

## Weight suppression predicts weight gain during inpatient treatment of bulimia nervosa

Michael R. Lowe<sup>a,b,\*</sup>, William Davis<sup>b</sup>, Dara Lucks<sup>a</sup>, Rachel Annunziato<sup>a</sup>, Meghan Butryn<sup>a</sup>

<sup>a</sup> Drexel University, United States

<sup>b</sup> The Renfrew Foundation, United States

Received 8 August 2004; received in revised form 9 September 2005; accepted 11 November 2005

### Abstract

Bulimic individuals typically lose a substantial amount of weight in the process of developing their disorder. Such weight suppression (WS) may be behaviorally and metabolically problematic. The present study tested the hypothesis that WS would predict weight gain during the inpatient hospitalization of 146 bulimia nervosa-spectrum inpatients. WS represented the difference ( $M=12.0$  kg) between highest weight ever and current body weight. Controlling for length of stay and current dieting (EAT-D scores), high levels of WS predicted greater weight gain. Furthermore, WS and admission BMI independently predicted weight gain when entered together in a regression analysis. Weight gain was also related to clinical improvement. These findings suggest that weight suppression, independently of current dieting status, may produce psychobiological pressures toward weight gain and could complicate the treatment of bulimia nervosa.

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*Keywords:* Weight suppression; Bulimia nervosa; Weight gain; Weight loss; Dieting

In early writings on bulimia nervosa, the discrepancy between patients' premorbid and current weights was viewed as a major contributor to bulimic psychopathology. In the first systematic description of bulimia nervosa, Russell [1] viewed it as "an ominous variant of anorexia." Russell [2] suggested that clinicians often fail to appreciate that a bulimic patient's "unremarkable" weight is almost always less than the "healthy" weight that preceded the onset of her eating disorder. Garner and Fairburn [3] also suggested that the unwillingness of bulimic patients to return to their premorbid weights may contribute to their persistent binge eating and purging [1,3,4].

Because anorexic patients are visibly underweight and often at medical risk, treatments for anorexia usually require patients to gain weight. In contrast, bulimic patients' body weights are generally in the normal range. As a result, there is typically no attempt made to modify body weight during the treatment of bulimic patients. In addition, among outpatients there is little

change in body weight during cognitive-behavioral therapy (CBT) for bulimia [5,6] despite the substantial reduction in bulimic symptoms associated with this treatment. This means that CBT for bulimia nervosa, the most successful form of psychological treatment [10], implicitly accepts whatever patients happen to weigh when they enter treatment. Thus, as long as patients' body weights are above the cutoff demarcating anorexia (generally defined as 15% below the desirable body weight for one's height, or a body mass index (BMI) of  $18.5 \text{ kg/m}^2$ ), weight gain is not usually a goal of treatment.

Evidence indicates that bulimic individuals typically have substantially higher premorbid weights than do those suffering from anorexia. Weight suppression (WS) refers to the difference between an individual's current body weight and highest body weight ever (since reaching his or her adult height). In two large samples of bulimic patients who were currently in the low-normal weight range, Garner and Fairburn [3] found that approximately one-third of patients in one sample and over half of the patients in the other sample had previously been more than 15% overweight. Murphy-Eberenz [8] found that 98 anorexic inpatients reported a highest weight ever of 119 lb, whereas 124 bulimic inpatients reported a highest weight of 157 lb.

\* Corresponding author. Department of Psychology, Mail Stop 626, Drexel University, 245 N. 15th St., Philadelphia, PA 19102-1192, United States. Tel.: +1 215 762 4948; fax: +1 215 762 8706.

E-mail address: lowe@drexel.edu (M.R. Lowe).

In the process of developing their disorder, many bulimic patients lose as much weight as anorexic patients [3]. After losing a significant amount of weight, individuals with incipient bulimia nervosa eventually engage in binge eating. This is usually followed by the development of purging to avoid gaining weight from bingeing [1,3]. However, between the onset of binge eating and purging and the time when bulimic patients present for treatment, most regain some of their lost weight [1,3]. Consequently, at treatment onset, bulimic patients are generally at or slightly below the desirable weight for their height [5,6]. Nonetheless, they are on average still well below their highest historical weights. For example, Murphy-Eberenz [8] found the average degree of WS in a sample of bulimic patients to be approximately 11.8 kg. The degree of WS in outpatient bulimic samples may be lower but is still substantial. In two large samples of bulimic outpatients, Garner and Fairburn [3] found that the outpatients' mean lowest adult weight was approximately 30% below their mean highest adult weight. These data are similar to those of other clinical samples of bulimia nervosa patients [1,9].

