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Restrictive dieting vs. “undieting” Effects on eating regulation in obese clinic attenders

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Abstract

This study tested predictions from restraint theory [Herman & Polivy (1984). A boundary model for the regulation of eating. In: A. J. Stunkard, & E. Stellar (Eds.), *Eating and its disorders* (pp. 141–156) New York: Raven Press.] and the three-factor model of dieting [Psychol. Bull. 114 (1993) 100.] using an eating regulation paradigm. Participants were 42 obese, nonbinge eaters assigned to either a weight loss group (restrictive dieters or RDs) or a group designed to eliminate dieting (“undieters” or UD). Participants took part in an ostensible ice cream taste test with or without a preload, both before and after the weight control intervention. At pretest, restraint theory’s prediction that participants would engage in counter-regulatory eating was not supported. At posttest, after 8 weeks of the dieting interventions, RDs increased and UD decreased their intake following a preload, a pattern most consistent with the predictions of restraint theory. This counter-regulatory trend was observed in spite of a significant decrease in RDs’ Disinhibition scale scores following treatment. Implications of these findings for restraint theory, the three-factor model of dieting, and relapse in obesity treatment were discussed. © 2001 Elsevier Science Ltd. All rights reserved.

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Restrained eating refers to the chronic effort to limit food intake for the purpose of weight control. According to restraint theory, the dietary limitations restrained eaters impose upon themselves make them vulnerable to disinhibiting influences such as high-calorie preloads and emotional distress (Herman & Polivy, 1984). Such influences are thought to undermine restrained eaters’ ability to retain control over their eating. Thus, restrained eaters eat

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somewhat more after consuming a milkshake preload than after consuming no preload (a pattern called counter-regulatory eating) and eat more when exposed to emotionally distressing stimuli than when exposed to neutral stimuli (Lowe, 1993; Ruderman, 1986). Unrestrained eaters, by contrast, experience no change or a reduction in their eating when confronted by these disinhibiting stimuli.

Despite general agreement on these points, a number of questions have been raised about restraint theory (Lowe, 1993). The present study was designed to investigate two of these questions. The first is whether the predictions of restraint theory apply to individuals who are dieting to lose weight. The second is whether the predictions of restraint theory apply to overweight individuals. Evidence related to both of these issues is presented below.

1. Restrained eating vs. dieting to lose weight

The developers of restraint theory view the constructs of “restraint” and “dieting” as equivalent (Herman & Polivy, 1984; Polivy & Herman, 1985). They use the terms “restrained eater” and “dieter” interchangeably and also characterize restrained eaters as having imposed a “diet boundary” on their eating behavior (Herman & Polivy, 1984). However, Lowe (1993) reviewed a variety of studies that found that most restrained eaters are not currently dieting to lose weight and that those who are dieting respond differently on a variety of appetitive and eating-related measures than those who are not. For instance, among restrained eaters, those who are currently dieting to lose weight tend to eat less with than without a preload, whereas those not currently dieting show the opposite eating pattern (Lowe, 1994; Lowe, Whitlow, & Bellwoar, 1991).

A shortcoming of existing research on both restraint and dieting is that they are typically measured as individual difference variables rather than being manipulated experimentally. One goal of the present research was to address this limitation by manipulating these variables and studying their effects on eating regulation. A unique feature of our dieting manipulation was its bidirectional nature — that is, dieting behavior was increased in one group and decreased in another. By attempting to change dieting intensity in opposite directions, we were able to conduct a more definitive test of the contrasting predictions of restraint theory (Herman & Polivy, 1984) and the three-factor model of dieting (Lowe, 1993).

The present study took place within a larger project comparing different approaches to weight control in obese individuals. One group, assigned at random to a restrictive diet condition, lost weight by going on a low-calorie diet and applying various cognitive-behavioral strategies to change their eating behavior. This group was expected to lose a substantial amount of weight (5 kg or more, on average) in the 8 weeks during which the study was implemented. Thus, this group represented a good operationalization of the construct of “dieting to lose weight.” If findings on eating regulation in normal weight current dieters (Lowe, 1994; Lowe et al., 1991) are applicable to obese clinic attenders who are losing weight, then after weight loss nonpreloaded restrictive dieters (RDs) should increase their food intake and preloaded RDs should decrease their intake. From restraint theory’s point of view, on the other hand, RDs will have been taught to impose a very clear-cut “diet boundary” (Herman & Polivy, 1984) on their eating and, after losing weight, would therefore be expected to demonstrate the opposite eating pattern (i.e., to show counter-regulatory eating).

