An Attempt to Modify Unhealthful Eating Attitudes and Weight Regulation Practices of Young Adolescent Girls

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This is the first long-term, controlled study evaluating the effectiveness of a prevention curriculum designed to modify the eating attitudes and unhealthful weight regulation practices of young adolescent girls. Nine hundred sixty-seven sixth and seventh-grade girls were randomized to experimental healthy weight regulation curriculum or no-treatment control classes. A prevention intervention was developed around three principal components: (1) Instruction on the harmful effects of unhealthful weight regulation; (2) promotion of healthful weight regulation through the practice of sound nutrition and dietary principles and regular aerobic physical activity; (3) development of coping skills for resisting the diverse sociocultural influences that appear linked to the current popular obsessions with thinness and dieting. The intervention failed to achieve the hoped-for impact. We did observe a significant increase in knowledge among girls receiving the intervention and among high-risk students only, there was a small albeit statistically significant effect on body mass index. These findings question the wisdom of providing a curriculum directed at all young adoles-

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cents, most of whom are not at risk to develop an eating disorder. Rather than targeting the entire population, a healthy weight curriculum designed to modify the eating attitudes and unhealthful weight regulation practices of young adolescent girls might better focus on "at risk" students. © 1993 by John Wiley & Sons, Inc.

A thin body type is the dominant cultural ideal for females in modern Western society. A 1978 Nielsen survey showed that 45% of all households in America contained a dieter at some point during the year and that 56% of all women aged 24–54 years diet (Nielson, 1979). In another survey, 38% of a sample of college females were statistically underweight, yet only 5% believed their weight to be below average (Gray, 1977). As one eminent clinician has said, the popular media convey the message ". . . day in and day out, that one can be loved and respected only when slender" (Bruch, 1978).

Research indicates that the adult preoccupation with weight and the practice of restrictive dieting and other methods of unhealthful weight regulation have spread to child and young adolescent populations. For example, binge eating, dieting, and various unhealthy weight regulation practices are now widespread among adolescents (Crowther, Post, & Zaynor, 1985; Killen et al., 1986, 1987; Patton, 1988; Rosen & Gross, 1987). In previous research, we found that 33% of 10th-grade females judged themselves to be overweight or very overweight when in fact their weight was within 75% of age-adjusted mean body mass index (BMI), 10.4% employed some form of purging behavior for weight-control, and another 10.3% displayed the major DSM-III symptoms of bulimia (Killen et al., 1987). Other investigations have reported similar findings. For instance, Lifshitz and Moses (1988) found that 39% of a sample of 798 teenage girls were on diets to lose weight, 27% reported uncontrollable eating binges, 8% had impulses to vomit after meals, and 3% stated that they engaged in vomiting behavior to control their body weight. These practices may begin at a very early age. In one study, 30% of 9-year-olds reported worrying that they were too fat now or feared becoming fat in the future, 81% of 10-year-olds in the study were restrained eaters, and 9% of 9-year-olds reported purging behavior for the purpose of weight control (Mellin, Irwin, & Scully, 1992).

Concerns with weight and unhealthy weight regulation practices may be particularly problematic during early adolescence. An unwarranted fear of obesity coupled with excessive caloric restriction can have a deleterious impact on normal growth and development (Lifshitz & Moses, 1988). Pugliese, Lifshitz, Grad, Fort & Marks-Katz, 1983 identified 14 otherwise normal children who demonstrated inhibited growth that was linked to caloric restriction arising from fear of becoming fat.

Concern over body weight and unhealthful weight regulation practices may also manifest themselves in clinical eating disorders. Although only 1-2% of adolescent girls meet all DSM-III-R interview criteria for bulimia nervosa, 6-16% of adolescents have symptoms of bulimia nervosa using less stringent criteria (Shisslak, Crago, & Neal, 1987). Unhealthful weight regulation practices may be risk factors for the development of these clinical eating disorders (Killen et al., 1986), which in turn are associated with significant psychological and even medical problems (Palla & Litt, 1988).

Various accounts of the factors governing adoption of unhealthful weight regulation practices have been proposed. Attitudes and behaviors about weight and dieting are influenced by cultural, familial, personal, and biological factors. Our society values attractiveness, and thinness in particular, thereby making obesity a highly stigmatized condition and one to be avoided (Striegel-Moore, Silberstein, & Rodin, 1986; Garner &

Garfinkel, 1980). Family and friends may model and reinforce these attitudes (Pike and Rodin, 1991; Shisslak et al., 1987). Adolescents may adopt a number of weight regulation practices in an attempt to remain or become thin. They may learn from family and friends that by binging it seems possible both to eat and not gain weight and that laxatives, diet pills, and diuretics can be used to control weight (Kog & Vandereycken, 1985). Ironically, dieting itself may actually potentiate disordered eating through cycles of dieting and weight regain making future attempts at weight loss more difficult. The pressures to remain thin or lose weight may be particularly difficult to cope with during puberty when normal increases in weight and shape may predispose adolescents toward a desire to lose weight, dissatisfaction with body image, and fear of becoming fat (Pugliese et al., 1983). The development of unhealthy weight regulation practices is probably an interaction among these social, cultural, family, and biological variables.

