

Treatment of Overweight in Children and Adolescents: Does Dieting Increase the Risk of Eating Disorders?

Meghan L. Butryn, MS¹
Thomas A. Wadden, PhD^{2*}

ABSTRACT

Objective: Overweight is a serious health problem in children and adolescents. Some investigators fear that dieting, the principal method of reducing body weight, may precipitate eating disorders and related complications. This review examined the literature on the effects of dieting on eating behavior and psychological status in youth.

Method: Electronic databases were searched for articles containing combinations of the following keywords: weight loss, dieting, treatment, overweight, obesity, anorexia, bulimia, binge eating, eating disorder, children, and adolescents. A manual search of reference lists also was conducted.

Results: Five relevant studies were found. Their findings suggest that a professionally administered weight loss poses minimal risks of precipitating eating disorders in overweight children and adolescents. Significant improvements in psychological status also were observed in several studies.

Discussion: Concerns about potential ill effects of dieting should not dissuade overweight youth from pursuing sensible methods of weight loss. © 2005 by Wiley Periodicals, Inc.

Keywords: overweight; children; adolescents; dieting

(*Int J Eat Disord* 2005; 37:285–293)

Introduction

Overweight is rapidly becoming a major public health problem among America's children and adolescents. Approximately 15% of adolescents are overweight, defined as a body mass index (BMI; kg/m²) greater than the 95th percentile (National Center for Health Statistics, 2003). This value represents a tripling in the prevalence of this condition since 1980 (Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). An additional 22% of adolescents are at risk of overweight, defined as a BMI between the 85th and 95th percentiles. This compares with a value of 15.7% in 1980 (Troiano et al., 1995).

Public health officials have elected not to use the term *obesity* to describe excess weight in children and adolescents. Regardless of how they are characterized, approximately 80% of overweight teenagers will become obese adults and, as a result, experience increased risks of cardiovascular disease, hyperlipidemia, hypertension, diabetes

mellitus, gallbladder disease, several cancers, and psychosocial complications (Casey, Dwyer, Coleman, & Valadian, 1992; Garn, Sullivan, & Hawthorne, 1989). Longitudinal studies have clearly demonstrated the adverse health effects in adults of having been obese as a teen (DiPietro, Mossberg, & Stunkard, 1994; Must, Jacques, Dallal, Bajema, & Dietz, 1992). Recent investigations, however, have shown that obese teens may not be spared from health complications until they reach adulthood. Twenty years ago, type II diabetes was rare in children and adolescents. A study published in 1996, however, found that one third of adolescents in Cincinnati who were diagnosed with diabetes had the type II form of this disease, representing a 10-fold increase from rates in 1982 (Pinhas-Hamiel et al., 1996). This observation was confirmed shortly thereafter by other reports from the United States (Glaser, 1997; Phillips & Young, 2000). Similarly, a study from Japan found that the rate of type II diabetes had increased 30-fold in the past 20 years (Kitagawa, Owada, Urakami, & Yamauchi, 1998). Investigators fear that the diabetes disease process progresses more quickly in youth than in adults (Styne, 2001).

Decreased caloric intake (i.e., dieting) and increased physical activity are the cornerstone of weight management in overweight adolescents, as they are in obese adults. Some clinicians and researchers, however, fear that dieting may increase the risk of eating disorders, particularly in adolescent females (Garner & Wooley, 1991; Hirschmann

Accepted 7 March 2004

*Correspondence to: Thomas A. Wadden, PhD, Weight and Eating Disorders Program, University of Pennsylvania School of Medicine, 3535 Market Street, Suite 3029, Philadelphia, PA 19104. E-mail: wadden@mail.med.upenn.edu

¹Department of Psychology, Drexel University, Philadelphia, Pennsylvania

²Department of Psychiatry, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/eat.20098

© 2005 Wiley Periodicals, Inc.

& Munter, 1988; Polivy & Herman, 1985). These investigators believe that weight loss interventions may do more harm than good. By contrast, obesity experts generally believe that early intervention is desirable. Family support for change is likely to be available, eating and activity habits may be more amenable to modification, and adipose tissue cell proliferation may be curtailed (Goldfield & Epstein, 2002). Early treatment also may be cost-effective. Preventing overweight children and adolescents from becoming obese adults could reduce the healthcare costs of treating obesity-related complications.

The current article examines concerns that dieting may increase the risk of eating disorders in overweight adolescents and older children who seek to lose weight. We review the history of this concern, define dieting, and describe common weight management interventions for overweight youth. The effects of dieting on eating behavior and psychological status are reviewed, as are directions for future research.

Concerns About Dieting

Dieting is frequently implicated in the pathogenesis of eating disorders (Schmidt, 2002). It typically precedes the onset of symptoms of anorexia nervosa and bulimia nervosa (Hsu, 1997). An investigation of adolescents, for example, found that females who were characterized as moderate or severe dieters were 5 and 18 times more likely, respectively, than nondieters to develop an eating disorder over a 3-year period (Patton, Selzer, Coffey, Carlin, & Wolfe, 1999). Findings such as these have led school-based eating disorder prevention programs to warn students about the ill effects of dieting (e.g., Kater, Rohwer, & Levine, 2000).