According to Heatherton, Herman, Polivy, King, and McGree (1988), the restraint construct reflects unsuccessful dieting, wherein a weight-conscious person continuously attempts to diet, only to have his or her diets undermined by bouts of disinhibited eating. These repeated cycles of dieting and overeating are viewed as creating or worsening body image and self-esteem problems as well as undermining the normal functioning of hunger and satiety mechanisms (Herman & Polivy, 1984; Polivy & Herman, 1993). Obviously, it would be neither feasible nor appropriate to try to experimentally recreate the cycles of dieting and dieting failure which characterize restrained eating. However, it is possible to *reduce* restrained eating by eliminating dieting attempts, promoting reliance on internal hunger and satiety signals to regulate eating, and addressing the overvaluation of thinness that characterizes restrained eaters. Polivy and Herman (1992) have in fact developed just such an “undieting” program. In a pilot study of this 10-week program conducted with 15 obese women, participants showed improvements in mood and self-esteem, as well as on several scales of the Eating Disorders Inventory (Garner, Olmsted, & Polivy, 1983).

In the present study, a second group of obese women was randomly assigned to an “undieting” condition modeled after Polivy and Herman’s intervention. In the first 8 weeks of this condition, participants were encouraged to abandon dieting, a recommendation that was based on the arguments that: (a) many of the presumed benefits of weight loss do not occur; (b) dieting-induced weight loss is short-lived; and (c) the costs of dieting exceed the benefits (Polivy & Herman, 1983). These individuals were expected to become less invested in losing weight via dieting and, in fact, to lose little if any weight over 8 weeks. If it is true that chronic dieting efforts undermine the regulation of eating (Herman & Polivy, 1984), then reducing dieting behavior should improve eating regulation. Thus, according to restraint theory, nonpreloaded undieters (UDs) should eat more after 8 weeks of treatment (because they are no longer trying so hard to limit their eating) and preloaded UD should eat less (since they should have less of a “diet boundary” for the preload to undermine). According to Lowe (1993), on the other hand, the relinquishing of whatever dietary control participants were practicing should reduce eating in the no-preload condition and increase it in the preload condition. In sum, opposing predictions are made from the perspective of “current dieting” (Lowe, 1993) and the perspective of restrained eating (Herman & Polivy, 1984) in both the restrictive dieting and the undieting conditions.

2. Restraint, obesity, and eating regulation

Restraint theory was originally developed as an explanation for differences in the behavior of normal weight and overweight individuals. Nisbett (1972) had suggested that previously observed characteristics of obese individuals (e.g., Schachter, 1968) might be due to the fact that they were suppressing their weight below its biologically appropriate level. Herman and Mack (1975) and Herman and Polivy (1975) extended this argument by suggesting that normal weight individuals who were restraining their eating should behave similarly to overweight individuals. This hypothesis has been supported in some areas (e.g., emotional reactivity and distractibility — see Herman & Polivy, 1980), but it has not been supported in the area of counter-regulatory eating. Ruderman and Christensen (1983) examined the

applicability of restraint predictions to the eating regulation of obese individuals, and Ruderman and Wilson (1979) examined the same question by reanalyzing the data from two previous studies (Hibschler & Herman, 1977; Spencer & Fremouw, 1979). The conclusion reached from these analyses was that neither obese individuals in general, nor obese individuals who scored highest in restraint, were prone to counter-regulatory eating (Ruderman, 1986). When dieting rather than restraint was assessed, Lowe et al. (1991) also found that overweight individuals, regardless of dieting status, regulated their intake following a preload. McCann, Perri, Nezu, and Lowe (1992) proposed that the absence of counter-regulation among overweight individuals in these studies might be due to the fact that they were all done with college students, and that overweight college students were perhaps not sufficiently high in restraint to demonstrate the counter-regulatory effect. McCann et al. examined eating regulation (prior to the start of a weight loss program) among an older group of obese clinic attenders, who, they reasoned, would have had a much more extensive history of unsuccessful dieting. Consistent with this reasoning, the obese clinic attenders demonstrated a clear-cut pattern of counter-regulatory eating. They consumed twice as much ice cream after consuming either one or two milkshake preloads than after consuming no preload. Furthermore, McCann et al. found support for Polivy and Herman's (1985) contention that counter-regulation is a marker of binge-eating tendencies by showing that the degree of counter-regulatory eating was directly related to the severity of the participants' binge-eating problems. Since even those who scored in the lowest third of the distribution of binge-eating scores showed a counter-regulatory eating pattern, we predicted that subjects in the present study would demonstrate a counter-regulatory eating pattern at pretest.

