Psychosocial and Physical Impairment in Overweight Adolescents at High Risk for Eating Disorders

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Abstract

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Objective: Many overweight adolescents display elevated risk for the development of eating disorders, as seen in higher rates of weight/shape concerns and disordered eating behaviors, but the extent of impairment in this subset of high-risk adolescents has not been explored.

Research Methods and Procedures: Eighty-one overweight adolescents (63% girls) presenting for an Internet-based weight loss program were assessed at baseline using the Eating Disorder Examination Questionnaire, the Depression, Anxiety, and Stress Scale, and the Pediatric Quality of Life questionnaire. Adolescents who earned elevated scores on both the Weight Concern and Shape Concern subscales of the Eating Disorder Examination Questionnaire were considered at high risk for the development of eating disorders (56.8%).

Results: Comparisons of high- and normal-risk groups revealed that high-risk adolescents reported higher levels of depression [$F(3,76) = 5.75$, $p = 0.019$], anxiety [$F(3,76) = 5.67$, $p = 0.020$], and stress [$F(3,75) = 8.50$, $p = 0.005$], and greater impairments in physical health [$F(3,77) = 10.7$, $p = 0.002$], emotional functioning [$F(3,77) = 5.3$, $p = 0.024$], and social functioning [$F(3,77) = 10.0$, $p = 0.002$]. There were no differences in school functioning [$F(3,77) = 1.5$, $p = 0.219$]. Among the high-risk adolescents, over half (52.2%) reported binge eating at least once in the past month.

Discussion: Results suggest that overweight adolescents at high risk for the development of eating disorders also experience elevated levels of negative affect, impairment in health-related quality of life, and eating disturbances, although prospective data are needed to determine the directionality between eating disorder pathology and general psychopathology. Further research is warranted to evaluate whether behavioral weight loss interventions should be enhanced for this high-risk subset.

Key words: adolescents, obesity treatment, psychosocial variables, binge eating, eating disorders

Introduction

The rates of overweight in adolescents have tripled in the past two decades, with recent estimates showing that 16.1% of adolescents present with BMI at or above the 95th percentile of sex-specific BMI-for-age values using the 2000 Centers for Disease Control and Prevention (CDC)[1] Growth Charts (1,2). The myriad of medical consequences of adolescent overweight is well-documented (3,4). Furthermore, research indicates a wide range of psychosocial difficulties facing overweight adolescents, such as greater occurrences of teasing (5,6), difficulties with platonic and romantic peer relationships (7–10), and higher risk of suicide attempts (8). Given the apparent challenge that weight loss presents to youth (11), it is important to consider the presence of psychosocial factors that could hinder weight control efforts.

[1] Nonstandard abbreviations: CDC, Centers for Disease Control and Prevention; ED, eating disorder; HRQOL, health-related quality of life; EDE-Q, Eating Disorder Examination–Questionnaire; EDE, Eating Disorder Examination interview; QEWP-A, Questionnaire on Eating and Weight Patterns for Adolescents; DASS, Depression, Anxiety, and Stress Scale; PedsQL, Pediatric Quality of Life Inventory Version 4.0 Generic Core–Teen Report.

The risk for the development of eating disorders (EDs) is elevated among overweight adolescents, and evidence exists for associated challenges to weight loss efforts. In cross-sectional studies of adults (12–15), pediatric overweight has been linked to the development of bulimia nervosa and binge eating disorder. The increased risk for EDs in overweight adolescents is observed in elevated weight and shape concerns, dieting behaviors, and body dissatisfaction (13,16–19), which are considered to be specific and highly potent risk factors for the development of EDs compared with other psychiatric problems (13). Indeed, in a study of preadolescent girls, Burrows and Cooper (19) evaluated concerns with shape, weight, and eating, as well as low self-esteem and depressive symptoms, as potential contributors to increased risk of EDs in 11- to 12-year-old girls and found that overweight girls possessed these risk factors to a higher degree than their normal-weight peers. Likewise, multiple studies of adolescent boys and girls show that overweight adolescents use unhealthy and harmful weight-loss techniques at a higher rate than normal-weight adolescents who are equally dissatisfied with their bodies, possibly in an attempt to find a quick solution to their weight problem (20–23).