The majority, however, of adolescent dieters do not develop anorexia nervosa or bulimia nervosa. Although 44% of teenage girls and 15% of boys report trying to lose weight, the prevalence of eating disorders in girls (who are at a significantly higher risk than boys) is between 1% and 4% (American Psychiatric Association, 2000; Serdula et al., 1993). Thus, dieting appears to be a necessary but not sufficient condition for the development of anorexia nervosa and bulimia nervosa (Wilson, 1993). Other factors, including a genetic predisposition, personality traits (such as negative self-evaluation), or a family history of certain psychiatric disorders, appear to contribute to the development of eating disorders in the presence of dieting (Schmidt, 2002).

Who is Dieting?

Other issues must be examined when considering whether dieting is a risk factor for the development of eating disorders in overweight adolescents who seek to lose weight. First, studies of average weight or lean youth may have limited relevance to their overweight peers. Excess body fat may protect both overweight teens and adults from the adverse behavioral and psychological effects that were observed in average weight male volunteers who were subjected to severe caloric restriction and lost 24% of their initial body weight (Keys, Brozek, Henschel, Mickelson, & Taylor, 1950). These men became clinically depressed, as well as obsessed with food. In addition, a substantial number began to binge eat when their energy intake returned to normal at the end of the study. By contrast, studies of obese adults who have lost 10%–20% of their initial weight have shown improvements in mood, as well as in binge eating (if it was present before weight reduction; National Task Force on the Prevention and Treatment of Obesity, 2000). A second consideration is that dieting can take many forms, from starvation to moderate energy restriction to a preoccupation with purportedly good and bad foods (French & Jeffery, 1994). Clearly, some interventions would appear more likely than others to be associated with adverse effects.

Defining Dieting

Estimates of the prevalence of dieting vary widely depending on the wording of weight control questions and the presence of items that ask about specific behaviors (French & Jeffery, 1994). For instance, the desire to lose weight is much more prevalent than actual engagement in dieting behaviors (French & Jeffery, 1994). The lack of precision in defining dieting behaviors also is apparent in the controversy surrounding restraint theory. Research demonstrating that unsuccessful dieters and individuals with bulimia nervosa score higher than comparison groups on Herman and Polivy's (1980) Restraint scale is often cited as support for the hypothesis that dieting causes binge eating. However, as Stunkard (2002) has noted, the term *restraint* is a misnomer, in that high scores on the Restraint scale are not indicative of dieting, but of disinhibition of eating behavior. In fact, restrained eaters do not differ from unrestrained eaters, as identified by the Restraint scale, in caloric intake or weight loss (Heatherton, Herman, Polivy, King, & McGree, 1988; Heatherton, Polivy, & Herman, 1991).

In the current article, dieting is defined as "the intentional and sustained restriction of caloric

intake for the purposes of reducing body weight or changing body shape, resulting in a significant negative energy balance" (p. 2582). This is the definition proposed by the National Task Force on the Prevention and Treatment of Obesity (2000) in its review of the behavioral effects of dieting in obese adults. French, Perry, Leon, and Fulkerson (1995) found in a population-based study that this type of dieting was fairly common in adolescents. Reducing caloric intake, fat intake, or snacks was each reported by approximately 25% of respondents. Unhealthy weight control behaviors were less common. For example, 8% of respondents reported fasting, 5% acknowledged using diet pills, and 4% reported vomiting. In a nationally representative sample of adolescents, those who used moderate methods of dieting reported a more nutritionally sound intake than nondieters, suggesting that adolescent dieting can be health promoting (Story, Neumark-Sztainer, Sherwood, Stang, & Murray, 1999). Unhealthy (as compared with healthy) dieting would appear more likely to be associated with the development of eating disorders. Use of diet pills, laxatives, or vomiting to control weight are, in fact, all criteria for the diagnosis of anorexia and bulimia.

Weight Loss Interventions for Children and Adolescents

Effective management of overweight in children and adolescents targets diet, physical activity, and behavior change, and often requires parental participation (Goldfield, Raynor, & Epstein, 2002). Dietary change may include reduction of calorie or fat intake, as well as improved adherence to dietary guidelines such as the food guide pyramid (Epstein, Myers, Raynor, & Saelens, 1998). A popular approach to diet modification in youth is provided by the traffic light diet, which classifies foods into red (stop), yellow (caution), or green (go) categories based on caloric value and nutrient density (Epstein & Squires, 1988). Typically, the initial goal is to limit intake to 1,000–1,300 kcal per day, adjusted to promote a weight loss of approximately 0.25 kg per week.

To increase physical activity, programs typically encourage structured aerobic exercise (such as swimming, jogging, or basketball), as well as lifestyle activity, which involves increasing physical activity throughout the day by methods such as walking rather than riding or using stairs rather than escalators. Preliminary studies found that lifestyle activity

was more effective than structured exercise in facilitating the maintenance of lost weight (Epstein, Valoski, Wing, & McCurley, 1994; Epstein, Wing, Koeske, & Valoski, 1985). Reducing sedentary behaviors, including watching television and playing video games, also has been shown to contribute significantly to weight management (Epstein et al., 1995).