Two additional studies have examined food intake in a controlled setting among overweight individuals who underwent weight loss. One assessed intake without a preload (Rodin, Slochower, & Fleming, 1977) and the other measured intake both without and with a preload (Wardle & Beales, 1988). These studies found that overweight people increase their food intake following weight loss irrespective of preload condition.

A final feature of the present study was its exclusion of binge eaters. Individuals responding to advertisements for the study were screened to exclude those who had experienced any episodes of objective binge eating (Fairburn & Cooper, 1993) during the prior 3 months. This was done so that the emergence of any binge-eating problems during the study could be clearly attributed to the effects of treatment per se. While this provision would be expected to limit the degree of counter-regulation that might occur at pretreatment (McCann et al., 1992), there is no reason to expect that it would otherwise affect the predictions made earlier.

3. Methods

3.1. Participants

Participants for this study were recruited from a larger pool of 154 obese women who ranged in age from 24 to 66 (mean age = 44.32, S.D. = 10.19). Their body mass index (BMI; kg/m²) ranged from 27.4 to 46.3 kg/m² (mean BMI = 36.1, S.D. = 4.45). Recruitment took

place at the University of Pennsylvania Weight and Eating Disorders Program. All participants had expressed an interest in joining a research study comparing different approaches to long-term weight control. Participants were excluded from the study if they had: a history of objective binge-eating episodes in the previous 3 months, as assessed by the Eating Disorder Examination (EDE; Fairburn & Cooper, 1993); an eating disorder within the past 10 years; a diagnosis of bipolar or major depressive disorder (as defined by DSM-IV; American Psychiatric Association, 1994); a substance abuse or dependence disorder; any major psychiatric disorder; were currently taking any medications that affect weight or energy expenditure; any health condition which precluded them from participation in a restrictive diet (heart conditions, history of cancer, diabetes, pregnancy, etc.).

There were four treatment conditions overall in the study. However, participants in two of these conditions (a lifestyle modification group and a minimal-treatment control condition) were excluded from the eating regulation study. Participants in the Restrictive Dieting (RD) and Undieting (UD) groups were invited to participate in the eating regulation study, but involvement in the eating regulation study was not required as part of the larger project on alternative approaches to weight control.

A total of 50 women were originally recruited to participate. Over the course of the experimental protocol, eight participants were withdrawn. One woman (assigned to the undieting-preload condition) was excluded from the study because she was found vomiting in the wastebasket of the test room immediately after eating the ice cream at pretest. She claimed that she must have “some kind of aversion to ice cream.” Another participant (assigned to the restrictive dieting-preload condition) refused to complete the posttest eating test because she was afraid of overeating and feeling guilty about breaking her diet. Six additional participants (three assigned to the restrictive dieting-no-preload condition and three assigned to the undieting-no-preload condition) failed to complete the posttest because of scheduling difficulties or other complications. Final analyses were conducted on a sample of 42 females. The participants had a mean age of 43.4 years (S.D. = 10.11) and a mean BMI of 35.84 (S.D. = 4.01). Thirty-five of the original participants (70%) were Caucasian, 14 (28%) were African American, and 1 (2%) was Hispanic.

3.2. Procedure

Participants in this study were told that we were interested in studying taste preferences before they began the program and 8 weeks later. When the study was completed, they were informed of our interest in the amount of ice cream consumed, as well as why this information was initially withheld.

The RD group consumed their normal diet for 1 week while keeping food records. They then began a medically supervised, low-calorie diet that consisted of four servings daily of a liquid diet combined with an evening meal of a frozen-food entree and two cups of salad. This dietary regimen was maintained from weeks 2 to 13. For weeks 14–20, participants began to gradually substitute conventional foods for the liquid formula while continuing to lose weight. During the first 20 weeks of the program, participants attended weekly group sessions that focused on cognitive-behavioral methods of weight reduction (Wadden & Foster, 1992). Weeks 20–40 involved instruction in weight loss maintenance.