The presence of specific risk factors for ED is noteworthy because of the particularly difficult challenges to weight control that may be created. Dietary restraint through deliberate and planned calorie restriction (i.e., dieting) among individuals with body dissatisfaction can lead to disinhibition of eating (i.e., binge eating), thus perpetuating obesity (23,24). The cognitive behavioral mechanism explaining this phenomenon was tested and supported using structural equation modeling in the study of Decaluwé and Braet (25) of overweight children and adolescents. Their study demonstrated that, among overweight youth, low self-esteem predicted weight and shape concerns, which predicted dietary restraint, which predicted binge eating. In a prospective study of boys and girls between the ages of 9 and 14 years, self-reported dieting was associated with binge eating and prospectively predicted more weight gain than in non-dieters over 3 subsequent years (26). Likewise, dieting attempts and binge eating in children prospectively predicted increases in body weight among overweight children or children with overweight parents (27).

Body dissatisfaction can also impede weight loss because of its negative impact on physical activity and eating patterns. Among overweight adolescents, body-related concerns are barriers to physical activity (28). Specifically, "feeling self-conscious about one's body or looks" and "not wanting people to see one's body when doing physical activity" were the most frequently endorsed barriers to physical activity by overweight adolescents compared with non-overweight peers.

In addition to these specific risk factors for EDs, putative barriers to weight loss include elevated negative affect, such as depression, anxiety, and stress. Negative affectivity is also considered a non-specific risk factor for the development of psychiatric problems, including EDs (13). However, research regarding the rates and prevalence of negative affect in overweight adolescents has been inconsistent. In clinical samples, there is some support for higher rates of depression and anxiety in overweight children and adolescents compared with non-overweight peers (29–31), but there is little evidence to date for this relationship in community samples (31–33). There is some evidence that depressive symptoms predict onset of obesity in youth (22,34). Greater impairment of global psychosocial functioning, as assessed by measures of health-related quality of life (HRQOL), has been found within the overweight adolescent population. HRQOL, a multidimensional construct that pertains to the effect of a health condition (e.g., overweight) on individuals' interpersonal, physical, emotional, and work or school functioning, has been shown to be significantly impaired among obese children and adolescents relative to a healthy, non-obese comparison sample across all domains (35–37). There have also been studies with overweight children and adolescents indicating that HRQOL declines as BMI increases (35,37–39).

Negative affect may present obstacles to weight loss. It is posited that depression and anxiety symptoms in overweight adolescents may be related to decreased physical activity (29), thus impeding weight control attempts. Also, preliminary findings suggest that elevated stress is associated with overweight in adolescents (40), and similar to adults, children have been shown to eat in response to stress (41). This relationship between stress and eating suggests that frequent or high levels of stress can potentially lead to weight gain and/or cause difficulty in losing weight (42). To our knowledge, there is no published research to date on the relationship between compromised HRQOL and difficulties in weight loss attempts or behaviors. However, HRQOL is related to depressive symptoms (43) and health-related self-efficacy (44,45), which may impact success in weight loss (46).

In summary, weight/shape concerns, negative affect, and impaired HRQOL may serve to perpetuate overweight and act as barriers to weight loss. Behavioral weight loss interventions have been relatively untested with adolescents in comparison with children, for whom well-established treatments exist (42). While not all overweight adolescents evidence risk factors for the development of EDs, and only a small subset of adolescents (<18%) go on to develop clinically significant EDs (47), we hypothesize that there is a vulnerable subgroup of overweight adolescents exhibiting specific risk factors for EDs (i.e., elevated weight and shape concerns) who also experience a constellation of psychosocial impairment, which may have implications for their success in weight loss treatments. This study aims to explore the relationship among weight/shape concerns, nega-

tive affect, and HRQOL in overweight adolescents to better understand this overweight, high-risk subgroup.

Research Methods and Procedures

Participants

Participants were comprised of a cross-sectional sample of 81 overweight adolescents (12 to 17 years) seeking treatment using an Internet-delivered weight-control and body-image intervention in San Diego, CA, and St. Louis, MO. Exclusion criteria were the presence of serious medical conditions resulting in significant weight changes (e.g., endocrinologic diseases); the use of prescription medication significantly affecting weight; complications of overweight that contraindicated moderate physical activity (e.g., orthopedic disorders); reading ability below the sixth grade level; and past or present diagnosis of a clinical ED.