Since most bulimic individuals are well below their highest pre-morbid weights, and since they experience relatively little weight change during or after treatment [10,11], most bulimic individuals who stop binge eating and purging remain in a state of WS. The relatively low weights and high WS of many successfully treated bulimic patients might account for abnormally low caloric intake and nutritional deficiencies (e.g., insufficient intake of fat, fiber, potassium, calcium, magnesium, iron, and thiamine) that have been reported (e.g., [12–14]). Also, although the evidence concerning reduced metabolic rate in bulimia nervosa is mixed [15], WS could contribute to reduced metabolic rate in some individuals with bulimia nervosa. Taken together, the aforementioned findings suggest that WS could represent an obstacle to successful treatment, could heighten risk for relapse, and could help sustain unhealthy levels of restrained eating even among successfully treated bulimic patients.

Despite data suggesting that WS may be an important variable for understanding the symptoms and risks associated with bulimia, this variable has been subject to little empirical investigation. Data on obese individuals who have lost weight and kept it off for a lengthy period suggest that long-term maintenance of a weight loss does not increase one's risk of experiencing behavioral or psychological problems [16,17]. However, given the fact that bulimic individuals maintain an average body mass well below that of most formerly obese individuals, and that they engage in extreme behavior patterns to avoid weight gain, WS may be more problematic in bulimic individuals.

A major difference between outpatient and inpatient treatment of bulimia nervosa is the rapidity with which patients are expected to adopt a more normal eating style. In outpatient CBT treatment, patients are taught over 6–8 weeks to consume more appropriate amounts and types of food and to follow a more conventional eating schedule [6]. Thus patients have some time to adjust to the dramatic changes that are occurring in their eating pattern. In contrast, in an inpatient setting bulimic

patients are encouraged to normalize their eating patterns immediately upon admission. At the same time, their opportunity for binge eating and purging is sharply curtailed. Thus bulimic patients — and those highest in WS in particular — might be expected to gain weight during an inpatient stay.

The primary purpose of this study was to test the hypothesis that WS would predict weight gain during treatment in bulimia nervosa-spectrum inpatients. A secondary goal was to determine if weight changes experienced during hospitalization were related to change in bulimic symptoms.

## 1. Methods

### 1.1. Participants

Participants were 146 admissions between 1994 and 1999 to an urban inpatient treatment program specializing in eating disorders. Although all participants completed a diagnostic interview, the number who completed other admission and discharge measures ranged from 133 to 146. Therefore, the number of participants included in each analysis described below varies.

All participants were females who met the DSM-IV [18] criteria for bulimia nervosa or EDNOS. The initial diagnosis was made by a master's level clinician using a semi-structured interview, and the official diagnosis was then made by a psychiatrist if the patient was admitted. About one in three patients admitted to the inpatient facility receive an EDNOS diagnosis. In order to maximize our sample size and the representativeness of our data, 21% ( $N=33$ ) of the sample consisted of EDNOS patients. EDNOS patients with a BMI between 19 and 27 kg/m<sup>2</sup>, who also reported bingeing (and, typically, purging) at least one time per week at admission, were included in the current sample. The fact that these patients were hospitalized for eating problems indicates that they were experiencing a clinically significant eating disorder. Furthermore, research suggests that there are more similarities than differences between eating disordered individuals who do and do not qualify for full DSM diagnoses [19,20]. Nonetheless it should be kept in mind that about one-fifth of the participants in the sample did not meet all diagnostic criteria for this disorder. According to independent sample *t*-tests, these two diagnostic groups did not have significantly different (i.e.,  $p < .05$ ) Eating Attitudes Test total scores, Beck Depression Inventory scores, length of stay during treatment, pre-treatment WS, or weight gain during treatment. Although the Bulimia Test-Revised total scores were significantly higher for participants diagnosed with BN ( $M=115.2$ ,  $SD=16.3$ ) than for participants with EDNOS ( $M=105.8$ ,  $SD=11.3$ )  $t(138)=2.5$ ,  $p < .01$ , the mean score for participants in the EDNOS group was higher than the score of 98 that research suggests is the optimal cutoff for detecting BN (Welch, Thompson, and Hall 1993). Participants diagnosed with BN had significantly higher pre-treatment BMIs ( $M=23.5$ ,  $SD=6.0$ ) than those diagnosed with EDNOS ( $M=22.0$ ,  $SD=2.0$ )  $t(142.5)=2.3$ ,  $p=.02$ . Because of the inclusion of EDNOS patients, the sample studied here is referred to as having a bulimia nervosa-spectrum (BN-S) eating disorder.