The UD group received weekly group sessions focusing on the “undieting” approach. During weeks 1–7, participants were taught to abandon dieting and relearn how to recognize and respond to their bodies’ internal cues for hunger. Weeks 8–20 were devoted to learning the principles of natural eating as an alternative to dieting and methods of dealing with negative body image.

The present study examined RDs ($n = 22$) and UD s ($n = 20$) prior to treatment onset (week 0) and after 8 weeks of intervention (week 9). These two groups were selected because they were considered to represent opposing approaches to weight loss. The RD group maximized the cognitive and behavioral restraint of eating, while the UD intervention encouraged participants to abandon their former cognitive and behavioral restraints. In the RD group, restraint was expected to increase and weight to decrease. In the UD group, restraint was predicted to decrease but no systematic changes in weight were expected.

Participants in these two groups were assigned at random to a preload or no-preload condition for the “taste preference” manipulation. This created a total of four groups for analysis [restrictive dieting-preload (RD-P; $N = 11$); restrictive dieting-no preload (RD-NP; $N = 11$); undieting-preload (UD-P; $N = 11$); undieting-no preload (UD-NP; $N = 9$)]. The preload condition was treated as a repeated measure, so participants were tested in the same preload condition before and after the 8-week dieting intervention.

In most cases, participants were scheduled to complete the eating regulation experiment immediately following completion of an EDE interview (Fairburn & Cooper, 1993) at baseline and after 8 weeks of treatment. In cases in which this was not possible, participants were scheduled to come in specifically for the eating test at their convenience. Because scheduling for the eating regulation study was usually based on the scheduling of the EDE for the larger study, the eating regulation component was administered any time from mid-morning to early evening. This wide range of testing times precluded any instructions about food consumption prior to the experiment. However, since most participants were scheduled immediately following their EDE, the majority had not eaten for at least 1 h.

During the taste test manipulation, participants were seated in a small private room at a table. Using procedures very similar to those used in past eating regulation studies (Herman & Mack, 1975; Lowe et al., 1991), they were told that the experimenters were interested in examining how their taste preferences might change after 8 weeks of treatment. Participants were told that the experiment involved both a preload and a no-preload condition because past research had studied taste preferences in these two conditions. Those who were randomly assigned to the preload condition were instructed that they would need to drink a milkshake prior to completing the taste test. The experimenter explained that the purpose of the preload was to examine whether earlier taste experiences affected subsequent taste ratings. To maintain standardization, they were asked to drink the entire 8-oz milkshake (which consisted of 4 oz of whole milk, 4 oz of vanilla ice cream, and 1 tablespoon of chocolate syrup). Participants were given the opportunity to ask questions about the instructions. Questions were answered in a manner consistent with the “taste test” explanation.

Just prior to the eating test, participants were presented with a 100-mm visual analog scale of hunger. The scale was anchored on either end with the labels “not hungry at all” and “as hungry as I’ve ever felt.” Participants were instructed to mark the point on the line which best represented their current state of hunger. Those in the preload condition proceeded to the

“taste test” immediately after drinking the milkshake preload. Those in the no-preload condition proceeded directly to the taste test.

For the “taste test” portion, participants were presented with a bowl of three different ice cream flavors. The ice cream was presented in a set order with chocolate on the left, vanilla in the middle, and a combination flavor (e.g., sundae or cookies-n-cream) on the right. The combination flavor varied with availability. Each bowl contained approximately 500 g of ice cream, which was premeasured. In addition, participants were given a spoon, a napkin, and a six-item taste rating (e.g., sweet, creamy, rich, etc.) questionnaire for each flavor. The participants were instructed to taste as much of each flavor as needed to make an accurate taste rating and then rate it on the six-item questionnaire. Participants were encouraged to help themselves to the remaining ice cream following the initial ratings but were asked not to change the ratings. The experimenter explained that the participant would have 10 min to complete the taste test after which time the experimenter would return. Participants were asked to focus only on the task at hand for the time allotted.

Participants underwent the same taste test manipulation after 8 weeks of their designated treatment. At posttest, they were again administered the standardized directions for the taste test. Two participants who did not follow pretest directions for remaining in the testing room for a full 10 min (one remained in the room for 6 min and one for 8 min) were given the same time for the posttest eating session as they had taken at the pretest session. Following the taste test, the participant was thanked for participation and escorted out of the test room. Amount of ice cream consumed was determined by comparing the weights of the bowls before and after the eating regulation test.

