REVIEW ARTICLE

Dieting and the Development of Eating Disorders in Overweight and Obese Adults

National Task Force on the Prevention and Treatment of Obesity

We reviewed articles evaluating the relations among dieting, weight loss treatment, weight cycling, eating disorders, and psychological functioning in overweight and obese adults. Moderate caloric (energy) restriction, in combination with behavioral weight loss treatment, does not seem to cause clinically significant binge eating in overweight adults without preexisting binge eating problems and might ameliorate binge eating, at least in the short term, in those reporting recurrent binge eating before treatment. Most studies of behavioral weight loss interventions report improvements in psychological status during weight loss. However, these improvements might return to baseline with weight regain. Weight cycling does not seem to be associated with clinically significant psychopathologic conditions, although results of cross-sectional studies show an association between weight cycling and binge eating, as well as poorer perceived health status. "Nondieting" approaches seem to lead to improvements in mood and self-esteem; however, weight loss is generally minimal. Concerns that dieting induces eating disorders or other psychological dysfunction in overweight and obese adults are generally not supported by empirical studies. Such concerns should not preclude attempts to reduce caloric intake and increase physical activity to achieve modest weight loss or prevent additional weight gain.

Arch Intern Med. 2000;160:2581-2589

Overweight and obesity affect millions of Americans, and their prevalence continues to increase. Overweight (defined as a body mass index [BMI; calculated as weight in kilograms divided by the square of height in meters] ≥25) affects more than half of adult Americans, and 23% meet criteria for obesity (BMI ≥30).[1] Overweight and obesity are associated with numerous adverse health conditions, including type 2 diabetes and cardiovascular disease. Direct and indirect medical costs attributable to obesity are estimated to approach $100 billion yearly.[2] Current public health policy recommends weight loss or maintenance for those above a healthy body weight. For example, the 1995 Dietary Guidelines for Americans[3] contains a recommendation to "maintain or improve your weight," whereas the National Institutes of Health[4] recommends weight loss in obese adults and in those who are overweight and have comorbid conditions. Weight maintenance is recommended for individuals currently overweight without associated health risks.

The health benefits of initial weight loss have been well documented. Weight loss lowers blood pressure and cholesterol levels and improves glycemic control.[4] Concerns regarding the association of weight loss[5,6] and cycles of weight loss and regain (weight cycling)[7,8] with morbidity and mortality also have been discussed in previous reviews. However, there has been less attention to the behavioral consequences of dieting and weight loss. Achieving weight loss requires energy restriction, increased physical activity, or frequently both. Concerns have been raised that recommending weight loss, with concomitant dietary restriction, might precipitate the development of eating disorders or might exacerbate eating disorders among those already affected.[9]

A complete list of the members of the National Task Force on the Prevention and Treatment of Obesity appears in the acknowledgments at the end of this article.

The purpose of this study is to review the literature on the impact of weight loss treatment in general, and dietary restriction in particular, on the development or course of eating disorders in overweight and obese adults. We also consider the effects of dieting and weight loss on other psychological variables, most notably depression. Because many people who lose weight ultimately regain it, the effects of weight cycling on eating disorders and depressive symptoms are also reviewed. Because dietary restriction in children and adolescents poses special concerns, the conclusions derived from this review of the literature should be considered applicable to adults only.

DEFINING DIETING

The term "dieting" is widely used as if it described a well-defined, accurately measured pattern of behavior. The reality is different. In a review of the effects of dieting on weight loss and health, French and Jeffery[10] concluded that the "results of studies of dieting are difficult to interpret because dieting has not been consistently and clearly operationalized." In addition, some investigators[11-13] have noted that results of studies designed to measure the impact of "restrained eating" differ depending not only on the individual's body weight but also on whether one is currently dieting to lose weight or has a history of frequent dieting. Dieting, as used in this article, refers to the intentional and sustained restriction of caloric intake for the purpose of reducing body weight or changing body shape. The restriction of caloric intake results in significant negative energy balance.

STUDY SELECTION

Electronic databases (MEDLINE and PsycINFO) were searched for articles using varying combinations of the keywords "dieting," "weight loss," "weight cycling," "binge eating," "eating disorders," "psychopathology," "affective disturbances," "depression," and "obesity." This was supplemented by a manual search of bibliographies. Studies published in languages other than English were not included. Representative cross-sectional or prospective studies were identified that evaluated (1) the relations between dieting, weight loss treatment, or weight cycling and the development or exacerbation of eating disorders in overweight and obese adults; (2) the relations between dieting, weight loss treatment, or weight cycling and psychological functioning in overweight and obese adults; (3) the impact of "nondieting" treatments on weight, eating disorders, or psychological functioning; and (4) the effects of weight gain prevention interventions on psychological functioning and eating behavior. Although numerous studies reached similar conclusions (eg, improvement in depression scores with behavioral weight loss treatment), not all studies were cited; however, attempts were made to cite any studies with findings differing from the majority. Because surgical treatment of obesity is an option for only a small minority of individuals with severe obesity, articles addressing only the relation between surgical obesity treatment and the variables of interest were not reviewed.

HISTORY OF CONCERN

The initial suggestion that dieting and weight loss cause negative psychological consequences, including eating disorders and depressive symptoms, came from the study by Keys et al.[14] This study involved normal-weight young men who participated in a semistarvation experiment in which they received about 1600 cal/d (6694 J/d) (ie, approximately half of their previous food intake) for 6 months. The diet resulted in loss of roughly 25% of their body weight. Profound effects were observed across a wide range of functioning. Extreme negative emotional reactions, including depression, irritability, and anger, were common. A subgroup of men engaged in binge eating that persisted, in some cases, after free access to food was restored. The majority of men reported a return to normal eating 5 months after refeeding. These findings were not entirely unexpected, given that the men's body weight was reduced 25% below normal levels and easily met the weight criterion for anorexia nervosa.

Findings from this study of adverse effects of caloric restriction in normal-weight individuals are often extrapolated to those who are overweight. However, obese individuals might be protected from some of these ill effects by virtue of their larger energy stores. In addition, current recommendations for weight loss in obese adults call for caloric deficits of 500 to 700 kcal/d (2092 to 2929 kJ/d), leading to modest weight loss (eg, 10% of initial body weight),[4] in contrast to the more extreme caloric restriction in the experiment by Keys et al. The relevance of the findings of Keys et al to obese individuals who seek weight loss is unclear.