Parental participation in treatment is critical for children and is also of benefit in adolescents (Brownell, Kelman, & Stunkard, 1983; Goldfield et al., 2002; Wadden et al., 1990). Parents may reward changes in their child's diet or physical activity or modify their own eating or activity habits to model healthy behaviors. Similarly, parents can limit high-fat and high-sugar foods in the house, while increasing fruits, vegetables, and other healthy choices. One study found that using parents as the exclusive agents for their child's behavior change resulted in greater decreases in overweight than treating the child alone (Golan, Weizman, Apter, & Fainaru, 1998).

Family-based behavioral programs have reduced children's percentage overweight by as much as 25% and have produced successful weight maintenance for as long as 10 years (Epstein et al., 1994; Epstein, Valoski, Wing, & McCurley, 1990; Golan et al., 1998). More typical reductions in percentage overweight have ranged from 5% to 15% (Goldfield et al., 2002). In some cases, decreases in weight (or fat) have been associated with significant reductions in systolic and diastolic blood pressure, fasting serum cholesterol levels, triglyceride levels, and hyperinsulinemia, and with significant increases in high-density lipoprotein serum cholesterol levels (Epstein et al., 1998).

Behavioral Consequences of Dieting: A Review of the Literature

To review the relationship between weight loss interventions and the risk of eating disorders in children and adolescents, we searched electronic databases (i.e., MEDLINE and PsycINFO) for articles containing various combinations of the following keywords: weight loss, dieting, treatment, overweight, obesity, anorexia, bulimia, binge eating, eating disorder, children, and adolescents. We also conducted a manual search of numerous reference lists. We did not include articles published in languages other than English. We examined only studies that evaluated the effects on eating behavior and psychological status of professionally

administered weight loss programs. We note that we were unable in these studies to separate the potential effects of dieting from those of weight loss.

We found only five relevant studies (Table 1). Although each examined eating-related behaviors or attitudes, none employed criteria required for the diagnosis of a specific eating disorder. Studies are reviewed in ascending order of length of follow-up (i.e., from shortest to longest).

Effects of Dieting on Eating Behavior

Braet, Tanghe, DeBode, Franckx, and Winckel (2003) evaluated a 10-month, inpatient cognitive-behavioral weight loss program. At baseline, participants in the program had a median age of 13 years and a median BMI of 33 kg/m². At posttreatment, the median weight loss was 19 kg. At this time, mean scores on the Drive for Thinness subscale of the Eating Disorder Inventory (EDI; Garner, Olmsted, & Polivy, 1983) decreased significantly. Mean scores on the EDI Bulimia subscale did not change significantly. However, the number of participants scoring at least 1 *SD* above the norm on this subscale (which indicates a heightened risk for developing an eating disorder) decreased from seven to two over the course of treatment. On the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986), scores on the external eating subscale decreased. No significant changes were found in Emotional Eating or Restrained Eating. In sum, that study found no evidence that substantial weight loss was associated with an increase in eating disorder symptomatology.

Levine, Ringham, Kalarchian, Wisniewski, and Marcus (2001) evaluated a family-based behavior modification program for severe pediatric overweight. Children had a mean baseline age of 10.2 years and weight of 79.7 kg. At the end of treatment, they decreased their percentage overweight by an average of 11% but did not maintain this

reduction when assessed approximately 8 months later. Symptoms of eating disorders were measured at pretreatment and follow-up by the Children's Eating Attitudes Test (ChEAT), which is designed to assess respondents' attitudes toward their eating and dieting behavior. The ChEAT measures perceived body image, obsessions/preoccupations with food, and dieting practices. At follow-up, a statistical trend was observed for a decrease in ChEAT scores. Thus, preoccupation with dieting, unhealthy dieting behaviors, and concerns about being overweight tended to decrease. Together, these results suggest that neither significant weight loss nor weight regain causes an increase in symptoms of an eating disorder.

Epstein, Paluch, Saelens, Ernst, and Wilfley (2001) evaluated an intervention in which all participants received the traffic light diet intervention. Some also were provided training in problem-solving. Participants had a mean age of 10.3 years and a weight of 59.5 kg. Follow-up assessments, conducted 18 months posttreatment, found that percentage overweight decreased an average of 13% across conditions. Weight dissatisfaction, purging/restricting, and total symptoms of disordered eating were assessed by the Kids' Eating Disorder Survey (KEDS; Childress, Jarrell, & Brewerton, 1993). No significant changes were observed over time.

Braet and Van Winckel (2000) examined a cognitive-behavior modification (CBM) program that taught participants self-regulation and problem-solving skills and promoted lifestyle change. Children had a mean baseline age of 11 years and a mean weight of 62 kg. CBM was delivered in a group, individual, or summer camp format and was compared with a one-session advice condition. At a 4.6-year follow-up assessment, percentage overweight (which did not differ between groups) had decreased an average of 11% from baseline. Measurement of height and weight indicated that none of the participants was anorectic at follow-up.