Owing to the increasing prevalence of eating disorders, the American College of Physicians (ACP) and several research groups have called for public education and early intervention (ACP, 1986). However, at present, little, if any, research effort has been devoted to the promotion of healthful weight regulation among normal weight children and adolescents and no controlled studies have examined programs designed to prevent eating disorders. This study was conducted to evaluate the efficacy of a school-based curriculum designed to modify the eating attitudes and unhealthful weight regulation practices of young adolescent girls.

METHODS

Subjects/Randomization Procedure

During January and March 1989, a total of 967 sixth and seventh-grade girls (11–13 years of age) enrolled in four northern California middle schools (sixth-eighth grades) were randomized to experimental healthy weight regulation curriculum or no-treatment control classes. Of these, $N = 931$ actually participated in the study. Missed follow-up assessments and missing data cause the number of subjects to vary from one analysis to another. In each case, all subjects with the relevant data were included in each analysis.

Randomization was done within each grade and school by class. All subjects in classes of the same grade and school assigned to the control group were counted in the analysis as a single class. All subjects in a class assigned to the treatment group had their curriculum delivered to them as a unit, and were each counted in the analysis as a single class. The study was approved by the Stanford University School of Medicine internal review board. Baseline demographics are presented in Table 1.

Prevention Intervention

Assumptions Underlying Our Approach

The primary objective of the prevention intervention was to modify unhealthful eating attitudes and weight regulation practices. The prevention program designed to achieve this objective was built upon three principal components: (1) instruction on the harmful effects of unhealthful weight regulation; (2) promotion of healthful weight reg-

Table 1.   Characteristics of the study sample
at baseline

Mean age	12.4 (SD=.72)
Ethnicity	
White	40.6%
Hispanic/Latino	22.8%
Asian	19.7%
(Cambodian, Vietnamese, Chinese, Japanese, Thai)	
Pacific Islander	3.2%
Black	3.6%
Native American	2.6%
Other	7.5%

ulation through the practice of sound nutrition and dietary principles and regular aerobic physical activity; (3) development of coping skills for resisting the diverse sociocultural influences that appear linked to the current popular obsessions with thinness and dieting.

Curriculum Development Process

The research team developed an 18-lesson prevention intervention. Throughout the curriculum, program content was delivered via slide show presentations in order to capture student attention and engage students in the intervention. Slide shows illustrated the stories of seven girls who demonstrated both healthy and unhealthy approaches to weight regulation. Text of dialogue between characters, which focused on the issues related to the lesson topic of the day, was superimposed on each slide and read by student volunteers. To enhance program credibility, models used in the slide show were similar in age, ethnicity, and socioeconomic status to girls in the target schools. Students were also given a workbook with written assignments. Lessons were developed around the following assumptions:

Weight gain is a normal and necessary part of pubertal growth in females. Females progress from the childhood baseline of 8% of body composition as fat, true of both sexes, to 22% by the end of puberty. This estrogen-dependent phenomenon occurs sequentially with each successive stage of pubertal development. However, research has shown that at each successive stage of pubertal development in females there is increasing dissatisfaction with one's body and increasing desire to be thinner. In an attempt to combat society's overemphasis on thinness, lessons were developed that focused on normal growth and development processes and ways in which obsessions with thinness may interfere with these processes. For example, students were (a) introduced to the five Tanner stages (Marshall & Tanner, 1969); (b) shown why weight gain is a natural and important part of human development; and (c) that the healthy weight range within each Tanner stage is relatively wide. The lessons stressed that students will pass through each of the Tanner stages at their own pace, thus making comparisons to others (i.e., same-age peers as well as popular icons) misleading.

Excessive caloric restriction is not an effective long-term weight control strategy. Excessive dieting is ineffective in achieving long-term weight loss and may lead to the disregulation of eating and weight (Striegel-Moore et al., 1986). In an effort to dissuade students of the utility of excessive caloric restriction for weight control the team created lessons focusing on (a) the physical and psychological reasons for the failure of most diets; and (b) the effects of diets on normal health and development. Students were instructed on

the metabolic changes that result from dieting, how these changes influence weight loss and maintenance attempts, and how diets can cause physical problems among growing adolescents.

*Caloric restriction may actually potentiate weight disregulation.*Dieting may actually potentiate disordered eating in those who are vulnerable (Garner & Garfinkel, 1980). Polivy and Herman (1985) reviewed evidence from human studies suggesting that dieting may precede binge eating in a causal chain. Therefore, the curriculum also addressed the psychological effects associated with dieting. Students were shown how simple diet techniques can lead to binge behaviors and can result in diet/binge cycles. Bulimia nervosa and anorexia nervosa were defined, symptoms were outlined, and the negative medical and psychological outcomes associated with these disorders were illustrated.