Participants were recruited through newspaper advertisements, on-line advertisements (i.e., Craig's List), and flyers posted at junior high and high schools, children's hospitals, pediatricians' offices, weight loss organizations, YMCAs, religious groups, libraries, teen centers, a local office of the Health and Human Services Agency, and local businesses. In addition, referrals were obtained through school nurses and pediatricians.

Measures

BMI. Weight and height were measured by trained research assistants in a private room using a calibrated balance beam or digital scale and a stadiometer. BMI (kilograms per meter squared) percentiles were calculated for age and sex using reference data from the 2000 CDC BMI-for-age-and-sex growth charts. Using CDC definitions, adolescents are considered "at risk for overweight [in adulthood]" if their BMI is between the 85th and 94th percentiles and "overweight" if their BMI is ≥95th percentile. For simplicity, all adolescents in this study above the 85th percentile were referred to as "overweight."

Eating Disorder Symptoms. The Eating Disorder Examination–Questionnaire (EDE-Q) (48) is the self-report version of the Eating Disorder Examination interview (EDE) (49), which is considered the gold standard of ED psychopathology assessment. Psychometric studies of the EDE have described good internal consistency (α coefficients: 0.67 to 0.79) (50), discriminative validity (50–52), concurrent validity (51), and test–retest reliability (Spearman correlation coefficients: ≥0.70) (53). Psychometric studies of the EDE-Q have described good internal consistency (α coefficients: 0.78 to 0.93) and test–retest reliability (Pearson r: 0.81 to 0.94) (54).

The EDE-Q was administered to assess frequency and severity of disordered eating attitudes and behaviors over the past 28 days. There are 38 items, which use a seven-point rating scheme and yield Weight Concern, Shape Con-

cern, Eating Concern, and Dietary Restraint subscales, as well as a global score of overall eating pathology. The frequency of diagnostic behaviors, such as binge eating and self-induced vomiting, are also assessed. Correlations between the EDE-Q and EDE on subscales range from 0.78 to 0.85 ($p < 0.001$) (47). For the St. Louis participants ($n = 25$), a child version of the EDE-Q (unpublished data) was administered. This version maintains the same answer options and time frame but simplifies the language of the measure.

Additional ED behaviors (e.g., diet pill use) were assessed using the Questionnaire on Eating and Weight Patterns for Adolescents (QEWP-A) (55), which is a 12-item self-administered questionnaire written for adolescents and used to diagnose respondents with binge eating disorder and bulimia nervosa. Concurrent validity for the adolescent version when compared with parent report is low ($\kappa = 0.19$) (55); however, a comparison of the adult version of the measure with a clinical interview yields a κ of 0.60 (56). Concurrent validity of the QEWP is adequate compared with other measures of eating pathology (56), and stability of the measure over a 3-week period is adequate (ϕ: 0.42) (57).

Adolescents were determined to be at high risk for the development of an ED based on their EDE-Q Weight Concern and Shape Concern subscale scores. Using normative data from a young adolescent female sample (58), adolescents scoring higher than the published mean score on both of these subscales were determined to be at high risk for the development of an ED (unpublished data). Higher ratings on similar measures of weight and shape concerns have been prospectively linked to the development of ED (59). Within the present sample, 46 adolescents (56.8%) were considered to be at high risk for the development of an ED because of high scores on both subscales.

Negative Affect. The Depression, Anxiety, and Stress Scale (DASS) (60) is a 42-item self-report measure of negative emotional symptoms experienced over the past week (e.g., hopelessness, self-deprecation, situational anxiety, difficulty relaxing, irritability) and yields separate Depression, Anxiety, and Stress scales. Test–retest reliability of the three scales is acceptable (Depression: $r = 0.71$; Anxiety: $r = 0.79$; Stress: $r = 0.81$) (61), and internal consistency of each scale is good (α coefficients: 0.89 to 0.96) (60). The DASS Anxiety scale correlates $r = 0.81$ with the Beck Anxiety Inventory, and the DASS Depression scale correlates $r = 0.74$ with the Beck Depression Inventory (60).

HRQOL. The Pediatric Quality of Life Inventory Version 4.0 Generic Core–Teen Report (PedsQL) (62) assesses HRQOL in children and adolescents in the areas of physical, emotional, social, and school functioning. The 23-item generic core measure was developed for use in healthy and pediatric populations with acute or chronic health condi-

tions (63). Summary scores are produced for Psychosocial Health and Physical Health. Internal consistency reliability is good for Total Scale Score ($\alpha = 0.88$ child), Physical Health Summary Score ($\alpha = 0.80$ child), and Psychosocial Health Summary Score ($\alpha = 0.83$ child) (63). Higher scores indicate more positive HRQOL.