3.3. Measures

3.3.1. *Herman and Polivy Restraint Scale*

The Restraint Scale (Herman & Polivy, 1980) is a 10-item measure of chronic dieting. Research has shown that restrained eaters eat more than unrestrained eaters when confronted by disinhibiting influences (Lowe, 1993). The Restraint Scale consists of two factors usually called Weight Fluctuation and Dietary Concern (Ruderman, 1986). Because the RD intervention produced weight loss and because of questions about the validity of the Weight Fluctuation subscale in obese people (Ruderman, 1986), the Weight Fluctuation factor was not used.

3.3.2. *Eating disorder examination*

The EDE is a 62-item semistructured interview that assesses psychopathology specific to eating disorders. It has demonstrated excellent interrater reliability, internal consistency, and validity (Fairburn & Cooper, 1993). The EDE was used to derive a second measure of restraint and to screen out binge eaters.

3.3.3. *Eating Inventory (EI)-Cognitive Restraint Scale*

The EI-Cognitive Restraint Scale is a measure of cognitive and behavioral strategies for reducing food intake. It has been shown to predict food restriction in the natural environment (Lowe, 1993).

3.3.4. Eating Inventory-Disinhibition Scale

The EI-Disinhibition Scale is a measure of overeating associated with various disinhibitors. It has been associated with increased eating and degree of overweight in a number of studies (Lawson et al., 1995; Westenhoefer, 1991).

4. Results

4.1. Treatment effects

To determine if the two treatments produced the expected effects, we first analyzed changes in weight, hunger, restraint, and overeating during the first 8 weeks of treatment. Table 1 shows these results.

4.1.1. Weight change

An analyses of variance (ANOVA) with one between-group factor (RD vs. UD) and one within-group factor (pre- vs. posttesting) was conducted to determine how the RDs and UDs changed over time. RDs lost more weight (mean weight loss = 7.47 kg; S.D. = 2.24) in the first 8 weeks of treatment than UDs, as reflected by the significant Group \times Time interaction. BMI for UDs remained virtually unchanged in this interval (with a mean weight gain of 0.06 kg).

4.1.2. Hunger

On the visual analog hunger scale, the only significant effect was for time; hunger increased in both groups from pre- to posttest [$F(1,38) = 9.09$; $P < .01$].

Table 1
Mean pre–post changes on weight and eating-related measures

	Week 0		Week 9		<i>F</i> for interaction effect
	Restrictive dieting	Undieters	Restrictive dieting	Undieters	
Weight (lb)	210.30 (28.40)	215.73 (26.17)	194.58 (27.74)	215.86 (27.32)	173.80**
Visual analog hunger rating	28.50 (22.21)	25.64 (23.05)	36.73 (23.60)	43.25 (20.59)	1.90
EI-Disinhibition Scale	10.48 (3.28)	10.45 (2.79)	8.14 (3.57)	9.59 (3.05)	4.46*
Herman and Polivy Dietary Concern Scale	11.20 (3.50)	10.36 (3.33)	12.89 (3.41)	7.77 (3.12)	32.99**
EDE-Restraint Scale	1.69 (1.53)	1.12 (1.25)	2.99 (0.59)	0.58 (0.82)	16.77**
EI-Restraint Scale	8.88 (4.13)	8.82 (4.33)	13.29 (3.59)	7.50 (3.16)	26.08**

Figures in parentheses are standard deviations.

* $P < .05$.

** $P < .001$.

4.1.3. Disinhibition

On the EI-Disinhibition Scale, both groups showed a decrease in disinhibited eating. However, RDs showed a bigger decrease than UD s [$F(1,38)=4.46$; $P<.05$].

4.1.4. Restrained eating

Significant interaction effects were found for all measures of restraint, with RDs showing increases and UD s showing decreases on the EI-Restraint, Dietary Concern and EDE-Restraint subscales. These findings confirm that the respective treatments were successful in changing restraint levels in the desired direction.

4.2. Changes in ice cream consumption

Analyses were conducted to examine the effects of the preload manipulation on ice cream consumption from before to after the first 8 weeks of the weight control program. Fig. 1 depicts these results.