RELATION OF DIETING TO EATING DISORDERS

Most eating disorders in overweight and obese adults involve binge eating, with binge eating disorder (BED) being the most common eating disorder seen in obesity treatment settings.[15] Binge eating disorder is included in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*,[16] as a diagnosis requiring further study. Results of studies from the United States indicate that the prevalence of BED in adult community samples is less than 3%.[15] The prevalence in overweight persons is higher, with increasing prevalence as degree of obesity and intensity of treatment increase. People with BED report frequent episodes of eating substantially larger amounts of food than do others in similar circumstances, along with an accompanying feeling of loss of control. These individuals do not compensate for their overeating by purging (ie, vomiting or laxative abuse), fasting, or excessive exercise, a characteristic that distinguishes them from persons with bulimia nervosa.[16]

The development of anorexia nervosa and bulimia nervosa are almost invariably preceded by dietary restriction. It has been suggested that weight loss dieting might

be a "necessary but not sufficient" condition for the development of eating disorders,[17] at least in individuals with anorexia or bulimia nervosa. At any given time, 44% of adult women and 29% of adult men in the United States describe themselves as trying to lose weight,[18] as do 44% of adolescent girls and 15% of adolescent boys.[19] Although many diet, however, comparatively few go on to develop eating disorders: the prevalence of eating disorders (including anorexia and bulimia nervosa) is estimated to be 1% to 4% of adolescent and young adult women, the populations at highest risk.[20] Some other factor(s) must interact with dieting to cause eating disorders; possibilities range from genetic predisposition and biological vulnerability to individual psychopathology, to familial and cultural influences.

PROSPECTIVE STUDIES OF DIETING AND BINGE EATING

An important issue is whether weight loss treatment increases binge eating in those with or without BED before starting treatment. We will consider several different approaches to weight loss and their reported effects on binge eating. The following studies evaluated treatments designed to produce weight loss in obese adults rather than targeting binge eating behaviors.

Moderate Energy Restriction

Obese adults who seek weight loss in university- or commercial-based programs are usually prescribed a diet of conventional foods designed to induce an energy deficit of 500 to 700 kcal/d and a weight loss of 0.50 to 0.75 kg/wk.[21,22] Diet is often combined with recommendations to increase physical activity and modify inappropriate eating habits. Most programs provide some form of individual or group counseling to meet these goals. Structured interventions of 16 to 20 weeks produce average weight losses of 7% to 10% of initial weight.[21,22]

Three studies[23-25] found that this approach was not associated with reports of binge eating in obese adults who, before treatment, were classified as non–binge eaters. Moreover, each of 3 investigations[23,26,27] of patients with BED found that binge episodes declined significantly during behavioral weight reduction therapy. An abstract by Marcus and colleagues[27] reported that patients treated with behavioral treatment lost 9.9 kg during a 6-month program, and the number of binge days decreased from approximately 20 per month at baseline to 2.7 per month at the end of treatment.[23,26,27]

The results of these studies suggest that obese adults who participate in traditional behavioral weight loss programs are unlikely to develop binge eating difficulties. In fact, the data suggest that such treatment ameliorates binge eating in obese patients who report recurrent binge eating at the time of study entry.[23,26,27]

Severe Energy Restriction

Very low-calorie diets (VLCDs), providing 400 to 800 kcal/d (1674 to 3347 kJ/d), were popular in the 1980s and continue to be used today on a more limited basis.[28] These diets induce an energy deficit greater than 1000 kcal/d (>4184 kJ/d) in most patients, which yields average losses of approximately 20% of initial weight in 12 to 16 weeks.[21,28] Although VLCDs do not seem to have adverse long-term effects on resting energy expenditure or body composition,[8,28] they have been anecdotally reported to precipitate binge eating, particularly during the refeeding period that follows the termination of severe energy restriction.[29] The excess eating is thought to be a compensatory response to the physiologic or psychological effects of food deprivation.[29] Three studies[24,30,31] have examined this issue. A study of 38 women on a weight loss program that included a 12-week VLCD[31,32] observed no significant increase in the frequency of reported binge days in patients who, before treatment, were classified as non–binge eaters. In addition, there were no significant changes on the Binge Eating Scale,[33] as assessed 6 months after the VLCD. Individuals with BED were no more likely to report deviations from the VLCD than were those without BED; however, in those who lapsed, greater caloric intake was reported. Patients diagnosed before treatment as binge eaters tended to report fewer binge episodes at follow-up ($P<.06$), and their scores on the Binge Eating Scale declined significantly. Improvements in eating behavior, as measured by this scale, were observed in another study[24] that included a 16-week liquid VLCD. In that study, the number of patients with severe binge eating declined from 9 to 5. Wing and colleagues[34] found no greater rate of reported dietary lapses in patients treated by moderate vs severe energy restriction. Patients who report binge eating difficulties, on average, lose as much weight on a VLCD as those who do not report binge eating.[30,31,35,36]

One study,[30] however, reported a clear increase in binge eating after 12 weeks' consumption of a liquid VLCD. As many as 60% of patients who, at baseline, had been classified as non–binge eaters reported occasional binge episodes in the 9 months after consumption of the VLCD. At the final assessment, 12 months after severe caloric restriction, 15% of this sample was judged to meet the criteria for BED. (By contrast, 39% of patients who before treatment met BED criteria no longer did so at the final assessment.) These findings are cause for concern but must be interpreted cautiously. Except for the baseline and final assessments, all measurements of binge eating were based on patients' subjective assessments. Moreover, in the brief period between the baseline assessments and their beginning the VLCD, 30% of these patients reported having binge eating episodes, although they had recently been diagnosed as non–binge eaters by the study's expert raters. This finding underscores the need to use uniform criteria in assessing binge eating.