Data Analyses

Data were screened for normality by checking skewness and kurtosis statistics. ED risk groups (high risk vs. normal risk) were compared on sex, age, race, parental education, site, and overweight status using χ^2 for categorical variables and ANOVA for continuous variables. To evaluate the relationship of negative affect and HRQOL with ED risk, an analysis of covariance was conducted, with negative affect or HRQOL subscales as the dependent variable and ED risk status as a fixed factor. Demographic variables for which there were differences between groups were included as covariates (i.e., sex, site).

Results

The mean age of the sample was 13.96 ± 1.68 years, and 51 (63%) were girls. Adolescents self-reported their race as white ($n = 41$; 50.6%), black ($n = 21$; 25.9%), Hispanic ($n = 10$; 12.3%), and other ($n = 9$; 11.1%). The mean BMI was 34.19 ± 6.97 kg/m^2. Parent responses indicated that 24 (28.9%) adolescents were currently experiencing medical problems (e.g., asthma). See Table 1 for additional sample characteristics.

Within the sample, 46 (56.8%) adolescents met the criteria for being at high risk for the development of an ED as defined by elevated scores on both the Weight Concern and Shape Concern subscales of the EDE-Q. Reports of purging (i.e., self-induced vomiting, laxative/diuretic misuse), compensatory behavior (e.g., driven exercise after a binge), and diet pill use were low and occurred only among those designated as high risk (Table 2). Although no participants had a clinical ED, 24 (52.2%) of the high-risk group reported on the EDE-Q that they had experienced at least one binge episode (i.e., large amount of food accompanied by loss of control; mean, 3.79 ± 3.53 episodes; range = 1 to 12 episodes) in the past 28 days vs. zero participants in the normal-risk group. BMI, BMI z-scores, and BMI percentiles were not correlated with high-risk status.[2] Means for the high-risk group on EDE-Q subscales were comparable with those reported for adults with EDs (49).

A higher proportion of girls (66.6%) than boys (40%) were categorized as high risk ($\chi^2 = 5.47$, $p = 0.019$). Site

[2] Using the CDC weight status categorizations, 10 adolescents met the "at-risk-for-over-weight" criterion (BMI = 85th to 94th percentile) and 71 adolescents met the "overweight" criterion (BMI $\geq$ 95th percentile). Results were unchanged when high-risk status was compared using weight status categorizations.

Table 1. Sample characteristics ($n = 81$)

Variable	
Age (years)	13.96 ± 1.68
Sex [n (%)]	
Male	30 (37.0)
Female	51 (63.0)
Race [n (%)]	
White	41 (50.6)
Black	21 (25.9)
Hispanic	10 (12.3)
Other	9 (11.1)
BMI	34.19 ± 6.97
BMI percentile	97.71 ± 2.57
BMI z-score	2.19 ± 0.44
Parent education [n (%)]	
High school or less	10 (12.0)
Some college/technical school	37 (44.6)
College graduate	17 (20.5)
Some graduate school	7 (8.4)
Graduate/professional degree	11 (13.3)
Current medical problems [n (%)]	
Yes	24 (28.9)
No	58 (69.9)

differences were found, indicating that a higher proportion of San Diego participants (69.6%) were categorized as high risk compared with St. Louis participants (40.0%; $\chi^2 = 7.08$, $p = 0.008$). Notably, race differed by site, such that there was a higher proportion of black participants in St. Louis (40%) vs. San Diego (15.2%; $\chi^2 = 10.83$; $p = 0.013$), possibly accounting for site differences in ED risk. Black youth tend to report greater body satisfaction than youth of other races, thus reducing their risk for the development of EDs (64). Given these differences in ED risk, sex and site were entered as covariates in subsequent analyses. There were no statistically significant differences by ED risk status on age, race, parental education, or BMI z-score.