TABLE 1. Summary of treatment studies evaluating eating disorder symptomatology

Study	Number ^a	Baseline Mean BMI	Treatment	Follow-up (months)
Braet, Tanghe, De Bode, Franckx, and Winckel, 2003	38 (27)	33.0	Inpatient multicomponent	6
Levine, Ringham, Kalarchian, Wisniewski, and Marcus, 2001	24 (16)	33.9	Behavioral family-based	8
Epstein, Paluch, Saelens, Ernst, and Wilfley, 2001	64 (47)	25.5	Behavioral family-based	24
Braet and Van Winckel, 2000	136 (109)	n/a	Cognitive-behavioral	55
Epstein, Valoski, Wing, and McCurley, 1994	185 (158)	33.9	Behavioral family-based	120

Note: BMI = body mass index.

^aNumber of participants enrolled. Values in parentheses indicate the number of participants at follow-up assessment.

Follow-up assessment with the DEBQ indicated that external eating decreased and restrained eating increased over the 4.6 years. The authors interpreted this to mean that the program helped children to control external food stimuli and to develop the restraint necessary for weight control. Emotional eating, also measured by the DEBQ, did not change. At follow-up, five participants (9%), three of whom were in the one-session advice condition, scored more than 1 *SD* above the norm on the Bulimia subscale of the EDI. The proportion of participants identified as being at risk for an eating disorder does not appear to be elevated compared with community samples of adolescents.

A 10-year follow-up study, the longest to date, evaluated outcomes for participants who had enrolled in one of four weight control programs during childhood (Epstein, Valoski, Wing, & McCurley, 1994). All interventions were family based and implemented the traffic light diet to reduce caloric intake. Participants had an average baseline age of 10.4 years and a weight of 55.3 kg. Thirty-four percent of participants reduced their percentage overweight by more than 20% at follow-up. On a medical history form, 4% of participants reported that they had been treated for bulimia nervosa over the course of the 10-year follow-up. None reported treatment for anorexia nervosa. These rates are consistent with those reported in community samples and cannot be definitely interpreted in the absence of a no-treatment control group.

Together, these five studies suggest that professionally administered weight loss interventions pose minimal risks of precipitating eating disorders in overweight children and adolescents. Support for this conclusion is provided by cross-sectional studies that examined the relationship between dieting and binge eating in clinical populations. A study of obese adolescents with binge eating disorder found no relationship between a history of participation in diet programs and the increased occurrence of binge eating (Berkowitz, Stunkard, & Stallings, 1993). Similarly, approximately one half of adults with BED report that dieting did not precede the onset of this disorder (Yanovski, 2002).

Effects of Dieting on Psychosocial Status

There have long been concerns that dieting and weight loss also may precipitate adverse emotional reactions including depression, anxiety, and irritability (Stunkard, 1957; Stunkard & Rush, 1974). Thus, it is important to assess this possibility in overweight children and adolescents who seek weight loss. Myers, Raynor, and Epstein (1998) evaluated children's psychosocial status, as deter-

mined by mothers' reports on the Child Behavior Checklist (CBCL; Achenbach, 1991). Children, who had a mean age of 10.4 years and a mean BMI of 27.6 kg/m², participated in a family-based behavioral program. From baseline to 1-year follow-up, participants' percentage overweight decreased an average of 20%. During this time, global child psychopathology decreased significantly, whereas global competence increased. The proportion of children who met clinical criteria for at least one behavior problem decreased from 29% at baseline to 13% at follow-up. Improvements in some aspects of psychosocial status, including somatic complaints and social competence, were positively associated with weight loss.

Four of the five studies described earlier, which evaluated eating disorder symptomatology, also examined other psychological outcomes. Braet et al. (2003) found during their 10-month inpatient program that self-perception of competence increased significantly in three of the five areas assessed, although global self-worth did not improve significantly. Participants were assessed by the Self-Perception Profile (Harter, 1985). Levine et al. (2001) found that participants reported significant reductions in symptoms of depression and state anxiety at the end of treatment that were maintained at the 8-month follow-up. Epstein et al. (2001) observed that total behavior problems, as well as internalizing behavior problems (as measured by the CBCL), decreased significantly at an 18-month follow-up evaluation. In the Epstein et al. (1994) 10-year follow-up study, 12% of participants reported seeking treatment for depression during the decade. The authors suggested that this prevalence of depression was not surprising, given the increased prevalence of psychiatric disorders in persons who seek specialized treatment for obesity (Goldsmith et al., 1992). The favorable findings of these five studies contradict suggestions that dieting has a negative effect on mood (e.g., Polivy & Herman, 1985). The apparent inconsistency in these findings may be explained by the differences between the constructs that are measured by restrained eating and dieting (Lowe, 1993).

Summary and Future Directions

The current review found that professionally administered weight loss programs for overweight children and adolescents generally did not increase symptoms of eating disorders and were associated with significant improvements in psychosocial

status. Thus, concerns about the possible adverse effects of dieting should not deter our nation's growing number of overweight youth from pursuing sensible methods to lose weight or, at a minimum, to prevent the progression of adiposity. Replacing, for example, the consumption of sugared sodas and fruit juices with water, and encouraging physical activity in lieu of television viewing, would appear to present few risks to overweight youth.