*Adolescents can learn to counteract the cultural pressures promoting dieting and a thin body ideal.*Adolescent females may need skills to resist the potent social influences promoting dieting and other unhealthful weight regulation strategies (Killen, 1985). This component of the intervention focused on helping students to identify effective methods for making healthy choices and resisting cultural pressures to adopt unhealthy weight regulation practices. Students were taught how to (1) recognize social influence to achieve excessive thinness, (2) evaluate the outcomes of potential choices, and (3) identify and use counterarguments to resist social influence.

*Adolescents can be trained to adopt more healthful nutrition practices and physical activity regimens.*We assume that students can be trained to adopt a healthful and balanced eating and exercise regimen. Our own school-based research focusing on cardiovascular disease prevention has shown positive effects for eating and exercise modification programs (Killen et al., 1988). Five lessons addressed physical activity and healthy nutrition practices. Students were introduced to the benefits of regular aerobic activity and choosing a diet high in fiber and complex carbohydrates. Students were also provided with facts on the deleterious effects of a sedentary lifestyle and choosing a diet high in saturated fat and cholesterol. Students were assisted in the development, evaluation and adoption of personalized long-term nutritional and physical activity plans.

Measurements

Anthropometric Measures
Height. Standing height was measured to the nearest millimeter using a portable direct reading stadiometer by trained personnel. Two measures of height were obtained and the average used in data analyses.

Weight. Body weight was determined to the nearest 0.1 kg using digital scales with the subjects wearing light indoor clothing without shoes or coats. Two measures of weight were obtained and the average used in data analyses.

Body mass index. BMI was computed from the formula kg/m^2, which is generally considered to be the preferred index of relative body weight as a reflection of adiposity (USDHEW, 1974; Keys, Flaminio, Karvonen, Kimura, & Taylor, 1972; Killeen, Vanderburg, & Harlan, 1978).

Structured Clinical Interview
The bulimia nervosa section of the Structured Clinical Interview for DSM-III-R disorders (SCID) was utilized for evaluating symptoms of anorexia and bulimia nervosa (Spitzer, Williams, & Gibbon, 1987). The following behaviors were assessed: (a) binge

eating frequency, (b) use of self-induced vomiting or laxatives, diuretics, strict dieting or fasting in order to prevent weight gain, (c) feeling of lack of control over eating during a binge, (d) concern with weight and shape. Liberalized eating disorder criteria were used to assign girls to symptomatic and asymptomatic groups in the absence of established criteria in such a young age group. Our case definition of bulimia nervosa included any girl who met the following criteria: (a) recurrent binge eating, (b) regular use of either self-induced vomiting or laxatives, diuretics, strict dieting or fasting in order to prevent weight gain and at least one of the following: (c) feeling of lack of control over eating during a binge, (d) persistent overconcern with weight and body shape.

The interviews were conducted by 10 graduate students in psychology who were trained to use the structured interview. Training consisted of reviewing the DSM-III-R diagnostic criteria, observing live interviews of eating disorder patients conducted by one of the investigators (C.H.), and observing videotaped SCID interviews. Interrater reliability was assessed by having two interviewers rate 40 study interviews. Kappa coefficients for the interview questions ranged from .66 to 1.00.

Self-Report Assessments

Assessments were carried out over a 5-day period in each of the middle schools by staff trained by the principal investigators. In order to ensure confidentiality, students were assigned a special identification number for tracking purposes. Each survey contained two cover sheets, the first with a label printed with the student's name and ID number and the second with a label containing only the ID number. Students were instructed to destroy the first cover sheet once they received the survey so that only the cover with the ID number label would remain.

Demographics. Students reported birthdate, educational history of parents, ethnic identification, number of parents and number of siblings living in the home.

Knowledge. A 24-item knowledge test was derived by the authors in consultation with other experts working in the field of eating disorders. The pool of items was written to reflect the knowledge basic to understanding healthy weight regulation principles, for example, the biology of normal growth and development, how cultural factors affect attitudes about weight and nutrition, the dangers of laxatives, diet pills, etc., for weight loss. The items were then pretested with a group of sixth and seventh-grade students not participating in the intervention. Items were eliminated that were not well understood by the students or that were answered correctly by most of the students.

Development of Dimensional Measures of Eating Attitudes and Unhealthful Weight Regulation Practices

The girls in this study were young and only just entering the age of greatest hazard of eating disorders. In fact, only one girl met all DSM-III-R criteria for bulimia nervosa (Killen et al., 1992). The measurement challenge in this study was to identify instruments that might assess the range of dysfunctional eating attitudes and weight regulation practices that might place young girls at risk for developing full-blown eating disorders and that might be sensitive to the effects of intervention.

The use of DSM-III-R criteria yields only binary classifications. However, for research purposes such as ours, a dimensional rather than a classification (binary) approach may be preferable. For example, Fairburn and Beglin (1990) have advanced arguments favoring study of the range of disordered eating phenomena that occur in the community. They have argued that a broad spectrum of eating disorders exists in the

community. They suggest that there is difficulty in applying accepted diagnostic criteria to subjects in the community because the existing criteria have been derived from the experience of clinicians who see only the small subset of persons who seek treatment for an eating disorder. They argue persuasively that subjects representative of the general population need to be studied with an instrument that yields more than a categorical diagnosis.