A main effect for Time indicated that, as a group, participants ate more at posttest than at pretest [$F(1,38)=4.12$; $P<.05$]. The main effect for Preload condition was not significant, and the main effect for Diet Condition was marginally significant [$F(1,38)=3.50$; $P<.07$], with RDs tending to eat more than UD s overall. The Diet Condition \times Time, the Preload \times Time, and the Diet Condition \times Preload interaction effects were not significant. A three-way ANOVA examining the Diet Condition \times Preload \times Time interaction was marginally significant [$F(1,38)=3.74$; $P<.07$]. Controlling for changes in BMI, EI-Restraint, EDE-Restraint, Dietary Concern, Hunger, or EI-Disinhibition ratings left the interaction term essentially unchanged (the P values remained in the marginally significant range).¹

The prediction from restraint theory that participants would engage in counter-regulatory eating at pretest was not borne out; collapsing across dieting groups, participants ate nonsignificantly less in the preload condition than in the no-preload condition, $t(41)=0.97$; ns. Next, three planned comparisons were conducted to test the predictions based on the restraint and three-factor dieting models, as described earlier. The restraint hypothesis that preloaded RDs would eat more after than before dieting was tested. Preloaded RDs almost doubled their intake at posttest. A one-tailed t test examining this change was only marginally significant, $t(10)=1.61$, $P<.08$. The related prediction that RDs would counter-regulate at posttest was not supported; while preloaded RDs ate somewhat more than nonpreloaded RDs at posttest, this was not significant. Finally, the prediction that following the intervention preloaded RDs would eat more than preloaded UD s was tested. A trend consistent with this prediction was again found, $t(20)=1.47$, $P<.09$, one-tailed.

One striking aspect of the foregoing results was the dissociation between changes in eating behavior and changes in the EI-Disinhibition measure. That is, at the same time

¹ One outlier was identified among the participants. This individual, who had been assigned to the RD-P group, consumed 707 g of ice cream at posttest. This intake was considerably higher than that of all other participants, with the next highest posttest intake being 369 g. Despite this intake, the individual showed a weight loss of 15.2 lb in the 8-week period and a decrease in EI-Disinhibition ratings. Removing this participant's data from the data set did not appreciably alter the three-way interaction [$F(1,37)=3.38$, $P<.08$].