Supporting Evidence from Research on Obese Adults

The conclusion that professionally administered weight control programs for overweight youth do not precipitate disordered eating is supported by additional research on the effects of dieting in obese adults. This research has focused primarily on binge eating. Studies consistently found that weight loss programs that prescribed modest caloric restriction did not precipitate binge eating (Goodrick, Poston, Kimball, Reeves, & Foreyt, 1998; Klem, Wing, Simkin-Silverman, & Kuller, 1997; National Task Force on the Prevention and Treatment of Obesity, 2000; Wadden et al., 2004; Wilson, 2002). In fact, traditional behavioral programs often were associated with a significant decrease in binge eating episodes in individuals who began treatment with this complication. The National Task Force on the Prevention and Treatment of Obesity concluded that dieting and weight loss, in overweight or obese adults, were not associated with the development of eating disorders. In addition, one study found that when nonobese women were placed on a 6-week, low-calorie diet, bulimic symptomatology significantly decreased relative to a control condition (Presnell & Stice, 2003).

The National Task Force on the Prevention and Treatment of Obesity (2000) review also found that dieting and weight loss in obese adults typically were associated with improvements in depression, anxiety, and related complications. This was true even in persons treated by very low-calorie diets. The inclusion, in most programs, of behavior therapy to promote weight loss may have contributed to the observed improvements in mood (Wadden, Stunkard, & Liebschutz, 1988; Wadden, Stunkard, & Smoller, 1986). Long-term studies also showed that weight regain, although upsetting to dieters, was not associated with significant increases in depression, anxiety, or binge eating (National Task Force on the Prevention and Treatment of Obesity, 2000; Wilson, 2002).

Directions for Future Research

The foregoing conclusions regarding treatment of overweight in children and adolescents clearly are based on a very limited number of studies. Further research is needed to reach firm conclusions. In particular, studies are needed to reconcile findings of the apparently benign effects of dieting, as practiced in behavioral weight loss programs, with concerns that dieting may precipitate eating disorders. Several issues must be considered.

First, healthy dieting, which encourages only modest caloric restriction, in combination with the increased consumption of low-fat dairy products and fruits and vegetables, appears to present few risks to overweight youth. As discussed, such dieting is likely to improve the nutritional value of foods consumed. By contrast, extreme dieting, which includes severe caloric restriction (e.g., crash diets) and the prohibition of certain foods (e.g., fad diets), would appear to significantly increase the risk of eating disorders and emotional complications. This potential exists both in overweight youth and average weight girls who diet aggressively in pursuit of an ever-thinner ideal. The hypothesized difference in outcomes underscores the importance of clearly defining the behavior that is intended by the term *dieting* and distinguishing it from related constructs, such as restrained eating.

Second, disturbances in eating behavior and mood also must be clearly defined and measured. The pediatric obesity studies that we reviewed did not include criteria for the diagnosis of bulimia nervosa, BED, or eating disorder not otherwise specified. None, for example, measured objective or subjective binge episodes as defined by Fairburn and Cooper (1993). Future studies should incorporate efforts by Bryant-Waugh, Cooper, Taylor, and Lask (1996) to modify the Eating Disorder Examination for use with children and adolescents. This examination is the gold standard for the assessment of eating disorders in adults (Wilson, 1993).

Third, some overweight youth may be at greater risk of adverse behavioral consequences of dieting and weight loss, even when they participate in a professionally administered program or follow a sensible eating plan on their own. Longitudinal studies, for example, have shown that severe body image dissatisfaction (and weight and shape preoccupation) is the most robust predictor of the development of eating disorders in adolescent girls (Field, Camargo, Taylor, Berkey, & Colditz, 1999; Killen et al., 1994; Stice & Agras, 1998). Thus, overweight teenagers with marked body image dissatisfaction, depression, or other psychiatric

complications may be at greatest risk of experiencing binge eating episodes when subjected to even modest caloric restriction. Studies of this issue are required and should include long-term follow-up evaluations. Weight regain (after weight loss) is common in overweight adolescents, as it is in obese adults. Although studies of adults have not found that such weight regain is associated with clinically significant behavioral consequences, it could be in overweight youth who already have a history of psychiatric complications. Whenever possible, as in Epstein's outstanding series of studies, follow-up assessment should be conducted through late adolescence when symptoms of bulimia nervosa or BED would have a greater likelihood of emerging.

Responding to the Epidemic of Overweight and Obesity

Ultimately, large-scale randomized, controlled trials will be needed to determine the behavioral risks posed by different weight loss interventions for overweight youth. Ethical constraints, however, will limit investigators from using such trials to assess the effects of crash diets and other fundamentally unsound approaches. In addition, given the generally low occurrence of eating disorders, case-control studies may provide a better mechanism of identifying dietary practices that are most likely to be associated with the development of complications.