Because we concur with the need to examine the broad spectrum of disordered eating we chose an analytic approach that included as a first step the identification of reasonably valid dimensional measures of eating disorder symptoms, eating attitudes, and weight regulation practices. We briefly describe our approach below.

The following self-report instruments were included at baseline and at various follow-up assessments.

*Restraint.*Dietary restraint was measured using the revised Restraint scale developed by Herman, Polivy, Pliner, and Threlkeld (1978).

*Eating Disorder Inventory (EDI).*The EDI is a 64-item instrument designed to assess a variety of psychological and behavioral characteristics common to anorexia and bulimia nervosa (Garner, Olmsted, & Polivy, 1983). The instrument consists of eight subscales: (1) Drive for Thinness, (2) Bulimia, (3) Body Dissatisfaction, (4) Ineffectiveness, (5) Perfectionism, (6) Interpersonal Distrust, (7) Interoceptive Awareness, (8) Maturity Fears.

*Self-report assessment of eating disorder symptoms.*A self-report instrument was developed to assess eating disorder symptoms and to yield a DSM-III-R diagnosis for bulimia nervosa. Questions included: frequency of binge eating; frequency of dieting and diet pill use; frequencies of fasting, physical activity for weight control; frequencies for the following forms of purging behavior for weight control: vomiting, laxative use, diuretic use, ipecac use; fear of weight gain.

Principal Components Analysis

One concern was to guard against collinearity in the data. Therefore, a principal components analysis was conducted. Our analysis of the EDI produced five factors: (1) Appearance (composed of the Drive for Thinness and Body Dissatisfaction scales); (2) Bulimia scale; (3) Perfectionism scale; (4) Maturity Fears scale; and (5) a fifth factor composed of the Ineffectiveness, Interpersonal Distrust, and Interoceptive Awareness scales. Our analysis of the self-report of eating disorders instrument yielded the following factors: (1) Weight Concerns (composed of items assessing importance of weight, fear of gaining weight, diet history, etc.); (2) Purging/Weight Reducing Behaviors (composed of items assessing frequency of vomiting, laxative use, diet pill use, and fasting); (3) Physical Activity; (4) Dietary Restraint.

Validity Check

A second concern was to examine the validity of our self-report estimators. The approach taken was to compare the scores obtained on each of the estimators for students identified as cases by the SCID and students determined to be asymptomatic by the SCID. The following scales discriminated SCID-defined cases from noncases: Restraint, Weight Concerns, Purging/Weight Reducing Behaviors, Appearance (EDI), and Bulimia (EDI). Only these five scales were used in subsequent analyses.

Signal Detection Analysis

Finally, signal detection analysis was used to identify an optimally efficient indicator of high-risk status for eating disorders (Kraemer, 1992). The analysis, using only the

five scales shown to discriminate SCID-defined cases, indicated that the Weight Concerns scale was the optimally efficient discriminator with a sensitivity of 86% and specificity of 63% at a cutpoint score of 57. Specifically, students with high scores (>57) on the Weight Concerns scale were identified as being "at risk" for developing a clinical eating disorder.

Schedule for the Assessment of Outcome Data

Owing to time constraints, not all measures were collected at each assessment. The assessment schedule for outcome data was as follows: Height and weight were assessed at baseline, 18 weeks, 7 months, 14 months, and 24 months; knowledge was assessed at baseline, 18 weeks, and 7 months; restraint was assessed at baseline, 7 months, and 24 months; the EDI was assessed at baseline, 18 weeks, 14 months, and 24 months; self-reported assessment of unhealthful eating attitudes and weight regulation behaviors were assessed at baseline, 7 months, 14, and 24 months.

Statistical Analysis

Primary Outcome Analysis: A Focus on Induction of Change

Bandura (1976) has argued that the process of behavior change is separable into induction, generalization, and maintenance phases with each phase at least partly determined by different variables. Because this study represented our initial attempt to develop and test a model for prevention of unhealthful eating attitudes and weight regulation practices we chose to focus on the induction phase. Therefore, our primary analyses focus on the effects of the intervention on students' behaviors and attitudes in the initial weeks and months following delivery of the prevention program.

The primary outcome analysis was conducted as follows. The outcome measure on each primary outcome variable was defined a priori as the difference between baseline and the first assessment period following the conclusion of treatment. A nested analysis of variance (ANOVA) was used with treatment, classes within treatment group, and subjects within classes as sources of variance. The effect of treatment was tested with classes within treatment group providing the error mean square. However, we also report the effect of classes within treatment group against subjects within classes to gain insight into the possibility of intraclass dependence of responses, an issue of importance for design of future studies in which randomization must be done by class rather than by individual.