BN-S patients' mean age at admission was 25.4 years (SD=7.9; range=14 to 53 years). Their mean length of stay was 17.2 (SD=11.2) days. Forty-six percent of the BN-S patients reported at least one previous eating disorder-related hospitalization. Ethnicity information was collected periodically throughout the data collection period. This information and past census data indicate that the treatment population was comprised largely of Caucasian patients (~96%), with few patients of Hispanic (3%) or other (1%) ethnicity.

## 1.2. Measures

### 1.2.1. Admission questionnaire

A comprehensive admission questionnaire completed shortly after admission assessed background information (including highest body weight ever), relationship issues, as well as eating disorder and psychiatric symptoms.

### 1.2.2. Height, weight and WS

Height and weight were measured in street clothes without shoes on a physician's scale. Weight was assessed at both admission and discharge.

WS was defined as the difference between highest weight ever and current measured weight, so higher scores reflected a greater discrepancy between past highest weight and current weight (i.e.,  $WS = \text{highest past weight} - \text{current weight}$ ). The validity of recalled past weights was supported by a study that found a correlation of .85 between measured body weight at age 25 and recalled weights at age 25 that were collected an average of about 20 years later [21]. Also, Swenne [22], in a retrospective analysis using measured heights and weights from school health records, found that girls diagnosed with anorexia nervosa had significantly higher BMIs than age-matched, non-eating disordered girls in the general population before the former group developed their eating disorder. The difference between the highest premorbid BMI ( $M=21.5$ ) and the anorexic patients' BMI when presenting for treatment ( $M=17.1$ ) was substantial. Although these data were based on individuals with anorexia nervosa, it is well-known that those with bulimia nervosa are often overweight before they start losing weight. Thus the foregoing evidence, along with the fact that individuals with bulimia nervosa are generally in the normal weight range when they present for treatment, indicates that most bulimic individuals are relatively high in WS.

### 1.2.3. Beck Depression Inventory (BDI)

This 21-item self-report inventory assesses various symptoms of depression. It has adequate reliability and validity [23] and is widely used in research on depression.

### 1.2.4. Eating Attitudes Test-26 (EAT-26)

This 26-item self-report inventory is a reliable and valid measure of anorexic symptoms and dimensions relevant to bulimia nervosa [24]. Factor analysis of the questionnaire produced three subscales [24]. The Dieting Subscale (EAT-D) relates to avoidance of fattening foods and a preoccupation with

being thinner. The Bulimia Subscale (EAT-B) consists of items reflecting concerns about food, as well as thoughts indicative of bulimia nervosa. The Oral Control Subscale (EAT-O) relates to self-control of eating and perceived pressure from others to gain weight.

### 1.2.5. Bulimia Test-Revised (BULIT-R)

The BULIT-R [25] is a 28-item self-report questionnaire which assesses severity of binge/purge behavior, recent weight fluctuations, and feelings about eating. A study by Thelen et al. [26] validated this measure for use with the updated DSM-IV criteria for bulimia nervosa.