The current review has shown that professionally administered weight loss programs appear to be associated with minimal risks of behavioral complications in overweight children and youth. Moreover, efforts to replace the consumption of junk foods with fruits and vegetables or to substitute water for high-sugar drinks would appear to have only salutary effects. Although health professionals, teachers, and parents will continue to be concerned about misguided weight loss efforts in children and teenagers, all should be increasingly concerned by the growing epidemic of pediatric obesity. Fifteen percent of U.S. adolescents are already overweight and, as adults, will experience serious medical and psychosocial consequences of this condition. Concerns about potential ill effects of dieting should not impede efforts to improve the treatment of pediatric obesity. More important, such concerns should not discourage urgently needed public health campaigns to prevent the development of overweight and obesity in both children and adults (Wadden, Brownell, & Foster, 2002).

Completion of this review was supported by a grant from the Annenberg Commission on Adolescent Mental

Health and by a Midcareer Investigator Award in Patient Oriented Patient Research from the National Institute of Diabetes and Digestive and Kidney Diseases. The authors acknowledge the National Task Force on the Prevention and Treatment of Obesity whose article on the effects of dieting in obese adults stimulated completion of the current review.

References

- Achenbach, T.M. (1991). *Manual for the Child Behavior Checklist*. Burlington, VT: University of Vermont Press.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.
- Berkowitz, B.E., Stunkard, A.J., & Stallings, V.A. (1993). Binge-eating disorder in obese adolescent girls. *Annals of the New York Academy of Sciences*, 699, 200–206.
- Braet C., Tanghe, A., Bode, P.D., Franckx, H., & Winckel, M.V. (2003). Inpatient treatment of obese children: A multicomponent program without stringent calorie restriction. *European Journal of Pediatrics*, 162, 391–396.
- Braet, C., & Van Winckel, M. (2000). Long-term follow-up of a cognitive behavioral treatment program for obese children. *Behavior Therapy*, 31, 55–74.
- Brownell, K.D., Kelman, S.H., & Stunkard, A.J. (1983). Treatment of obese children with and without their mothers: Changes in weight and blood pressure. *Pediatrics*, 71, 515–523.
- Bryant-Waugh, R.J., Cooper, P.J., Taylor, C.L., & Lask, B.D. (1996). The use of the Eating Disorder Examination with children: A pilot study. *International Journal of Eating Disorders*, 19, 391–397.
- Casey, V.A., Dwyer, J.T., Coleman, K.A., & Valadian, I. (1992). Body mass index from childhood to middle age: A 50-year-follow-up. *American Journal of Clinical Nutrition*, 56, 14–18.
- Childress, A.C., Jarrell, M.P., & Brewerton, T.D. (1993). The Kids' Eating Disorders Survey (KEDS): Internal consistency, component analysis, and reliability. *Eating Disorders: Journal of Treatment and Prevention*, 1, 123–133.
- DiPietro, L., Mossberg, H.O., & Stunkard, A.J. (1994). A 40-year history of overweight children in Stockholm: Life-time overweight, morbidity, and mortality. *International Journal of Obesity*, 18, 585–590.
- Epstein, L.H., Myers, M.D., Raynor, H.A., & Saelens, B.E. (1998). Treatment of pediatric obesity. *Pediatrics*, 101, 554–570.
- Epstein, L.H., Paluch, R.A., Saelens, B.E., Ernst, M.M., & Wilfley, D.E. (2001). Changes in eating disorder symptoms with pediatric obesity treatment. *Journal of Pediatrics*, 139, 58–65.
- Epstein, L.H., & Squires, S. (1988). *The stop-light diet for children*. Boston: Little, Brown.
- Epstein, L.H., Valoski, A.M., Vara, L.S., McCurley, J., Wisniewski, L., Kalarchian, M.A., Klein, K.R., & Shrager, L.R. (1995). Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology*, 14, 109–115.
- Epstein, L.H., Valoski, A., Wing, R.R., & McCurley, J. (1990). Ten-year follow-up of behavioral family-based treatment for obese children. *Journal of the American Medical Association*, 264, 2519–2523.
- Epstein, L.H., Valoski, A., Wing, R.R., & McCurley, J. (1994). Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychology*, 13, 373–383.
- Epstein, L.H., Wing, R.R., Koeske, R., & Valoski, A. (1985). A comparison of lifestyle exercise, aerobic exercise, and