Secondary Outcome Analyses

Two issues were addressed at the secondary level. Because a primary target of this intervention might be those at risk, the subgroup of subjects at risk at baseline were analyzed separately using the same outcome measures and analytic procedures as used in the primary outcome analysis.

In addition, participants were also followed beyond the assessment of the primary outcome in a preliminary assessment of maintenance effects. Given the necessarily experimental and "untried" nature of our intervention we were less sanguine about the possibility of producing stable effects. Therefore, maintenance analyses were also treated as secondary. To assess long-term change, we estimated the slope of each primary outcome measure over time for each individual subject, using as many

time points as that subject reported after treatment. These slopes were then used in the above ANOVA model above to test whether maintenance of effect differentiated intervention versus control groups.

RESULTS

Dropout Analysis

For each of the major outcome variables, comparisons were made between baseline measures of those included and those excluded from the primary analysis owing to missing data. The only statistically significant result indicates a slight tendency for those with lower baseline knowledge scores to have missing data at follow-up. However, participants with missing data in the treatment group were not different from participants with missing data in the control group on any baseline variables. Thus there appears no significant compromise to the internal validity of the results.

Primary Analysis

All Subjects

Analyses were conducted comparing students from treatment and control conditions who attended both baseline and the initial follow-up (18 weeks or 7 months) assessment. Means and standard deviations for the primary outcome analysis are presented in Table 2.

Knowledge. Students receiving the curriculum gained significantly more knowledge than the control students pre-18 week follow-up [$F(4,25) = 40.11$; $p < .001$]. Mean change for girls in the treatment group was +4.5 (4.9); mean change for girls in the control group was −0.0 (3.5).

Table 2.   Treatment vs control comparisons: all participants present at both baseline and initial follow-up

Variable	N	Pre	18 Weeks	7 Months	Mean Change
Knowledge	C ($n = 438$)	5.1 (3.4)	5.1 (3.9)	—	0.0 (3.5)
	T ($n = 400$)	5.7 (3.5)	10.2 (5.9)	—	4.5* (4.9)
EDI scales					
Bulimia scale	C ($n = 401$)	0.1 (.32)	0.1 (.25)	—	0.0 (.27)
	T ($n = 374$)	0.1 (.35)	0.1 (.24)	—	0.0 (.31)
Appearance	C ($n = 398$)	0.8 (.67)	0.8 (.62)	—	0.0 (.43)
	T ($n = 365$)	0.9 (.66)	0.6 (.57)	—	−0.3 (.49)
Restraint	C ($n = 334$)	9.9 (4.9)	—	9.2 (5.0)	−0.7 (4.0)
	T ($n = 314$)	10.5 (5.2)	—	8.9 (4.7)	−1.5 (4.4)
Eating attitudes					
Weight Concerns	C ($n = 326$)	33.5 (23.9)	—	31.1 (23.0)	−2.4 (16.6)
	T ($n = 296$)	33.0 (24.7)	—	28.1 (21.6)	−4.9 (20.8)
Purging Behaviors	C ($n = 325$)	4.2 (9.9)	—	1.9 (4.8)	−2.3 (9.5)
	T ($n = 287$)	3.9 (9.4)	—	2.4 (5.9)	−1.5 (8.7)
Body mass index (kg/m²)	C ($n = 409$)	20.4 (4.1)	20.6 (4.3)	—	0.2 (0.7)
	T ($n = 379$)	20.3 (3.8)	20.5 (3.8)	—	0.2 (0.7)

*$p < .001$.

Eating attitudes and unhealthful weight regulation practices. There were no significant differences between treatment and control for any of the dimensional measures.

BMI. There were no significant differences between treatment and control groups.

Secondary Analysis

High-Risk Subjects

Students were classified as high (>57) or low risk (<57) on the basis of scores on the measure of Weight Concerns that was identified as the optimally efficient estimator. For the sake of clarifying the nature of these groups, data on alcohol use, depressive symptoms, and several eating disorder symptom variables are presented in Table 3.

Analyses were conducted comparing high-risk students from treatment and control conditions who attended both baseline and the initial follow-up assessment (18 weeks or 7 months). Means and standard deviations for high-risk students are presented in Table 4.

Knowledge. There was a significant gain [$F(4,20) = 34.62$; $p = .0001$] in knowledge for high-risk subjects who received the curriculum. Mean change for girls in the treatment group was $+6.1$; mean change for girls in the control group was -0.1.

Eating attitudes and unhealthful weight regulation practices. There were no significant differences on dimensional measures, eating attitudes, and weight regulation practices.