## 1.3. The treatment approach

The residential facility where the data were collected specializes in the treatment of women with eating disorders. Each patient was assigned to a treatment team consisting of a clinical psychologist, a psychiatrist, a master's level primary therapist, a registered nurse, a dietician, a family therapist, and art and movement therapists. Individual therapy and family therapy occurred approximately 4 times per week, where an integration of psychodynamic, interpersonal, and cognitive-behavioral strategies was used. Patients also attended weekly group meetings, which emphasized topics such as self-esteem, nutrition, sexual abuse, body image, eating patterns, interpersonal relations, and cognitive restructuring. Because this treatment facility also had a policy of placing underweight patients (i.e.,  $BMI < \sim 19 \text{ kg/m}^2$ ) on a supervised weight restoration program, the caloric intake prescribed for the thinnest bulimic patients was adjusted so they would gain some weight while hospitalized (though not as much as anorexic patients). Because encouragement to gain weight could be a confound in this study, patients with a pre-treatment BMI below  $19 \text{ kg/m}^2$  were excluded from the data analyses.

## 1.4. Procedures

Admission assessment measures (i.e., admission questionnaire, BDI, EAT-26, and BULIT-R) were administered to patients after their admission interview. Discharge materials (i.e., BDI, EAT-26, and BULIT-R) were completed during the last day or two of a patient's hospital stay.

## 2. Results

At admission, the mean BMI of the BN-S sample ( $N=146$ ) was  $23.2 \text{ kg/m}^2$  (SD= $5.4 \text{ kg/m}^2$ , range= $19.0$  to  $56.09$ ), which is similar to that of outpatient samples. Thirty-one patients had BMIs below 19 and were excluded from the analyses. Of the remaining sample, 80% had a BMI in the normal weight range (i.e., less than  $25 \text{ kg/m}^2$ ), 13.7% had a BMI in the overweight range ( $25$ – $29.9 \text{ kg/m}^2$ ), and 6.2% had a BMI in the obese range ( $30 \text{ kg/m}^2$  or greater). The mean degree of WS at admission (difference between self-reported highest weight ever and measured admission weight) for this sample was  $12.0 \text{ kg}$  ( $26 \text{ lb}$ , range 0 to  $99.43 \text{ kg}$ ). During an average hospital stay of

17.2 days (SD=11.2), patients gained an average of 1.1 kg (SD=1.9) or 2.5 lb.

A multiple regression analysis examined the prediction of weight gain during hospitalization. Length of stay was entered as a covariate with WS. Length of stay was not related to weight change during hospitalization ( $\beta=.11$ ,  $p=.23$ ). WS was a significant predictor of weight change when length of stay was held constant ( $\beta=.21$ ,  $p=.03$ ), with those highest in WS gaining the most weight. WS accounted for 4.7% of the variability in weight gain.

It is possible that WS predicted weight gain not because of the discrepancy between highest and current weight but because the higher historical weights of those high in WS reflects a predisposition toward weight gain that also manifested itself during the hospitalization. However, WS remained a significant predictor of weight change when previous maximum BMI was held constant ( $\beta=.71$ ,  $p<.001$ ). Previous maximum BMI also predicted weight gain when WS was held constant ( $\beta=-0.64$ ,  $p<.001$ ), with participants having greater maximum previous weights gaining less weight during treatment. This finding is opposite to what would be expected if WS predicted weight gain because it served as a proxy for a general tendency toward weight gain as reflected in previous highest BMI.

We also examined the correlation between pre-treatment BMI and WS to see if WS might be predictive because the thinnest patients were most weight suppressed. This correlation was not significant ( $r=.09$ ,  $p=.29$ ). However, since it was still possible that those with the lowest pre-treatment BMIs gained the most weight during treatment, we examined the relationship between pre-treatment BMI and weight gain. Those with lower pre-treatment BMIs gained more weight during treatment ( $r=-.36$ ,  $p<.001$ ). Pre-treatment BMI and WS were then entered simultaneously in a regression to examine their predictive effects on weight gain. WS remained a significant predictor of weight gain when pre-treatment BMI was controlled ( $\beta=.25$ ,  $p<.01$ ). Pre-treatment BMI also was a significant predictor of weight gain when WS was controlled for ( $\beta=-.34$ ,  $p<.01$ ), again with the thinnest patients gaining most weight. Together these two variables accounted for 17.5% of the variability in weight gain. The interaction of pre-treatment BMI and WS in the prediction of weight gain was not significant ( $\beta=-.11$ ,  $p=.27$ ), suggesting that although pre-treatment BMI independently predicted weight gain, the relationship between WS and weight gain during treatment did not depend on pre-treatment BMI.