Weight Loss Medications

A small but significant minority of obese adults take prescription or over-the-counter "diet" pills to lose weight. Two medications—sibutramine hydrochloride and orlistat—are approved for weight loss

and maintenance of weight loss in the United States.[37,38] Sibutramine is a combined serotonin-norepinephrine reuptake inhibitor that reduces food intake, apparently by enhancing satiety.[37] Orlistat is a gastrointestinal lipase inhibitor that reduces the absorption of dietary fat.[38] Both medications are associated with a gradual 7% to 10% reduction of initial weight during 6 months of treatment. Maximal weight loss usually occurs by month 6, and there seems to be some subsequent regain with continued therapy.

There have been no systematic investigations or published reports of eating disorders in patients treated with these 2 medications. Although it has been recommended that weight loss medications, if used, be continued on a long-term basis,[39] it is likely that they will be used as short-term or intermittent therapy in many cases. It is well established that rapid weight gain follows discontinuation of weight loss medication use.[39-41] The mechanisms that drive body weight levels to return to pretreatment levels remain to be identified. However, it should be noted that dexfenfluramine,[42] as well as the fenfluramine and phentermine combination,[43] before the discovery of their association with valvular heart disease,[44] had been reported to reduce binge eating in obese patients. At present, there are not adequate data to suggest that use of available weight loss medications either precipitates or ameliorates binge eating and related complications.

DIETING AND PSYCHOLOGICAL FUNCTIONING IN OVERWEIGHT AND OBESE ADULTS

We next consider the issue of whether dieting and weight loss in overweight and obese adults cause psychological problems. There have been several reviews of this literature[10]; therefore, findings are only briefly summarized here.

Concerns about a "dieting depression" can be traced to 2 early studies, the first by Keys and colleagues,[14] which, as previously mentioned, involved normal-weight rather than obese volunteers. The second study[45] found that 54% of obese patients, who were treated in a nutrition clinic, reported (retrospectively) that they had experienced symptoms of weakness, nervousness, irritability, fatigue, or nausea at some time when previously trying to lose weight. These individuals did not report symptoms of depression, although the report of the findings was titled the "Dieting Depression." The title derived from observations of a second group of 25 individuals who were treated at an inpatient unit for both their psychiatric complications and obesity. Other early studies, reviewed by Stunkard and Rush,[46] also reported negative emotional responses to dieting.

In contrast to these early findings, numerous studies conducted during the past 25 years have reported reductions in symptoms of depression and anxiety or, at minimum, no worsening in affect in obese patients treated by behavior modification combined with moderate caloric restriction,[47-50] severe caloric restriction,[24,47,50,51] or use of weight loss medications.[40,52,53] Several factors seem to explain the discrepancy between the early and later findings. Studies in the 1950s and 1960s were based primarily on patients who were undergoing psychodynamic psychotherapy and, thus, were likely to have had significant emotional disturbance before weight loss.[54,55] By contrast, more recent behavioral studies included obese individuals who volunteered specifically for weight reduction; most were known to be free of significant depression.[56] In addition, most patients in recent studies received group support and cognitive behavioral therapy, each of which might favorably affect mood.[54,55] Differences in methods used to assess mood, and the frequency of assessment, might further explain the discrepancies between the early and later studies.[54]

A potential limitation in determining the relation between dieting and psychological functioning or eating disorders is that most studies were carried out in individuals undergoing supervised weight loss treatment, in which weight loss methods might not reflect those used by the general population. Surveys of US adults report exercise and decreased fat intake[57] and counting calories[58] as the most common weight loss practices. The Weight Loss Practices Survey,[59] using a national probability sample of US adults, found that the most common weight loss practices among women included weighing oneself regularly (70%) and walking (58%). However, a few report the use of at least one "unhealthy" weight control practice, such as fasting (5%), meal skipping (21%), or use of diet pills (14%). In that survey, only 13% of women and 5% of men reported participation in a formal weight loss program. The degree to which data from weight loss treatment studies reflects the experience of individuals losing weight using a variety of weight loss strategies without supervision remains unclear.

Although most studies evaluating psychological changes with weight loss are from those who participated in clinical studies, recent information is available from 629 women and 155 men in the National Weight Control Registry, a registry of individuals who have lost at least 13.6 kg (mean, 30.0 kg) and who maintained a required minimum weight loss of greater than 13.6 kg for more than 1 year (mean, 6 years).[60] Almost half of the individuals in this sample report having lost weight on their own, without a formal weight loss program, and the remainder lost their weight in a variety of weight loss programs. Both groups reported using diet and exercise to lose weight. Registry participants completed a variety of measures of mood, distress, restraint, disinhibition, binge eating, and purging.[61] Distress and depression levels were similar to those of community-based samples, as were rates of binge eating and purging. Levels of restraint and disinhibition were similar to those in patients recently treated for obesity and differed from those of eating disordered samples. Although this is not a random sample of all long-term weight maintainers, and hence is subject to selection bias, the results provide reassurance that many individuals who

have lost and maintained weight through a variety of methods do not experience significant psychological distress or eating disordered behaviors.

Most findings indicate that obese adults who lose weight are likely to experience modest improvements in mood or, at minimum, no worsening in affect. Before weight loss, eg, obese individuals typically score in the nondepressed range on the Beck Depression Inventory.[62] With weight loss, they report even fewer symptoms of dysphoria. Binge eaters, who usually report mild-to-moderate depression before treatment, might be more likely to experience clinically significant improvements in mood during behavioral weight reduction therapy.[63] However, some individuals might have psychological problems that can be exacerbated by weight loss.[64,65] The clinician should remain vigilant for such vulnerable patients and refer them for assessment and counseling as appropriate.[65]

DOES WEIGHT CYCLING CAUSE EATING DISORDERS OR PSYCHOLOGICAL HARM?

Despite the best efforts of clinicians and researchers, most obese patients who lose weight are likely to regain it. Many do this repeatedly, initiating a pattern of loss and regain that has been labeled weight cycling. A previous review by the National Task Force on the Prevention and Treatment of Obesity[8] noted that there was little information about the effects of weight cycling on eating behaviors or mood. Since publication of that review, more information on psychological effects of weight cycling has become available. Research on this topic has used cross-sectional data comparing cyclers to noncyclers and prospective studies that assessed more directly the effects of weight cycling on binge eating and depression.