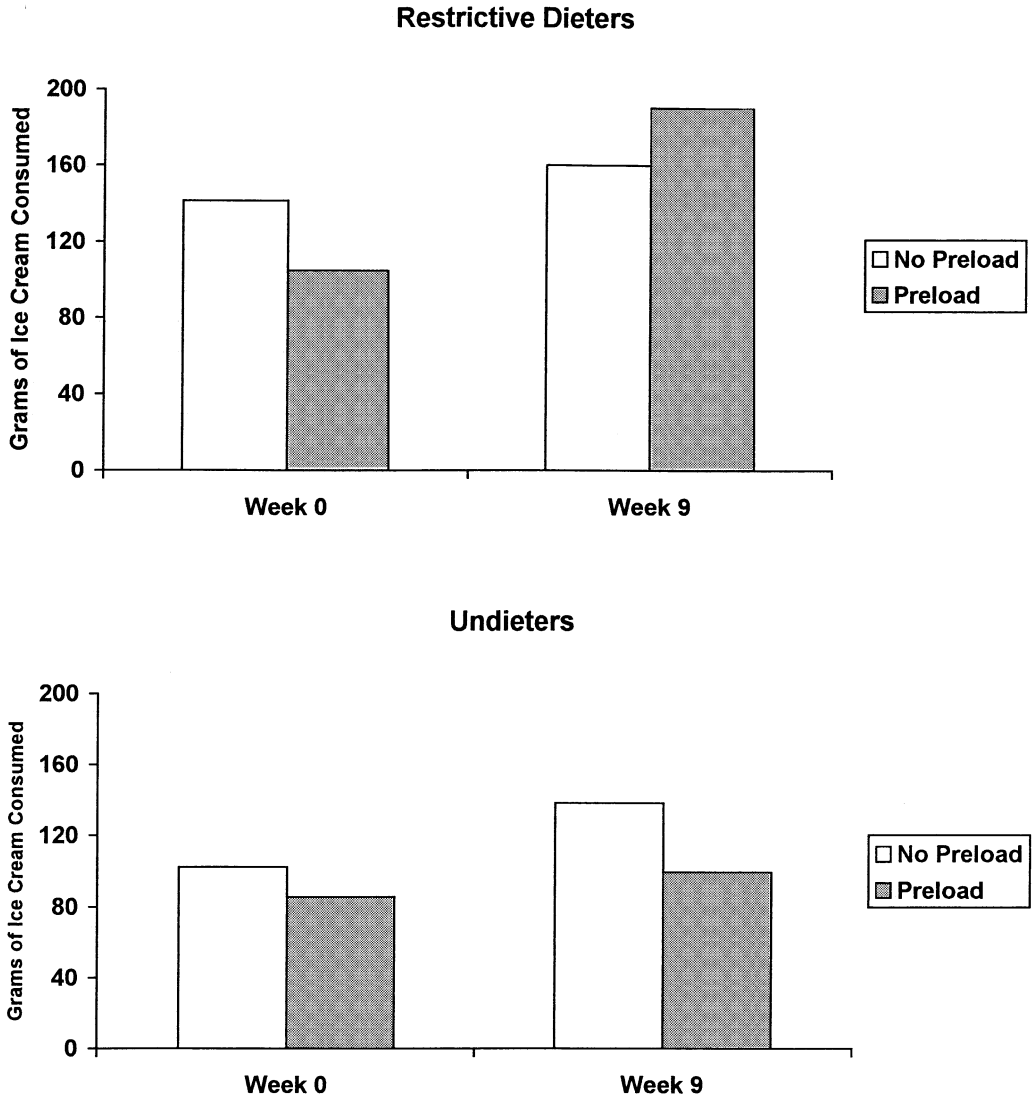


Fig. 1. Mean grams of ice cream consumed before (week 0) and after (week 9) the dieting intervention based on preload status and type of dieting intervention.

that RDs showed some evidence of disinhibition in their eating behavior after dieting, they also showed significantly greater declines (relative to UDs) on the Disinhibition Scale. To further study the relationship between these two measures of disinhibition in the preloaded RDs, we divided them into two groups by doing a median split on their ice cream intake at posttest. Although the resulting groups were very small ($n=5$ and 6 in the high- and low-intake groups, respectively), we then compared them on their Disinhibition Scale change scores from pre- to posttest. While both groups' Disinhibition scores decreased over time, the decrease in the low-intake group (3.2 units) was

significantly larger than the decrease in the high-intake group (1.45 units), $t(10)=1.73$, $P=.05$, one-tailed.

5. Discussion

The ability to test the eating regulation hypotheses examined in this study depended upon the creation of differences between the RD and UD groups that were consistent with their respective rationales. This differentiation between the groups was successfully achieved. The RD group lost a substantial amount of weight during the 8 weeks of the intervention, whereas the UD group's weight stayed the same. The changes in all three measures of restraint — with RDs showing increases and UDs showing decreases — were also in line with the rationale underlying each of the interventions.

At pretest, the prediction from restraint theory that the obese participants would engage in counter-regulatory eating was not supported. This result also contrasts with McCann et al. (1992), who found that their obese clinic attenders engaged in counter-regulatory eating prior to treatment, with the extent of counter-regulation being directly proportional to participants' level of binge-eating problems. Even those who scored in the bottom third of the Binge Eating Scale distribution in the McCann et al. study showed a fairly sizable increase in their eating following a preload (eating about 54% more after the preload than after no preload). Although our sample consisted entirely of nonbinge eaters, their mean score on the Restraint Scale (24.2) was substantially higher than the median score (15; Polivy, Herman, & McFarlane, 1994) typically used to differentiate restrained and unrestrained eaters in past research. They would therefore be expected to show a counter-regulatory eating pattern. The fact that our sample showed a small decrease in intake when preloaded may indicate that counter-regulatory eating and binge eating are indeed closely related phenomena in obese individuals (McCann et al., 1992). From this perspective, the total absence of binge eaters in the current sample may have precluded the emergence of counter-regulatory eating at pretest.

After 8 weeks of the intervention, there was some evidence that the restrictive dieting intervention influenced eating regulation differently than the undieting intervention. While participants in three conditions (both groups at pretest and UDs at posttest) ate somewhat less with than without a preload, preloaded RDs ate 30 g more of ice cream with a preload than without one. The three-way interaction and two of the three planned comparisons were marginally significant.