- calisthenics on weight loss in obese children. *Behavior Therapy*, 16, 345–356.
- Fairburn, C.G., & Cooper, Z. (1993). The Eating Disorder Examination. In C.G. Fairburn & G.T. Wilson (Eds.), *Binge eating: Nature, assessment, and treatment* (pp. 317–360). New York: Guilford Press.
- Field, A.E., Camargo, C.A., Taylor, C.B., Berkey, C.S., & Colditz, G.A. (1999). Relation of peer and media influences to the development of purging behaviors among preadolescent and adolescent girls. *Archives of Pediatric Adolescent Medicine*, 153, 1184–1189.
- French, S.A., & Jeffery, R.W. (1994). Consequences of dieting to lose weight: Effects on physical and mental health. *Health Psychology*, 13, 195–212.
- French, S.A., Perry, C.L., Leon, G.R., & Fulkerson, J.A. (1995). Dieting behaviors and weight change history in female adolescents. *Health Psychology*, 14, 548–555.
- Garn, S.M., Sullivan, T.V., & Hawthorne, V.M. (1989). Fatness and obesity of the parents of obese individuals. *American Journal of Clinical Nutrition*, 50, 1308–1313.
- Garner, D.M., Olmsted, M.P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa. *International Journal of Eating Disorders*, 2, 5–34.
- Garner, D.M., & Wooley, S.C. (1991). Confronting the failure of behavioral and dietary treatments for obesity. *Clinical Psychology Review*, 11, 729–780.
- Glaser, N.S. (1997). Non-insulin-dependent diabetes mellitus in childhood and adolescence. *Pediatric Clinics of North America*, 44, 307–337.
- Golan, M., Weizman, A., Apter, A., & Fainaru, M. (1998). Parents as exclusive agents of change in the treatment of childhood obesity. *American Journal of Clinical Nutrition*, 67, 1130–1135.
- Goldfield, G.S., & Epstein, L.H. (2002). Management of obesity in children. In C.G. Fairburn & K.D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (2nd ed., pp. 573–577). New York: Guilford Press.
- Goldfield, G.S., Raynor, H.A., & Epstein, L.H. (2002). Treatment of pediatric obesity. In T.A. Wadden & A.J. Stunkard (Eds.), *Handbook of obesity treatment* (pp. 532–555). New York: Guilford Press.
- Goldsmith, S.J., Anger-Friedfeld, K., Beren, S., Rudolph, D., Boeck, M., & Aronne, L. (1992). Psychiatric illness in patients presenting for obesity treatment. *International Journal of Eating Disorders*, 12, 63–71.
- Goodrick, G.K., Poston, W.S.C., Kimball, K.T., Reeves, R.S., & Foreyt, J.P. (1998). Nondietering versus dieting treatment for overweight binge-eating women. *Journal of Consulting and Clinical Psychology*, 66, 363–368.
- Harter, S. (1985). *Self-perception profile for children*. Denver: University of Denver Press.
- Heatherton, T.F., Herman, C.P., Polivy, J., King, G.A., & McGree, S.T. (1988). The (mis)measurement of restraint: An analysis of conceptual and psychometric issues. *Journal of Abnormal Psychology*, 97, 19–29.
- Heatherton, T.F., Polivy, J., & Herman, C.P. (1991). Restraint, weight loss, and variability of body weight. *Journal of Abnormal Psychology*, 100, 78–83.
- Herman, C.P., & Polivy, J. (1980). Restrained eating. In A.J. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia: Saunders.
- Hirschmann, J.R., & Munter, C.H. (1988). *Overcoming overeating: Living free in the world of food*. Reading, MA: Addison-Wesley.
- Hsu, L.K.G. (1997). Can dieting cause an eating disorder? *Psychological Medicine*, 27, 509–513.
- Kater, K.J., Rohwer, J., & Levine, M.P. (2000). An elementary school project for developing healthy body image and reducing risk factors for unhealthy and disordered eating. *Eating Disorders: The Journal of Treatment and Prevention*, 8, 3–16.
- Keys, A., Brozek, K., Henschel, A., Mickelson, O., & Taylor, H.L. (1950). *The biology of human starvation*. Minneapolis: University of Minnesota Press.
- Killen, J.D., Taylor, C.B., Hayward, C., Wilson, D., Haydel, K., Hammer, L., & Simmonds, B. (1994). Pursuit of thinness and onset of eating disorder symptoms in a community sample of adolescent girls: A three-year prospective analysis. *International Journal of Eating Disorders*, 16, 227–238.
- Kitagawa, T., Owada, M., Urakami, T., & Yamauchi, K. (1998). Increased incidence of non-insulin dependent diabetes mellitus among Japanese schoolchildren correlates with an increased intake of animal protein and fat. *Clinical Pediatrics*, 37, 111–115.
- Klem, M.L., Wing, R.R., Simkin-Silverman, L., & Kuller, L.H. (1997). The psychological consequences of weight gain prevention in healthy, premenopausal women. *International Journal of Eating Disorders*, 21, 167–174.
- Levine, M.D., Ringham, R.M., Kalarchian, M.A., Wisniewski, L., & Marcus, M.D. (2001). Is family-based behavioral weight control appropriate for severe pediatric obesity? *International Journal of Eating Disorders*, 30, 318–328.
- Lowe, M.R. (1993). The effects of dieting on eating behavior: A three-factor model. *Psychological Bulletin*, 114, 100–121.
- Must, A., Jacques, P.F., Dallal, G.E., Bajema, C.J., & Dietz, W.H. (1992). Long-term morbidity and mortality of overweight adolescents: A follow-up of the Harvard Growth Study of 1922 to 1935. *New England Journal of Medicine*, 327, 1350–1355.
- Myers, M.D., Raynor, H.A., & Epstein, L.H. (1998). Predictors of child psychological changes during family-based treatment for obesity. *Archives of Pediatric and Adolescent Medicine*, 152, 855–861.
- National Center for Health Statistics. (2003). *Overweight children and adolescents: United States, 1999–2000*. Retrieved April 1, 2003, from <http://www.cdc.gov/nchs/fastats/overwt.htm>
- National Task Force on the Prevention and Treatment of Obesity. (2000). *Dieting and the development of eating disorders in overweight and obese adults*. *Archives of Internal Medicine*, 160, 2581–2589.
- Patton, G.C., Selzer, R., Coffey, C., Carlin, J.B., & Wolfe, R. (1999). Onset of adolescent eating disorders: Population based cohort study over 3 years. *British Medical Journal*, 318, 765–768.
- Phillips, D.I., & Young, J.B. (2000). Birth weight, climate at birth and the risk of obesity in adult life. *International Journal of Obesity*, 24, 281–287.
- Pinhas-Hamiel, O., Dolan, L.M., Daniels, S.R., Standiford, D., Khoury, R.P., & Zeitler, P. (1996). Increased incidence of non-insulin dependent diabetes mellitus among adolescents. *Journal of Pediatrics*, 12, 608–615.
- Polivy, J., & Herman, C.P. (1985). Dieting and bingeing: A causal analysis. *American Psychologist*, 40, 193–201.
- Presnell, K., & Stice, E. (2003). An experimental test of the effect of weight-loss dieting on bulimic pathology: Tipping the scales in a different direction. *Journal of Abnormal Psychology*, 112, 166–170.
- Schmidt, U. (2002). Risk factors for eating disorders. In C.G. Fairburn & K.D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (2nd ed., pp. 247–251). New York: Guilford Press.
- Serdula, M.K., Collins, M.E., Williamson, D.F., Anda, R.F., Pamuk, E., & Byers, T.E. (1993). Weight control practices of U.S. adolescents and adults. *Annals of Internal Medicine*, 119, 667–671.
- Stice, E., & Agras, W.S. (1998). Predicting onset and cessation of bulimic behaviors during adolescence: A longitudinal grouping analysis. *Behavior Therapy*, 29, 257–276.