Weight Cycling and Binge Eating

Cross-sectional studies[32,66,67] have found a consistent, positive relation between weight cycling and binge eating; thus, the greater the number of weight loss efforts, the greater the occurrence (or severity) of binge eating. However, because these studies are cross-sectional or retrospective, it is unclear whether the weight cycling caused the binge eating. Equally likely is the possibility that binge eaters are more likely to weight cycle. Weight cycling also has been related to decreased eating self-efficacy,[68] increased dietary helplessness,[69] and poorer body image.[70] In addition, weight cycling has been shown to be related to dietary disinhibition.[69,71,72] However, Wadden and colleagues[73] did not find a relation between weight cycling and disinhibition when assessed cross sectionally, and decreases in dietary disinhibition seen during obesity treatment have been maintained despite weight regain during follow-up.[74] Some of the distress noted among weight cyclers might be mediated by the presence of BED. One cross-sectional study[75] evaluating weight cycling women with or without BED found that those with BED reported greater psychological distress and depression and lower self-esteem than weight cyclers without BED.

Weight Cycling and Psychopathologic Disorders

Cross-sectional studies generally have found no relation between weight cycling and increased psychopathologic disorders. Neither number of diets nor total lifetime weight loss correlate with depression,[73] and history of weight cycling has not been related to clinical levels of psychological distress[67,72] or to a maladaptive cognitive style.[71] Weight cycling, however, might be related to lower general physical and mental well-being.[67,68] Thus, weight cycling, although perhaps related to somewhat lower quality of life, does not seem to be associated with clinically significant psychosocial dysfunction.

As discussed earlier, behavioral approaches to obesity treatment, in conjunction with low-calorie diets, are associated with improvements in psychological functioning after weight loss.[55,76] However, weight regain during follow-up can attenuate these improvements,[53] with mood sometimes returning to baseline levels.[77] The psychological changes accompanying weight regain include increased depressive symptoms and decreased self-esteem, self-confidence, and satisfaction with appearance.[77] However, a recent prospective study[74] of the psychological effects of weight cycling demonstrated that the positive changes in mood corresponding with a 21.1±8.4-kg weight loss were maintained at follow-up despite total weight regain. Thus, there is a mixed pattern of change in psychological status during obesity treatment and follow-up.

Anecdotal accounts[72] of repeat dieters describe considerable frustration and distress over weight regain, whereas controlled research suggests that some of the improvements in psychological functioning that correspond with weight loss can be maintained despite returning to baseline levels of obesity. This discrepancy might be due in part to the observation that self-perception of weight cycling may be more predictive of psychological functioning than actual history of weight cycling.[78] Research is needed to understand differences in individuals or treatment protocols that result in the maintenance vs deterioration of improvements in psychological functioning.

NONDIETING APPROACHES FOR OBESE ADULTS

Concern with the generally poor long-term results of weight loss programs,[79] as well as with the possible adverse behavioral effects of dieting,[9] has led several practitioners to propose alternative "undieting" or "nondieting" approaches to weight control.[80-86] These programs differ in their specific methods, but all generally seek to (1) increase awareness about dieting behaviors and their purported ill effects, (2) identify and combat cultural notions that "thinner is better" and that body weight can be controlled by willpower, (3) help participants "stop dieting" by abandoning efforts to restrict energy intake and avoid certain foods, (4) help participants identify and eat in response to the body's "natural" hunger and satiety signals, and (5) increase self-esteem and positive body image through self-

acceptance rather than weight reduction. These programs are directed primarily at women, who disproportionately bear the burden of our nation's preoccupation with thinness.[87]

STUDIES OF NONDIETING APPROACHES

Polivy and Herman[83] tested a 10-week pilot program with the previous goals. After treatment, obese women showed significant improvements in mood and self-esteem and on several scales of the Eating Disorders Inventory,[88] including drive for thinness, bulimia, interoceptive awareness, and ineffectiveness. Patients, however, gained nearly 6 kg during the 10-week program, which decreased at 6 months to a net gain of only 3.5 kg. No other physical characteristics (ie, blood pressure, lipid levels, etc) were assessed.

Similarly, favorable changes in psychological functioning were reported in 2 additional 10- to 12-week studies[85,86]; in the second study,[86] changes in nondieting women were significantly greater than those observed in a control group. Weight and blood pressure, however, did not change significantly in the nondieting patients. In the longest study to date,[81] obese female binge eaters attended 24 weekly sessions, followed by 26 every-other-week meetings. Half of the women received a nondieting approach and the other half received a traditional weight loss program. The 2 groups reported comparable reductions in binge eating at the end of 6 and 18 months. Nondieting women gained 1.4 kg during the first 6 months compared with a loss of 0.6 kg for patients in the dieting condition. The authors attributed the unusually small weight loss for the dieting women to "deviations from a strict behavioral model" (which included not weighing patients regularly).

One short-term study reported small weight losses with a "nondieting" approach. An 8-week study[89] compared the effects of a nondieting, cognitive therapy (CT) approach with a behavior therapy (BT) weight loss program. The CT and BT groups lost small amounts of weight (1.8 vs 2.6 kg, respectively), whereas a control group gained 0.75 kg ($P<.05$ for treatment vs control). There were no significant differences between the CT and BT conditions in changes in psychological status or eating attitudes, although the CT group showed a trend toward greater improvements. Although a 6-month follow-up showed continued weight loss in the CT and BT groups, contact was by telephone only, and information on almost half of the participants was unavailable, making the findings difficult to interpret.

The limited data indicate that nondieting approaches are associated with significant improvements in self-esteem, mood, and eating behavior. Changes are generally comparable to those observed at the end of treatment with traditional behavioral weight reduction therapy. Nondieting approaches, however, do not seem to induce clinically significant short- or long-term weight loss. Thus, compared with weight reduction therapies, nondieting interventions are less likely to provide short-term improvements in weight-related complications such as hypertension or type 2 diabetes. These complications might be ameliorated, in the absence of weight loss, by patients significantly reducing their fat intake and/or increasing their physical activity. Such benefits have yet to be demonstrated with a nondieting approach, but further study is warranted. In addition, some populations might respond better to less structured interventions, as was seen in a pilot study of Pima Indians, who responded more favorably to a program emphasizing Pima history and culture than to a more traditional nutrition and activity intervention.[90]

It is also possible that combining elements of the nondieting philosophy with modest restriction of energy intake could induce significant long-term weight loss.[91-93] Sbrocco and colleagues,[91] eg, found that women treated by a nondieting approach, combined with an 1800-kcal/d (7531-kJ/d) diet and instruction in making more favorable dieting and activity choices, lost significantly more weight 1 year after treatment than those who received a traditional behavioral intervention. Although this result is encouraging, caution should be exercised in interpreting the findings of this preliminary investigation because of its small sample size.