Comparisons of high- and normal-risk groups using analyses of covariance revealed that high-risk overweight adolescents reported higher levels of depression [$F(3,76) = 5.75$, $p = 0.019$], anxiety [$F(3,76) = 5.67$, $p = 0.020$], and stress [$F(3,75) = 8.50$, $p = 0.005$] than their normal-risk counterparts. Means and standard deviation are reported in Table 3. In addition, high-risk adolescents showed greater impairments in physical health [$F(3,77) = 10.7$, $p = 0.002$], emotional functioning [$F(3,77) = 5.3$, $p = 0.024$], and social functioning [$F(3,77) = 10.0$, $p = 0.002$] than their normal-risk counterparts. There was no statistically significant difference on school functioning [$F(3,77) = 1.5$, $p = 0.219$] between these two groups (Table 4).

Table 2. ED symptoms

ED symptoms*	High risk for ED (*n* = 46)	Normal risk (*n* = 35)	Total sample (*n* = 81)
Purging†	1 (2.2)	—	1 (1.2)
Diet pill use	3 (6.5)	—	3 (3.7)
Driven exercise (compensatory)	22 (47.8)	5 (14.3)	27 (33.3)
Binge eating	24 (52.2)	—	24 (29.6)

ED, eating disorder; EDE-Q, Eating Disorder Examination–Questionnaire; QEWP-A, Questionnaire on Eating and Weight Patterns for Adolescents. Values are *n* (%).

* Assessed using the EDE-Q, with the exception of diet pills use, which was assessed using the QEWP-A.

† Purging defined as self-induced vomiting, laxative misuse, and diuretic misuse.

Discussion

The purpose of this study was to explore the relationship among ED risk, negative affect, and HRQOL in overweight adolescents. Results suggest that overweight adolescents at high risk for the development of ED also experience elevated levels of depression, anxiety, stress, and impairment in physical, emotional, and social aspects of HRQOL. The only area in which this high-risk group did not differ significantly from the normal-risk group was school-related functioning. Significantly, over half (56.8%) of the overweight adolescent boys and girls in our sample were determined to be at high risk for the development of EDs, and, among these high-risk youth, more than one half (52.2%) reported binge eating at least once over the past month. This is a sizable subgroup of the larger sample and highlights the constellation of difficulties facing overweight youth. From these findings, it seems that there exists a specific subset of overweight adolescents that faces elevated specific risk for the development of EDs and significant psychosocial challenges compared with other overweight adolescents.

Those adolescents who were at high risk for the development of an ED endorsed depressive and anxiety-related symptoms to a higher degree than their normal-risk counterparts. The literature's mixed findings for overweight adolescents on the association among depression, anxiety, and overweight may be explained by the existence of a subset of overweight individuals, such as the one identified in this study, that has greater psychosocial impairment. Specifically, overweight adolescents who are struggling with above-average weight and shape concerns are more likely to concurrently report elevated depressive and anxious symptoms, although directionality cannot be inferred. Furthermore, it is possible that these high-risk adolescents with greater negative affect are more likely to seek treatment for weight loss in comparison with other overweight adolescents in the community.

Overweight adolescents at high risk for EDs reported elevated stress, whereas those at normal risk for EDs experienced more normative levels of stress (60). This finding is consistent with past research that has shown that stress and ED symptoms are associated in adolescent girls (65). Stress can be defined in multiple ways (e.g., event-based vs. physiological symptoms), and how it is defined has implications for our understanding. The DASS Stress subscale assesses the frequency of physical tension symptoms (e.g., difficulty relaxing, nervous tension, irritability, and agitation). Roem-

Table 3. Depressive, stress, and anxiety symptoms in high-risk vs. normal-risk overweight adolescents

DASS	High risk for ED (*n* = 46)	Normal risk (*n* = 35)	F*	p
Depression	9.31 (9.28)	3.74 (5.54)	$F(3,76) = 5.75$	0.019
Anxiety	7.44 (7.30)	3.37 (4.56)	$F(3,76) = 5.67$	0.020
Stress	11.13 (8.27)	5.26 (6.44)	$F(3,75) = 8.50$	0.005

DASS, Depression, Anxiety, and Stress Scale; ED, eating disorder. Values are mean (standard deviation).

* Co-varying by sex and site.