Table 3. Comparison of students designated high and low risk for eating disorders on the basis of weight concerns score

	High Risk % (n)	Low Risk % (n)
Self-induced vomiting		
Never	77.6 (118)	91.5 (593)
Once or twice	11.8 (18)	4.9 (32)
<Monthly	2.0 (3)	1.7 (11)
≥Monthly	8.6 (13)	1.9 (12)
Laxatives		
Never	84.9 (129)	92.9 (603)
Once or twice	7.9 (12)	4.5 (29)
<Monthly	3.3 (5)	1.4 (9)
≥Monthly	3.9 (6)	1.2 (8)
Diet pills		
Never	88.1 (133)	97.4 (639)
Once or twice	6.6 (10)	0.8 (5)
<Monthly	1.3 (2)	0.4 (3)
≥Monthly	4.0 (6)	1.4 (9)
Alcohol in last month		
Never	65.4 (100)	74.8 (487)
Few sips	16.3 (25)	17.4 (113)
Part of one drink	7.8 (12)	3.8 (25)
2–4 drinks	4.6 (7)	2.6 (17)
5–10 drinks	4.6 (7)	0.6 (4)
11–20 drinks	0.0	0.2 (1)
20+ drinks	1.3 (2)	0.6 (4)
Depressive symptoms (CES-D)	24.2 (12.0)	16.6 (10.4)
High risk ($n = 122$)		
Low risk ($n = 514$)		

Table 4. Treatment vs control comparisons: all high-risk students present at both baseline and initial follow-up

Variable	N	Pre	18 Weeks	7 Months	Mean Change
Knowledge	C (n = 67)	4.9 (3.5)	4.8 (4.0)		−.1 (3.6)
	T (n = 68)	5.7 (2.9)	11.8* (5.5)		+6.1 (5.1)
EDI scales					
Bulimia scale	C (n = 64)	0.3 (.43)	0.2 (.28)	—	−.1 (0.4)
	T (n = 66)	0.4 (.52)	0.1 (.26)	—	−.3 (0.5)
Appearance	C (n = 61)	1.8 (.54)	1.6 (.67)	—	−.2 (0.6)
	T (n = 64)	1.7 (.62)	1.2 (.67)	—	−.5 (0.8)
Restraint	C (n = 54)	14.5 (3.9)	—	14.4 (4.2)	−.1 (4.5)
	T (n = 54)	16.1 (4.3)	—	12.5 (4.9)	−3.6 (4.7)
Eating Attitudes					
Weight Concerns	C (n = 61)	71.5 (10.0)	—	58.6 (19.9)	−12.9 (22.8)
	T (n = 52)	73.1 (12.7)	—	47.8 (21.4)	−25.3 (23.0)
Purging Behaviors	C (n = 60)	8.7 (13.6)	—	5.8 (8.3)	−2.9 (13.6)
	T (n = 49)	10.3 (16.1)	—	5.7 (8.4)	−4.6 (13.7)
Body mass index (kg/m^2)	C (n = 65)	24.2 (4.5)	24.5 (4.5)		+.3 (.04)
	T (n = 66)	23.1 (3.8)	23.3* (3.9)		+.2 (.01)

*p < .001.

BMI. Girls in both conditions showed increases in BMI from baseline to 18 week follow-up. However, the mean change for girls in the intervention group was slightly smaller and significant compared to controls [$F(4,20) = 6.65$, $p < .001$]. Mean change for treatment girls = +.2 (SD = .8); Mean change for control girls = +.3 (SD = .8).

Secondary Analyses: Change from Initial Follow-Up

Analyses were conducted comparing girls from treatment and control conditions who provided data at the initial follow-up (either 18 weeks or 7 months) and at least one other follow-up assessment (7, 14, or 24 months). Table 5 is based on data provided by

Table 5. Treatment vs control comparisons: Data for slope analysis[a]

Variable	N at 18 Weeks	18 Weeks	7 Months	14 Months	24 Months
Knowledge	C (n = 382)	5.2 (3.9)	5.0 (3.8)	—	—
	T (n = 342)	10.5 (6.0)	8.6 (5.7)	—	—
EDI scales					
Bulimia scale	C (n = 360)	0.1 (.21)	—	0.1 (.21)	0.1 (.22)
	T (n = 330)	0.1 (.21)	—	0.1 (.20)	0.1 (.20)
Appearance	C (n = 356)	0.7 (.61)	—	0.8 (.69)	0.8 (.68)
	T (n = 326)	0.6 (.54)	—	0.7 (.62)	0.8 (.65)
Restraint	C (n = 291)	—	8.9 (4.9)	—	8.7 (5.4)
	T (n = 254)	—	8.8 (4.6)	—	9.0 (5.3)
Eating Attitudes					
Weight Concerns	C (n = 334)	—	30.5 (22.9)	33.9 (24.1)	32.8 (25.0)
	T (n = 303)	—	28.7 (21.7)	32.5 (23.1)	31.2 (23.9)
Purging Behaviors	C (n = 348)	—	2.2 (6.0)	3.2 (8.5)	2.7 (7.4)
	T (n = 304)	—	2.2 (6.0)	2.3 (6.4)	3.2 (8.7)
Body Mass Index (kg/m^2)	C (n = 388)	20.7 (4.4)	21.3 (4.6)	21.7 (4.4)	21.8 (4.2)
	T (n = 363)	20.6 (3.9)	21.2 (4.0)	21.7 (4.0)	21.9 (4.2)

[a]Includes all subjects reporting data at three or more time points (i.e., baseline and at least two additional points).

all girls attending both the initial follow-up (either 18 weeks or 7 months) and at least one other follow-up assessment (7, 14, or 24 months). There were no significant intervention-control differences. Table 6 presents data for high-risk subjects attending both the initial follow-up (either 18 weeks or 7 months) and at least one other follow-up assessment (7, 14, or 24 months).