PREVENTION OF WEIGHT GAIN

Adults aged 20 to 50 years in the United States typically gain 0.5 to 1.0 kg per year.[94] Prevention of such weight gain and maintenance of current weight are recommended for normal-weight adults and overweight adults with no obesity-related comorbidities. Concern has been raised that such efforts to prevent weight gain in normal-weight and overweight adults might cause eating disorders or psychological difficulties. However, results of recent studies do not support this concern. Jeffery and French[95] reported results of a 3-year weight gain prevention program. This intervention emphasized weighing oneself regularly, eating more fruits and vegetables, reducing consumption of high-fat foods, and increasing exercise. Although restriction of energy intake was not specifically recommended, the intervention group reported somewhat greater decreases in fat and calorie intake than the control group. The intervention group also reported significantly greater increases in their use of healthy weight control practices (such as increasing fruit and vegetable consumption and cutting down on sweets and "junk food") relative to the control group. Although there was no significant difference in weight change between the control and intervention groups, participants who reported the greatest increases in these healthy weight control practices experienced the least weight gain during the 3 years. Individuals in the weight gain prevention condition and in the control group reported comparable decreases in unhealthy weight control practices such as using laxatives, diet pills, or diuretics.

Another intervention study (the Women's Healthy Lifestyle Project) attempted to prevent weight gain in middle-aged women by encouraging a low-calorie, low-fat diet and increased exercise. To prevent anticipated weight gain, women with a

BMI less than 24 were encouraged to lose 2.25 kg, and those with a BMI of 24 or more were encouraged to lose 4.50 to 6.75 kg depending on their initial BMI. Because of concern about such intervention in normal-weight women, the investigators carefully examined changes in psychological variables and binge eating.[96] Women in the intervention group experienced greater improvement than control subjects on all of the measures included in the study. For example, depressive symptoms, assessed with the Beck Depression Inventory,[62] decreased more in intervention subjects then in controls. Binge eating scores also decreased more in women who underwent the intervention than in controls, with the greatest decreases seen in overweight women in the intervention condition. Thus, the results of this study suggest that prevention of weight gain in normal-weight or slightly overweight adults is associated with positive, not negative, psychological consequences.

CONCLUSIONS

Based on currently available data, we conclude the following:

- Moderate caloric restriction, combined with behavioral weight loss treatment, does not seem to cause clinically significant binge eating in most overweight adults without preexisting binge eating problems. Moreover, behavioral weight loss treatment might ameliorate binge eating, at least in the short term, in those reporting recurrent binge eating before treatment. Additional studies are needed to determine the optimal sequence and content of therapies to ameliorate binge eating and facilitate sustained modest weight los.
- The impact of weight loss medication use on binge eating is currently unknown, and future studies should attempt to determine the effects of using these medications on binge eating and associated behaviors.
- Most studies of behavioral weight loss interventions report improvements in psychological status during weight loss. However, these improvements might return to baseline with weight regain.
- Weight cycling does not seem to be associated with clinically significant psychopathologic conditions. Cross-sectional studies show an association between weight cycling and binge eating, as well as poorer perceived health status, but causality cannot be determined.
- "Nondieting" approaches seem to lead to improvements in mood and self-esteem; however, weight loss is generally minimal. Interventions that combine the strengths of "nondieting" approaches in promoting self-esteem and improvements in body image with behavioral weight loss techniques for reducing caloric intake and improving physical activity might induce modest weight loss or prevent weight gain, but research into the efficacy of such approaches is needed.
- Although little information is available, interventions aimed at preventing overweight in at-risk populations do not seem to be associated with adverse psychological consequences. However, these studies have been carried out in adult populations. Research is needed to evaluate the impact of weight gain prevention interventions in children and adolescents to determine the effects on weight regulation, eating attitudes, and eating behaviors.
- Concerns that dieting induces eating disorders or other psychological dysfunction in overweight and obese adults are generally not supported by empirical studies. Such concerns should not preclude attempts to reduce caloric intake and increase physical activity to achieve modest weight loss or prevent additional weight gain.

Accepted for publication April 28, 2000.

The following are the members of the National Task Force on the Prevention and Treatment of Obesity: Charles J. Billington, MD, VA Medical Center, Minneapolis, Minn; Leonard H. Epstein, PhD, State University of New York at Buffalo; Norma J. Goodwin, MD, Health Watch Information and Promotion Service, New York, NY; James O. Hill, PhD, University of Colorado Health Sciences Center, Denver; F. Xavier Pi-Sunyer, MD, St Luke's–Roosevelt Hospital Center, Columbia University, New York; Barbara J. Rolls, PhD, Pennsylvania State University, State College, University Park; Judith S. Stern, ScD, University of California at Davis; Thomas A. Wadden, PhD, University of Pennsylvania, Philadelphia; Roland L. Weinsier, MD, DrPH, University of Alabama at Birmingham; G. Terence Wilson, PhD, State University of New Jersey, Rutgers; and Rena R. Wing, PhD, Brown University, Providence, RI. Staff members of the Division of Digestive Diseases and Nutrition, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, Bethesda, Md, are Susan Z. Yanovski, MD; Van S. Hubbard, MD, PhD; Jay H. Hoofnagle, MD; James Everhart, MD; and Barbara Harrison, MS.