- Story, M., Neumark-Sztainer, D., Sherwood, N., Stang, J., & Murray, D. (1999). Dieting status and its relationship to eating and physical activity behaviors in a representative sample of U.S. adolescents. *Journal of the American Dietetic Association*, 98, 1127–1135.
- Stunkard, A.J. (1957). The dieting depression: Untoward responses to weight reduction. *American Journal of Medicine*, 23, 77–86.
- Stunkard, A.J. (2002). Binge-eating disorder and the night-eating syndrome. In T.A. Wadden & A.J. Stunkard (Eds.), *Handbook of obesity treatment* (pp. 107–121). New York: Guilford Press.
- Stunkard, A.J., & Rush, J. (1974). Dieting and depression reexamined. A critical review of reports of untoward responses during weight reduction for obesity. *Annals of Internal Medicine*, 81, 526–533.
- Styne, D.M. (2001). Childhood and adolescent obesity. *Pediatric Clinics of North America*, 48, 1041–1053.
- Troiano, R.P., Flegal, K.M., Kuczmarski, R.K., Campbell, S.M., & Johnson, C.L. (1995). Overweight prevalence and trends for children and adolescents. *Archives of Pediatric and Adolescent Medicine*, 149, 1085–1091.
- Van Strien, T., Frijters, J.E.R., Bergers, G.P.A., & Defares, P.B. (1986). The Dutch Eating Behavior Questionnaire for assessment of restrained, emotional, and external eating behavior. *International Journal of Eating Disorders*, 5, 295–315.
- Wadden, T.A., Brownell, K.D., & Foster, G.D. (2002). Obesity: Responding to a global epidemic. *Journal of Consulting and Clinical Psychology*, 70, 510–525.
- Wadden, T.A., Foster, G.D., Sarwer, D.B., Anderson, D.A., Gladis, M., Sanderson, R.S., Letchak, R.V., Berkowitz, R.I., & Phelan, S. (2004). Dieting and the development of eating disorders in obese women: Results of a randomized trial. *American Journal of Clinical Nutrition*, 80, 560–568.
- Wadden, T.A., Stunkard, A.J., & Liebschutz, J. (1988). Three-year follow-up of the treatment of obesity by very low-calorie diet, behavior therapy, and their combination. *Journal of Consulting and Clinical Psychology*, 56, 925–928.
- Wadden, T.A., Stunkard, A.J., Rich, L., Rubin, C.J., Sweidel, G., & McKinney, S. (1990). Obesity in black adolescent girls: A controlled trial of treatment by diet, behavioral modification, and parental support. *Pediatrics*, 85, 345–352.
- Wadden, T.A., Stunkard, A.J., & Smoller, J.W. (1986). Dieting and depression: A methodological study. *Journal of Consulting and Clinical Psychology*, 54, 869–871.
- Wilson, G.T. (1993). Relation of dieting and voluntary weight loss to psychological functioning and binge eating. *Archives of Internal Medicine*, 119, 727–730.
- Wilson, G.T. (2002). The controversy over dieting. In C.G. Fairburn & K.D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (pp. 93–97). New York: Guilford Press.
- Yanovski, S.Z. (2002). Binge eating in obese persons. In C.G. Fairburn & K.D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (pp. 403–407). New York: Guilford Press.