Because WS among BN-S individuals could stem at least in part from current (as opposed to past) dieting, it is possible that WS predicted weight gain because it reflects the present intensity of dieting behavior. However, the correlation between WS and pre-treatment EAT-D scores ( $r=.10$ ,  $p=.22$ ) was not significant. EAT-D scores and WS were entered simultaneously in a regression to examine their predictive effects on weight gain. WS remained a significant predictor of weight gain when EAT-D scores were controlled ( $\beta=.19$ ,  $p=.03$ ). EAT-D scores also were a significant predictor of weight gain when WS was controlled for ( $\beta=.28$ ,  $p<.01$ ), with patients dieting most at pre-treatment gaining the most weight. The interaction term of EAT-

D scores and WS was not significant ( $\beta=.02$ ,  $p=.82$ ), indicating that the relationship between WS and weight gain does not depend on EAT-D scores.

Another alternative explanation for the results is that patients highest in WS were purging more often when admitted to the hospital and were therefore more dehydrated and more likely to gain weight when their purging stopped. To test this possibility we examined the relationship between WS and weight gain when the self-reported frequency of purging during the period prior to hospitalization (collected on the Admissions Questionnaire) was controlled. WS continued to predict weight gain when purging was entering simultaneously in a multiple regression ( $\beta=.24$ ,  $p=.01$ ). When WS was controlled, purging did not predict weight gain ( $\beta=-.06$ ,  $p=.50$ ). Therefore, there was no evidence that dehydration contributed to the prediction of weight gain by WS.

Pearson correlations were utilized to examine the relationship between weight change and change on the BDI and the three subscales of the EAT-26 (EAT-B, EAT-O, and EAT-D). The more weight BN-S patients gained during hospitalization, the more their EAT-B ( $r=.17$ ,  $p<.05$ ), EAT-O ( $r=.21$ ,  $p=.01$ ), and BDI scores ( $r=.20$ ,  $p=.02$ ) decreased. EAT-D change scores were not significantly correlated with weight gain. Thus weight gain was associated with improvement in binge eating, oral control, and depressive symptoms from pre- to post-treatment.

### 3. Discussion

The BN-S inpatients studied here presented with an average BMI at admission of 23.2 kg/m<sup>2</sup>, which is somewhat higher than the mid-point (21.75) of National Institutes of Health (NIH) recommendations for healthy BMI (18.5–25 kg/m<sup>2</sup>; NIH, 2000). The patients gained a mean of 1.1 kg (2.5 lb) during an average inpatient stay of 17 days. Given the brevity of the inpatient stay, this outcome is markedly different from the outcome of outpatient trials of various psychotherapies for bulimia nervosa, where weight typically does not change significantly over a period of about five months [5,6].

The primary aim of this study was to examine whether WS (i.e., the discrepancy between admission BMI and highest BMI ever) predicted weight change during hospitalization. The results indicated that WS accounted for significant variance in weight change (which mostly reflected weight gain). Lower pre-treatment BMI also significantly predicted greater weight gain, independently of WS. These findings indicate that greater weight gain during treatment can be predicted by two factors: how far below previous maximum weight a patient is, and a patient's BMI at admission. The significant prediction of weight gain by WS cannot be explained by staff encouragement of weight gain because those patients who were encouraged to gain weight (i.e., those with a BMI below 19 kg/m<sup>2</sup>) were excluded from the data analysis.

The tendency for patients with lower pre-treatment BMIs to gain more weight during treatment may be a result of biological aspects of low body weight (such as reduced metabolic rate).

