and bulimics. *Journal of Abnormal Psychology*, *101*, 383–390.
- Striegel-Moore, R. H. (1993). Etiology of binge eating: A developmental perspective. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge eating: Nature, assessment, and treatment* (pp. 142–173). New York: Guilford Press.
- Striegel-Moore, R. H., Silberstein, L. R., & Rodin, J. (1986). Toward an understanding of risk factors for bulimia. *American Psychologist*, *41*, 246–263.
- Telch, C. F., & Agras, W. S. (1993). The effects of a very low calorie diet on binge eating. *Behavior Therapy*, *24*, 177–193.
- Thelen, M. H., Farmer, J., Wonderlich, S., & Smith, M. (1991). A revision of the Bulimia Test: The BULIT-R. *Journal of Consulting and Clinical Psychology*, *3*, 119–124.
- Waller, N. G., Putnam, R. W., & Carlson, E. B. (1996). Types of dissociation and dissociative types: A taxometric analysis of dissociative experiences. *Psychological Methods*, *1*, 300–321.
- Williamson, D. A., Anderson, D. A., Jackman, L. P., & Jackson, S. R. (1995). Assessment of eating disordered thoughts, feelings, and behaviors. In D. Allison (Ed.), *Handbook of assessment methods for eating behaviors and weight-related problems* (pp. 347–386). Thousand Oaks, CA: Sage.
- Wilson, G. T. (1993). Relation of dieting and voluntary weight loss to psychological functioning and binge eating. *Annals of Internal Medicine*, *119*, 727–730.

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