Patterns of Change in Cohort

Figures 1 and 2 are included so the reader might examine patterns of change in BMI and the measure of Weight Concerns for a cohort of girls who were present at all assessments.

DISCUSSION

This is the first long-term, controlled study evaluating the effectiveness of a prevention curriculum designed to modify the eating attitudes and unhealthful weight regulation practices of young adolescent girls. Quite evidently, the intervention failed to achieve its hoped-for objectives. We observed an increase in knowledge among girls receiving the intervention but even when the gain was taken into account, scores averaged less than 50% correct. It seems unlikely that such gains are meaningful.

Our failure to achieve an effect may stem, in part, from our assumption that, without intervention, the incidence of dysfunctional eating attitudes and weight concerns would increase over time. Contrary to our expectations, weight concerns and frequency of disordered eating behaviors remained relatively stable over the 2 years of follow-up in both intervention and control groups. Given the self-report nature of the data, the possibility that students are more reluctant to report unfavorable attitudes or behaviors cannot be discounted. However, students in this study do report increased drug and alcohol use over time. This suggests that they are not simply providing prosocial responses.

Table 6. Treatment vs control comparisons: high-risk students

Variable	N at 18 Weeks	18 Weeks	7 Months	14 Months	24 Months
Knowledge	C ($n = 59$)	4.6 (3.7)	4.4 (3.6)	—	—
	T ($n = 58$)	12.0 (5.5)	8.9 (5.1)	—	—
EDI Scales					
Bulimia scale	C ($n = 59$)	0.1 (.21)	—	0.2 (.30)	0.2 (.39)
	T ($n = 52$)	0.1 (.22)	—	0.1 (.34)	0.2 (.44)
Appearance	C ($n = 57$)	1.5 (.63)	—	1.6 (.72)	1.6 (.73)
	T ($n = 50$)	1.2 (.68)	—	1.2 (.73)	1.4 (.79)
Restraint	C ($n = 43$)	—	14.4 (4.2)	—	13.3 (5.6)
	T ($n = 37$)	—	12.8 (4.7)	—	13.5 (5.1)
Eating Attitudes					
Weight Concerns	C ($n = 61$)	—	58.8 (18.8)	61.7 (22.3)	62.1 (23.6)
	T ($n = 50$)	—	47.9 (21.9)	54.5 (21.8)	52.7 (22.4)
Purging Behaviors	C ($n = 58$)	—	6.1 (8.3)	6.1 (8.2)	4.2 (9.4)
	T ($n = 47$)	—	5.5 (8.4)	6.2 (10.5)	6.7 (9.1)
Body mass index (kg/m^2)	C ($n = 61$)	24.9 (4.5)	25.4 (5.2)	26.2 (5.4)	26.1 (5.3)
	T ($n = 61$)	23.6 (3.8)	24.3 (3.9)	24.9 (4.3)	25.6 (4.5)

*Uses all high-risk subjects (Weight Concerns >57) reporting data at three or more time points (i.e., baseline and at least two additional points).

Weight Concerns For Girls Present At All Assessments
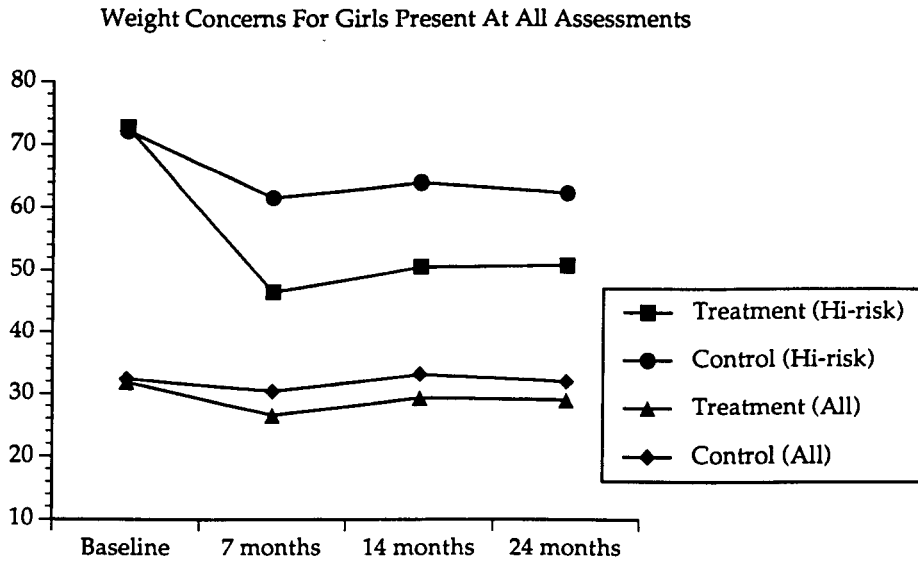

Figure 1.   Body mass index for girls present at all assessments.