The ability of WS to predict weight gain when pre-treatment BMI is controlled indicates that discrepancy from highest premorbid weight predicts weight gain regardless of a patient's current body mass in absolute terms. The greater weight gain among higher WS patients may reflect biological or behavioral mechanisms that are compensatory in nature, such as reduced metabolic rate or increased appetite. Alternatively, these findings might reflect the influence of whatever biological or behavioral mechanisms were responsible for producing the elevated weights in the first place. However, WS continued to be a strong predictor of weight gain when highest previous BMI was controlled; indeed, higher historical BMIs predicted reduced, rather than increased, weight gains. The results of analyses controlling for frequency of pre-treatment purging indicated that the prediction of weight gain by WS was probably not due to the possibility that the most dehydrated patients gained the most weight.

Given that bulimic individuals tenaciously avoid weight gain, the ability of WS and BMI to predict weight gain suggests that they are powerful influences on energy balance. The notion that patients gained weight despite their antipathy toward weight gain is supported by the results of another study conducted on the same patient population [27]. This study found a trend indicating that the more weight BN-S inpatients gained during hospitalization, the more they had lost at a three-month follow-up.

The cognitive-behavioral model of bulimia nervosa views current dieting as the key proximal cause of the maintenance of bulimic symptomatology [6,28]. When EAT-D scores were used as a covariate in the regression analyses, they too were found to predict weight change during the hospitalization (i.e., higher levels of dieting at admission predicted greater weight gain). When patients are admitted to inpatient treatment, they are suddenly required to relinquish binge eating and purging and to consume a more normalized diet. It is possible that BN-S patients who were dieting at the outset of treatment were not as prepared to cope with this sudden change and thereby gained more weight. Whatever the mechanism of action, these data are consistent with previous studies in non-clinical populations that have found that restrained eating is a prospective predictor of weight gain [29–31].

Consistent with the second hypothesis examined in this study, weight gain during hospitalization was weakly but consistently related to improvement in several clinical indices examined. It is impossible to determine how much of the individual differences in weight gain were due to changes in energy expenditure or energy intake. To the extent that they were due to the latter, the observed relationships might reflect that fact that as eating disorder-related psychopathology decreased, patients felt more comfortable consuming more food. Assuming that these findings are replicable, it will be important in future research to determine whether these relationships are clinically meaningful (e.g., indicating that patients who genuinely improve manifest their improvement both in terms of symptom reduction and weight gain) or if they are actually a further manifestation of bulimic pathology (i.e., the most compliant patients might both gain the most weight

and report the greatest symptom reductions, perhaps to hasten their discharge).

A recent study by our group [32] found that weight suppression was a robust predictor of outcome in a multi-site trial of cognitive-behavioral therapy for bulimia nervosa. At the outset of the trial, bulimic participants who eventually dropped out of the study were higher in weight suppression than those who completed the trial, and those who failed to achieve abstinence from binge eating and purging at the end of the trial were higher in weight suppression than those who achieved abstinence. These findings, combined with those of the present study, suggest that weight suppression may represent a serious obstacle to the successful treatment of bulimia because more weight suppressed patients may be especially concerned about gaining weight if they were to normalize their food intake and stop purging. Given their premorbid tendency toward overweight [3,33] and the fact that weight suppression could further increase their predisposition toward weight gain [32], these fears may be at least partially grounded in reality.

The results of the present study, along with those reported by Butryn et al. [32], suggest that cognitive-behavioral treatments for bulimia nervosa, which focus on modifying maladaptive cognitions and behaviors related to weight control, also need to take into account patients' body weight, in relation to both their highest weight ever and to the medically appropriate weight for their height. To the extent that patients' body weights are low in relative or absolute terms, it may mean that they need to gain some weight during treatment to reduce the potential conflict between the maintenance of a low body weight (in relative or absolute terms) and the normalization of their eating habits.

Two limitations of the current study require comment. First, the participants included in this study represented less than half of all BN-S patients admitted during the data collection period. Those patients who completed measures at admission and discharge did not differ significantly from those who completed measures only at admission [27]. Nonetheless, the generalizability of these findings to bulimic inpatients generally is unknown.

Second, to determine WS values, each individual's highest adult weight was obtained by self-report. Given that most eating disordered individuals are highly sensitive about their weight, the recall of highest weight may be biased. It would therefore be desirable in future research to collect a second source of data to check the validity of patients' reports of highest historical body weights.

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