Table 4. HRQOL in high-risk vs. normal-risk overweight adolescents

PedsQL*	High-risk (n = 46)	Normal risk (n = 35)	F(3,77)†	p	Population sample‡ Overweight	Obese	Clinical sample§ Obese
Physical health	76.1 (15.0)	87.7 (10.5)	10.7	0.002	83.5 (13.0)	77.5 (17.9)	71.0 (18.8)
Emotional functioning	62.5 (20.5)	75.4 (17.3)	5.3	0.024	72.6 (17.7)	68.6 (18.5)	63.2 (20.1)
Social functioning	72.3 (20.4)	86.6 (13.6)	10.0	0.002	80.2 (16.6)	72.6 (18.2)	67.5 (25.0)
School functioning	68.4 (18.9)	72.4 (17.7)	1.5	0.219	78.3 (15.5)	75.0 (14.5)	64.1 (20.4)

HRQOL, health-related quality of life; PedsQL, Pediatric Quality of Life Inventory Version 4.0 Generic Core–Teen Report. Values are mean (standard deviation).
* Higher numbers indicate greater HRQOL.
† Co-varying by sex and site.
‡ Williams et al. 2005.
§ Schwimmer et al. 2003.

mich et al. (41) showed that perceived stress results in increased caloric intake, particularly among children endorsing high dietary restraint, through an experimental manipulation where children were given 15 minutes to prepare for a short speech that would be videotaped and judged by peers. The children asked to do this activity reported feeling "very stressed" or "very worried" and consumed more food after the speech (41). Similar to the physical tension experienced by the children in the experiment of Roemmich et al., it could be the case that physical tension reported by overweight adolescents with high weight and shape concerns could be related to stressful social situations and feelings of depression or anxiety that are found at higher rates among these youth. Perhaps, overweight teenagers with elevated weight and shape concerns who are struggling psychosocially are more likely to feel stressed, anxious, or depressed, and consequently, eat more.

To our knowledge, this is the first study to describe HRQOL in overweight adolescent boys and girls in relation to their risk for development of an ED. Adolescents classified as high risk for developing an ED also reported the most impaired physical, social, and emotional quality of life. Scores earned by the high-risk adolescents indicated lower HRQOL than that found in population samples of obese and overweight youth (37) and were comparable to, or slightly better than, scores of hospital-referred obese youth (36) (Table 4). In this latter study of hospital-referred obese youth, Schwimmer et al. (36) noted that their sample reported HRQOL scores comparable with those earned by children with cancer, the group considered to have the most compromised HRQOL reported to date. This suggests that overweight adolescents at risk for EDs also experience significantly impaired quality of life. It is possible that overweight adolescents with high weight and shape concerns are more vulnerable to social and emotional difficul-

ties. This is consistent with the higher rates of depressive symptoms found in the high-risk group. Regarding the impairment on the physical functioning subscale, it is also possible that overweight adolescents at high risk for developing an ED are more sensitive to or more cognizant of physical limitations because of greater dissatisfaction with their weight.

In contrast to previous studies, this study did not find an association between higher overweight status and decreased HRQOL. The absence of a significant correlation may have been because of this study's exclusion of overweight adolescents suffering from serious medical consequences of obesity (e.g., type 2 diabetes, osteoarthritic difficulties), which likely excluded the most overweight adolescents. In addition, past research with adults has shown that HRQOL is associated with binge eating rather than weight (66).

Because of the cross-sectional nature of the study, the temporal order of the development of overweight, ED risk factors, and negative affect are unclear. Prospective data are needed to determine whether higher levels of these symptoms predispose to ED pathology, or, conversely, whether ED symptoms predispose to elevated general psychopathology. In addition, the generalization of this study to the general overweight adolescent population is limited because of the small sample size and the treatment-seeking nature of this clinic sample. Specifically, these adolescents were motivated to change their weight through involvement in an intervention and were, thus, more likely to have been suffering negative effects of their overweight status. Additionally, without a control group or a comparison group, we are unable to know how these adolescents would compare on the measures of negative affect to other psychiatric groups or non-impaired adolescents. Finally, virtually all of what we know about ED risk factors comes from research with girls (13). Although 40% of boys in our sample were

defined as high-risk, it is not certain whether ED risk factors operate the same way for boys as they do for girls. Therefore, we must be cautious in interpreting our findings for adolescent boys. A large, population-based prospective study of girls and boys evaluating weight and shape concerns, negative affect, and HRQOL at the time when youth first develop weight problems could shed light on the temporal and directional relationships among these factors and could allow for mediator and moderator analyses.