Given the findings, we question the wisdom of providing a curriculum directed at all young adolescents, most of whom are not at risk to develop an eating disorder. However, there are several groups that might serve as targets for interventions: (a) those with clinical eating disorders requiring clinical intervention; (b) those in remission who may require maintenance treatment; and (c) those at risk for developing the disorder who may benefit from prevention efforts.

In order to target the latter group, the risk factors for developing the disorder need to be identified and such risk factors must be relatively specific and sensitive. Our data
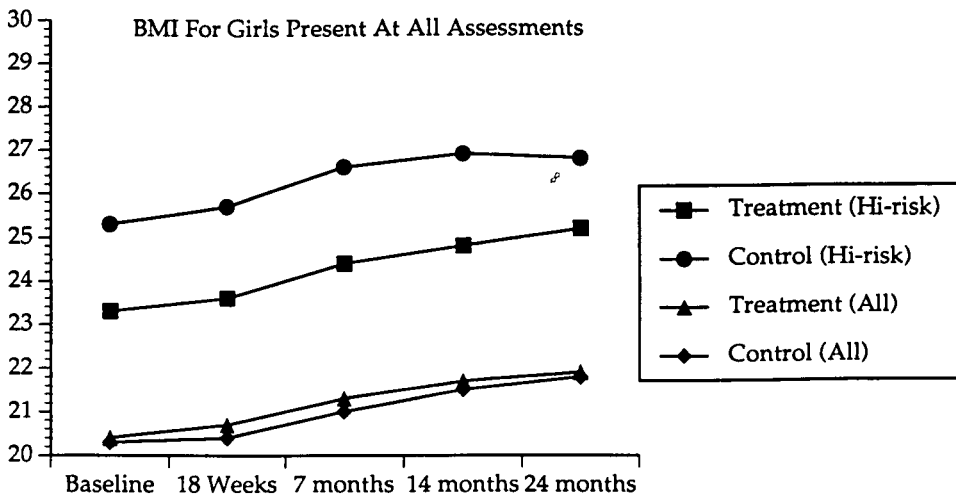
Figure 2.   Weight concerns for girls present at all assessments.

suggest that our simple measure of Weight Concerns may be useful in identifying at-risk girls. In this population, the composite measure based on items assessing importance of weight, worry about weight, fear of weight gain, recency of last diet, and feeling fat was an optimally efficient estimator with sensitivity (86%) and specificity (63%). These at-risk girls reported higher prevalences of unhealthful weight regulation practices such as self-induced vomiting, more depressive symptoms, and more frequent substance use. However, additional longitudinal studies are necessary to replicate this finding and to identify additional measures predicting future risk.

It may be reasonable to target high-risk adolescents with prevention interventions. For example, the intervention produced a very small albeit statistically significant effect on BMI. We report this result with caution because the analysis is secondary and there may be questions as to whether the result is clinically meaningful. However, an examination of Figure 1 suggests that the curriculum may also have been useful initially in reducing weight concerns among the high-risk cohort present at all assessments. Therefore, rather than targeting the entire population, a healthy weight curriculum designed to modify the eating attitudes and unhealthful weight regulation practices of young adolescent girls might focus more profitably on at-risk students.

It is likely, however, that such at-risk students would need more intensive intervention than was provided by our curriculum. For example, although weight concerns had improved considerably, the mean score for the at-risk students was still twice that of the lower risk students (see Fig. 1). As shown in Figure 2, girls identified as at risk remained substantially fatter as measured by BMI than lower risk girls over the 2-year period.

The curriculum was not designed to provide clinical intervention for students who already manifested eating disorders or for those at high risk to develop eating disorders. It is possible that an eating disorders prevention curriculum could be linked to treatment resources. For example, Shisslak et al. (1987) incorporated a consultation component into their pilot eating disorders program for high school students. Although this consultation service was publicized in the school newspaper and through announcements in the students' homerooms during the 9-week period only six students chose the consultation and only one student returned for more than one visit. An alternative strategy might embed a more intensive intervention within a curriculum providing information appropriate to all students (e.g., nutrition, exercise, normal growth, and development). We have developed such a model with some success in a program designed to reduce cardiovascular disease risk in 9th and 10th-grade students (Killen et al., 1988).

In sum, our results indicate that an untargeted prevention intervention is unlikely to be cost-effective, because the need for prevention is limited to a minority of the general population. On the other hand, our results suggest that it may be possible to screen a population to identify an at-risk subgroup that may be successfully targeted for prevention intervention. Because an identifiable subgroup of 11 and 12-year-old at-risk girls were reporting higher prevalences of substance use, unhealthful weight regulation strategies, and more depressive symptoms, we believe that the development and testing of unhealthful weight regulation prevention programs for such subgroups may remain a worthwhile endeavor. Moreover, we feel that this issue may be of concern in the more general context of prevention interventions for low-prevalence disorders.

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