It is clear that the size of the obtained effect was relatively small and that the reliability of the results is open to question. It is important to point out that a strength of the current study — its use of a clinical sample of overweight individuals undergoing weight loss — also became a constraint on our ability to replicate features of past research that has produced reliable counter-regulatory effects. That is, most past research demonstrating counter-regulation has involved well-controlled laboratory studies using college students as subjects. Our use of overweight clinic attenders reduced our ability to duplicate the methodology of past studies in several ways. First, the number of subjects who could be studied initially and at 8 weeks was small relative to previous studies; this reduced the power of the study to detect statistically significant differences. Second, because our study was piggy-backed onto the

larger clinical trial, scheduling constraints meant that participants came to the eating test at widely varying times and therefore, probably differed considerably in when they had last eaten. Third, the fact the eating test was typically conducted following the EDE session was not ideal, but again was dictated by the requirements of the larger study. Nonetheless, the scheduling of the eating test after the EDE may have inhibited food intake. Fourth, scheduling issues also made it impossible to have subjects' pre- and posttest eating tests conducted at the same time of day. This could have further increased variability in ice cream intake and therefore, the size of the error terms in the statistical analyses. Thus, the modest effects obtained should perhaps be interpreted in light of these methodological constraints.

If one assumes that the increased eating of preloaded RDs at posttest reflects a reliable phenomenon, then the results regarding eating regulation of RDs fit better with the predictions of restraint theory than with the hypotheses based on the "current dieting" factor of Lowe's (1993) three-factor model of dieting. It appears that the eating regulation demonstrated by normal weight current dieters in previous studies (Lowe, 1994; Lowe et al., 1991) does not apply to overweight clinic attenders who have lost weight. Since these two groups differ widely on a variety of potentially important dimensions (weight status, degree of documented weight loss, age, and clinic vs. college student population), it is impossible to know why the effects of dieting differed in these groups.

The trend toward increased eating among preloaded RDs at posttest was more striking because they showed a simultaneous increase in one form of disinhibition (counter-regulatory eating in a contrived setting) and a decrease in another form of disinhibition (reduced Disinhibition Scale scores, presumably reflecting greater eating control in the natural environment). This finding suggests that a latent predisposition toward disinhibition exists in some overweight dieters whose naturalistic food intake is characterized by the successful inhibition of overeating. Our exploratory analysis of those participants who showed the strongest counter-regulatory eating response indicated that they also experienced a smaller decrease in Disinhibition scores than those who did not show counter-regulatory tendencies. Although clearly speculative at this point, these findings might suggest that among overweight individuals who are initially successful in restricting their eating and losing weight, those who experience the greatest struggle in controlling overeating tendencies might be the most prone to relapse when a structured weight loss program comes to an end.

A final goal of this study was to test the hypothesis that counter-regulatory eating tendencies shown prior the start of the undieting intervention would dissipate at posttest. However, since counter-regulatory eating was not observed among UDAs at pretest, the opportunity to test this hypothesis never existed.

5.1. *Conclusions*

We began this investigation with two questions. One was whether the predictions of restraint theory apply to individuals who are dieting to lose weight, and the other was whether the predictions of restraint theory apply to overweight individuals. The results at pretest did not support the predictions of restraint theory since overweight individuals who were highly restrained did not engage in counter-regulatory eating. This finding, combined with those

reported by Ruderman and Christensen (1983), indicates that neither overweight people generally nor overweight restrained eaters in particular are necessarily susceptible to counter-regulatory eating. Rather, the findings of this study and a previous one (McCann et al., 1992) indicate that the best marker of obese individuals' susceptibility to counter-regulation appears to be their vulnerability to binge eating.

On the other hand, the results for the restrictive dieting condition suggest that weight loss dieting may create a vulnerability toward counter-regulatory eating even among obese individuals without binge-eating problems. Prior studies have also found that overweight individuals are prone to overeating following weight loss (Rodin et al., 1977; Wardle & Beales, 1988), but their results suggest that a triggering stimulus such as a preload is not necessary to elicit overeating. Overall, these results suggest that weight loss dieting does create an increased susceptibility to overeating in overweight individuals. Clinically, it may be worthwhile to develop "probes" to help identify individuals most prone to disinhibitory eating even when weight is still being lost. If such individuals are shown to be more susceptible to relapse, interventions to help vulnerable individuals to cope with potential disinhibitors might be developed earlier in weight loss programs.

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