Drs Wadden and Wilson serve as consultants or on the Speakers Bureaus of Knoll Pharmaceutical Co and Roche Laboratories, manufacturers of weight loss medications, and Dr Wadden has received research project support from Knoll Pharmaceutical Co, Roche Laboratories, and Novartis Nutrition. Drs Weinsier and Stern are members of the Weight Watchers Scientific Advisory Board. Dr Wing has received research project support from Roche Laboratories and Schering-Plough. Dr Rolls has served as consultant to or received research project support from Amgen, Knoll Pharmaceutical Co, Rhône-Poulenc Rorer, Pzizer, Procter & Gamble, and Ross Products/Abbott Laboratories. Dr Stern is a member of the Xenical Speakers Bureau. Dr Pi-Sunyer has consulted for or received research project support from Knoll Pharmaceutical Co, Roche Laboratories, Eli Lilly, Amgen, Genetech, and Parke-Davis. Dr Hill has served as a consultant to or received research project support from Knoll Pharmaceutical Co, Roche Laboratories, Glaxo-Wellcome, Coca Cola, and Procter & Gamble.

We thank Lynn McAfee, Council on Size and Weight Discrimination, Philadelphia, Pa, for her thoughtful comments.

Corresponding author: Susan Z. Yanovski, MD, National Institutes of Health, 6707 Democracy Blvd, Room 665, Bethesda, MD 20892-5450.

Reprints: Weight-Control Information Network, 1 Win Way, Bethesda, MD 20892-3665.

REFERENCES

1. Flegal KM, Carroll MD, Kuczmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960-1994. *Int J Obes Relat Metab Disord.* 1998;22:39-47.
2. Wolf AM, Colditz GA. Current estimates of the economic cost of obesity in the United States. *Obes Res.* 1998;6:97-106.
3. *Dietary Guidelines for Americans.* Washington, DC: US Dept of Agriculture, US Dept of Health and Human Services; 1995. Home and Garden Bulletin No. 232.
4. National Institutes of Health. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. *Obes Res.* 1998;6(suppl 2):51S-209S.
5. Williamson DF. Lingering questions about intentional weight loss [editorial]. *Nutrition.* 1996;12:819-820.
6. Williamson DF. Intentional weight loss: patterns in the general population and its association with morbidity and mortality. *Int J Obes Relat Metab Disord.* 1997;21(suppl 1):S14-S19.
7. Williamson DF. "Weight cycling" and mortality: how do the epidemiologists explain the role of intentional weight loss? *J Am Coll Nutr.* 1996;15:6-13.
8. National Task Force on the Prevention and Treatment of Obesity. Weight cycling. *JAMA.* 1994;272:1196-1202.
9. Polivy J, Herman CP. Dieting and binging: a causal analysis. *Am Psychol.* 1985;40:193-201.
10. French SA, Jeffery RW. Consequences of dieting to lose weight: effects on physical and mental health. *Health Psychol.* 1994;13:195-212.
11. Howard CE, Porzelius LK. The role of dieting in binge eating disorder: etiology and treatment implications. *Clin Psychol Rev.* 1999;19:25-44.
12. Lowe M, DiSimone-Weiss RT, Furgueson C, et al. Restraint, dieting, and the continuum model of bulimia nervosa. *J Abnorm Psychol.* 1996;105:508-517.
13. Lowe M, Gleaves DH, Murphy-Eberenz KP. On the relation of dieting and bingeing in bulimia nervosa. *J Abnorm Psychol.* 1998;107:263-271.
14. Keys A, Brozek J, Henschel A, et al. *The Biology of Human Starvation.* Minneapolis: University of Minnesota Press; 1950.
15. Yanovski SZ. Diagnosis and prevalence of eating disorders in obesity. In Ailhaud G, Guy-Grand B, et al, eds. *Progress in Obesity Research: 8.* London, England: John Libby & Co; 1999:229-236.
16. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.* Washington, DC: American Psychiatric Association; 1994.
17. Wilson GT. Relation of dieting and voluntary weight loss to psychological functioning and binge eating. *Ann Intern Med.* 1993;119:727-730.
18. Serdula MK, Mokdad AH, Williamson DF, Galuska DA, Mendlein JM, Heath GW. Prevalence of attempting weight loss and strategies for controlling weight. *JAMA.* 1999;282:1353-1358.
19. Serdula MK, Collins ME, Williamson DF, Anda RF, Pamuk E, Byers TE. Weight control practices of U.S. adolescents and adults. *Ann Intern Med.* 1993;119:667-671.
20. American Psychiatric Association. Practice guideline for eating disorders. *Am J Psychiatry.* 1993;150:212-228.
21. Wadden TA. Treatment of obesity by moderate and severe caloric restriction: results of clinical research trials. *Ann Intern Med.* 1993;119:688-693.
22. Wing RR. Behavioral approaches to the treatment of obesity. In: Bray GA, Bouchard C, James WPT, eds. *Handbook of Obesity.* New York, NY: Marcel Dekker Inc; 1998:855-873.
23. Porzelius LK, Houston C, Smith M, Arfkin C, Fisher E. Comparison of a standard behavioral weight loss treatment and a binge eating weight loss treatment. *Behav Ther.* 1995;26:119-134.
24. Wadden TA, Foster GD, Letizia KA. One-year behavioral treatment of obesity: comparison of moderate and severe caloric restriction and the effects of weight maintenance therapy. *J Consult Clin Psychol.* 1994;62:165-171.
25. Sherwood NE, Jeffery RW, Wing RR. Binge status as a predictor of weight loss treatment outcome. *Int J Obes Relat Metab Disord.* 1999;23:485-493.
26. Agras WS, Telch CF, Arnow BA, et al. Weight loss, cognitive-behavioral, and desipramine treatments in binge eating disorder: an additive design. *Behav Ther.* 1994;25:225-238.
27. Marcus MD, Wing RR, Fairburn CG. Cognitive treatment of binge eating v. behavioral weight control in the treatment of binge eating disorder [abstract]. *Ann Behav Med.* 1995;17:S090.
28. National Task Force on the Prevention and Treatment of Obesity. Very low-calorie diets. *JAMA.* 1993;270:967-974.
29. Wadden TA, Bartlett SJ. Very low calorie diets: an overview and appraisal. In: Wadden TA, Van Itallie TB, eds. *Treatment of the Seriously Obese Patient.* New York, NY: Guilford Press; 1992:290-330.
30. Telch CF, Agras WS. The effects of a very-low-calorie diet on binge eating. *Behav Ther.* 1993;24:177-193.
31. Yanovski SZ, Gormally JF, Lesser MS, Gwirtsman HE, Yanovski JA. Binge eating disorder affects outcome of comprehensive very-low-calorie diet treatment. *Obes Res.* 1994;2:205-212.
32. Yanovski SZ, Sebring NG. Recorded food intake of obese women with binge eating disorder before and after weight loss. *Int J Eat Disord.* 1994;15:135-150.
33. Gormally JF, Black S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. *Addict Behav.* 1982;7:47-55.
34. Wing RR, Shiffman S, Drapkin RG, Grilo CM, McDermott M. Moderate versus restrictive diets: implications for relapse. *Behav Ther.* 1995;26:5-24.
35. LaPorte DJ. Treatment response in obese binge eaters: preliminary results using a very low calorie diet (VLCD) and behavior therapy. *Addict Behav.* 1992;17:247-257.
36. Wadden TA, Foster GD, Letizia KA. Response of obese binge eaters to treatment by behavior therapy combined with very low calorie diet. *J Consult Clin Psychol.* 1992;60:808-811.
37. Lean MEJ. Sibutramine: a review of clinical efficacy. *Int J Obes.* 1997;21:30S-36S.
38. Sjostrom L, Rissanen A, Andersen T, et al. Randomised placebo-controlled trial of orlistat for weight loss and prevention of weight regain in obese patients. *Lancet.* 1998;352:167-172.
39. National Task Force on the Prevention and Treatment of Obesity. Long-term pharmacotherapy in the management of obesity. *JAMA.* 1996;276:1907-1915.
40. Craighead LW, Stunkard AJ, O'Brien RM. Behavior therapy and pharmacotherapy for obesity. *Arch Gen Psychiatry.* 1981;38:763-768.
41. Weintraub M, Sundaresan PR, Schuster B, Averbuch M, Stein EC, Byrne L. Long-term weight control study, V (weeks 190 to 210): follow-up of participants after cessation of medication. *Clin Pharmacol Ther.* 1992;51:615-618.
42. Stunkard A, Berkowitz R, Tanrikut C, Reiss E, Young L. D-fenfluramine treatment of binge eating disorder. *Am J Psychiatry.* 1996;153:1455-1459.
43. Alger SA, Malone M, Cerulli J, Fein S, Howard L. Beneficial effects of pharmacotherapy on weight loss, depressive symptoms, and eating patterns in obese binge eaters and non–binge eaters. *Obes Res.* 1999;7:469-476.
44. Cardiac valvulopathy associated with exposure to fenfluramine or dexfenfluramine: U.S. Department of Health and Human Services interim public health recommendations, November 1997. *MMWR Morb Mortal Wkly Rep.* 1997;46:1061-1066.
45. Stunkard AJ. The "dieting depression": incidence and clinical characteristics of untoward responses to weight reduction regimens. *Am J Med.* 1957;23:77-86.
46. Stunkard AJ, Rush J. Dieting and depression reexamined: a critical review of reports of untoward responses during weight reduction for obesity. *Ann Intern Med.* 1974;81:526-533.
47. Wing RR, Blair EH, Marcus MD, Epstein LH, Harvey J. Year-long weight loss treatment for obese patients with type 2 diabetes: does including an intermittent very-low-calorie diet improve outcome? *Am J Med.* 1994;97:354-362.
48. Wing RR, Marcus MD, Epstein LH, Kupfer DJ. Mood and weight loss in a behavioral treatment program. *J Consult Clin Psychol.* 1983;51:153-155.
49. Taylor CB, Ferguson JM, Reading JC. Gradual weight loss and depression. *Behav Ther.* 1978;9:622-625.
50. Wadden TA, Stunkard AJ. Controlled trial of very low calorie diet, behavior therapy, and their combination in the treatment of obesity. *J Consult Clin Psychol.* 1986;54:482-488.
51. Wing RR, Marcus MD, Blair EH, Burton LR. Psychological responses of obese type II diabetic subjects to very-low-calorie diet. *Diabetes Care.* 1991;14:596-599.
52. Wadden TA, Berkowitz RI, Vogt RA, Steen SN, Stunkard AJ, Foster GD. Lifestyle modification in the pharmacologic treatment of obesity: a pilot investigation of a potential primary care approach. *Obes Res.* 1997;5:218-226.
53. Brownell KD, Stunkard AJ. Couples training, pharmacotherapy, and behavior therapy in the treatment of obesity. *Arch Gen Psychiatry.* 1981;38:1224-1229.
54. Smoller JW, Wadden TA, Stunkard AJ. Dieting and depression: a critical review. *J Psychosom Res.* 1987;31:429-440.
55. Wing RR, Epstein LH, Marcus MD, Kupfer DJ. Mood changes in behavioral weight loss programs. *J Psychosom Res.* 1984;28:345-346.
56. Telch CF, Agras WS. Obesity, binge eating and psychopathology: are they related? *Int J Eat Disord.* 1994;15:53-61.
57. Neumark-Sztainer D, Sherwood NE, French SA, Jeffery RW. Weight control behaviors among adult men and women: cause for concern? *Obes Res.* 1999;7:179-188.
58. Serdula MK, Williamson DF, Anda RF, Levy A, Heaton A, Byers T. Weight control practices in adults: results of a multistate telephone survey. *Am J Public Health.* 1994;84:1821-1824.
59. Levy AS, Heaton AW. Weight control practices of U.S. adults trying to lose weight. *Ann Intern Med.* 1993;119:661-666.

60. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *Am J Clin Nutr.* 1997;66:239-246.
61. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. Psychological symptoms in individuals successful at long-term maintenance of weight loss. *Health Psychol.* 1998;17:336-345.
62. Beck AT, Steer RA. *Manual for the Beck Depression Inventory.* New York, NY: Psychological Corporation; 1987.
63. Gladis MM, Wadden TA, Vogt R, Foster G, Kuehnel RH, Bartlett SJ. Behavioral treatment of obese binge eaters: do they need different care? *J Psychosom Res.* 1998;44:375-384.
64. Felitti VJ. Childhood sexual abuse, depression, and family dysfunction in adult obese patients: a case control study. *South Med J.* 1993;86:732-736.
65. O'Neil PM, Jarrell MP. Psychological aspects of obesity and dieting. In: Wadden TA, Van Itallie TB, eds. *Treatment of the Seriously Obese Patient.* New York, NY: Guilford Press; 1992:252-270.
66. Spitzer RL, Devlin M, Walsh BT, et al. Binge eating disorder: a multisite field trial of the diagnostic criteria. *Int J Eat Disord.* 1992;11:191-203.
67. Venditti EM, Wing RR, Jakicic JM, Butler BA, Marcus MD. Weight cycling, psychological health, and binge eating in obese women. *J Consult Clin Psychol.* 1996;64:400-405.
68. Foreyt JP, Brunner RL, Goodrick GK, Cutter G, Brownell KD, St. Jeor ST. Psychological correlates of weight fluctuation. *Int J Eat Disord.* 1995; 17:263-275.
69. Carmody TP, Brunner RL, St. Jeor ST. Dietary helplessness and disinhibition in weight cyclers and maintainers. *Int J Eat Disord.* 1995;18:247-256.
70. Foster GD, Wadden TA, Vogt RA. Body image in obese women before, during, and after weight loss treatment. *Health Psychol.* 1997;16:226-229.
71. Kuehnel RH, Wadden TA. Binge eating disorder, weight cycling, and psychopathology. *Int J Eat Disord.* 1994;15:321-329.
72. Bartlett SJ, Wadden TA, Vogt RA. Psychosocial consequences of weight cycling. *J Consult Clin Psychol.* 1996;64:587-592.
73. Wadden TA, Bartlett S, Letizia KA, Foster GD, Stunkard AJ, Conill A. Relationship of dieting history to resting metabolic rate, body composition, eating behavior, and subsequent weight loss. *Am J Clin Nutr.* 1992;56(suppl):203S-208S.
74. Foster GD, Wadden TA, Kendall PC, Stunkard AJ, Vogt RA. Psychological effects of weight loss and regain: a prospective evaluation. *J Consult Clin Psychol.* 1996;64:752-757.
75. Kensinger GJ, Murtaugh MA, Reichmann SK, Tangney CC. Psychological symptoms are greater among weight cycling women with severe binge eating behavior. *J Am Diet Assoc.* 1998;98:863-868.
76. Wadden TA, Vogt RA, Andersen RE, et al. Exercise in the treatment of obesity: effects of four interventions on body composition, resting energy expenditure, appetite, and mood. *J Consult Clin Psychol.* 1997;65:269-277.
77. Wadden TA, Stunkard AJ, Liebschutz J. Three-year follow-up of the treatment of obesity by very low calorie diet, behavior therapy, and their combination. *J Consult Clin Psychol.* 1988;56:925-928.
78. Friedman MA, Schwartz MB, Brownell KD. Differential relation of psychological functioning with the history and experience of weight cycling. *J Consult Clin Psychol.* 1998;66:646-650.
79. Garner DM, Wooley S. Confronting the failure of behavioral and dietary treatments for obesity. *Clin Psychol Rev.* 1991;11:729-780.
80. Foreyt JP, Goodrick GK. *Living Without Dieting.* Houston, Tex: Harrison Publishing; 1995.
81. Goodrick GK, Poston WS, Kimball KT, Reeves RS, Foreyt JP. Nondieting versus dieting treatment for overweight binge-eating women. *J Consult Clin Psychol.* 1998;66:363-368.
82. Hirschmann JR, Munter CH. *Overcoming Overeating.* New York, NY: Ballantine Books; 1988.
83. Polivy J, Herman CP. Undieting: a program to help people stop dieting. *Int J Eat Disord.* 1992;11: 261-268.
84. Rothblum ED. "I'll die for the revolution but don't ask me not to diet." In: Fallon P, Katzman MA, Wooley SC, eds. *Feminist Perspectives on Eating Disorders.* New York, NY: Guilford Press; 1994: 53-76.
85. Roughan P, Seddon E, Vernon-Roberts J. Long-term effects of a psychologically based group programme for women preoccupied with body weight and eating behaviour. *Int J Obes.* 1990;14:135-147.
86. Ciliska D. Evaluation of two nondieting interventions for obese women. *West J Nurs Res.* 1998; 20:119-135.
87. Striegel-Moore R. Etiology of binge eating: a developmental perspective. In: Fairburn CG, Wilson GT, eds. *Binge Eating: Nature, Assessment, and Treatment.* New York, NY: Guilford Press; 1992:144-172.
88. Garner DM, Olmstead MP, Polivy J. Development and validation of a multidimensional eating disorders inventory for anorexia nervosa and bulimia. *Int J Eat Disord.* 1983;2:15-34.
89. Tanco S, Linden W, Earle T. Well-being and morbid obesity in women: a controlled therapy evaluation. *Int J Eat Disord.* 1998;23:325-339.
90. Narayan KM, Hoskin M, Kozak D, et al. Randomized clinical trial of lifestyle interventions in Pima Indians: a pilot study. *Diabet Med.* 1998;15:66-72.
91. Sbrocco T, Nedegaard RC, Stone JM, Lewis EL. Behavioral choice treatment promotes continuing weight loss: preliminary results of a cognitive-behavioral decision-based treatment for obesity. *J Consult Clin Psychol.* 1999;67:260-266.
92. Miller WC, Eggert KE, Wallace JP, Lindeman AK, Jastremski C. Successful weight loss in a self-taught, self-administered program. *Int J Sports Med.* 1993;14:401-405.
93. Miller WC, Wallace J, Lindeman AK, Dyer DL. The Non-Diet Diet: a 100-point scoring system for monitoring weight loss behavior. *J Am Diet Assoc.* 1991;91:973-975.
94. Williamson DF. Epidemiologic analysis of weight gain in U.S. adults. *Nutrition.* 1991;7:285-286.
95. Jeffery RW, French SA. Preventing weight gain in adults: the pound of prevention study. *Am J Public Health.* 1999;89:747-751.
96. Klem ML, Wing RR, Simkin-Silverman L, Kuller LH. The psychological consequences of weight gain prevention in healthy, premenopausal women. *Int J Eat Disord.* 1997;21:167-174.