This study has potential implications for the behavioral treatment of overweight in adolescents. First, it will be important to test whether overweight adolescents who are at high risk for ED fare worse than their normal-risk peers in traditional behavioral weight loss programs. Specifically, as behavioral weight loss treatments for adolescents are developed and evaluated, it would be helpful to explore whether this more psychosocially challenged subset of adolescents is more resistant to or experiences more challenges when engaging in weight loss efforts. Current behavioral weight loss interventions do not traditionally address the significant issues of ED pathology, negative affect, and compromised HRQOL, and it is possible that the presence of these co-occurring issues would serve to hinder or obstruct successful weight control in overweight adolescents.

For instance, turning to the ED literature, the dual pathway model of bulimia nervosa (67,68) describes one pathway where weight and shape concerns (i.e., body dissatisfaction) and consequent negative affect result in overeating as a distraction from unpleasant feeling states (69). As a result, asking overweight adolescents to restrict their caloric intake without addressing the underlying psychological distress that drives binge eating could make weight loss efforts much more difficult. The other pathway to bulimia described by Stice (67,68) proposes that body dissatisfaction drives dietary restraint, which leads to binge eating as a function of metabolic and psychological deprivation (70). Asking overweight adolescents at high risk for EDs to restrict their dietary intake could potentially backfire and lead to increased caloric intake through binge eating. In our sample, more than one half of the high-risk adolescents reported binge eating at least once in the past month compared with none of the normal-risk adolescents. Given that adults who binge eat tend to be less successful in weight loss programs (71), assisting adolescents with reducing weight and shape concerns could be central to eliminating impulsive eating behaviors that hinder weight loss.

If the dual pathway model of bulimia nervosa holds for overweight adolescents with high weight and shape concerns, developing specially tailored materials for this high-risk and more psychosocially challenged group to assist them with barriers to weight loss may be warranted. This could include components teaching cognitive behavioral skills to reduce negative affect, binge eating, and stress, as well as teaching cognitive behavioral skills to reduce body-related shame that could hinder attempts at increasing physical activity. In addition, either providing opportunities for or explicitly encouraging exercise in a safe, non-judgmental environment could increase physical activity and improve weight loss outcomes for this group. Given the adult literature showing that individuals with greater body satisfaction are more likely to lose a significant amount of weight in a behavioral weight loss program than their less-satisfied counterparts (72), it seems reasonable that treating adolescent weight and shape concerns can improve their chances for success in a weight loss program. In addition, depressive symptoms could also be addressed to reduce the likelihood of reduced treatment adherence (73) and treatment dropouts (74). Overweight adolescents may also benefit from addressing HRQOL, such as psychosocial functioning, in interventions to reduce overweight (43). HRQOL is found to be associated with health-related self-efficacy (i.e., belief in one's ability to cope with health problems) across different populations of adults (44,45). Higher self-efficacy is predictive of greater weight loss in the short term for adults who are participating in weight control interventions (46). Because we did not include a measure of self-efficacy, we can only postulate that adolescents with lower HRQOL may also have lower health-related self-efficacy, which could negatively impact outcome in a weight loss intervention. However, this is speculative, and further research will need to be done to test this hypothesis. Likewise, reducing overweight is likely to improve HRQOL in adolescents, particularly given data suggesting that positive changes in eating behavior are associated with enhanced quality of life (75).

Conversely, specialized weight loss programs for these high-risk adolescents may not be necessary to resolve issues of specific risk factors for ED, negative affect, and HRQOL. For instance, behavioral weight loss programs might actually improve body image in these adolescents, leading to reduced ED symptoms. It has been shown that behavioral weight loss programs have improved ED symptomatology in individuals with bulimia nervosa (76), as well as in normal-weight, overweight, and obese adult women (77–80). A behavioral weight maintenance intervention for older adolescent girls showed decreases in negative affect and bulimic symptoms, such as binge eating (81). However, no studies to our knowledge have examined the impact of behavioral weight loss programs on adolescents deemed at higher risk for the development of eating disorders.

Overweight in adolescence is a common health problem that negatively impacts individuals in numerous ways. Overweight adolescents are often dissatisfied with their weight and frequently turn to unhealthy methods in their pursuit of weight loss, ultimately putting them at even greater risk for developing an ED and increased adiposity. Developing a greater understanding of which overweight adolescents will likely go on to develop ED is necessary for the purpose of early identification and subsequent interven-

tion. ED- and obesity-prevention programs may also benefit from added understanding of this high-risk group to give appropriate and balanced guidance on healthy weight control and positive body image before the development of weight-related problems (82). In addition, it is possible that this subset of adolescents who are at high risk for the development of ED and are experiencing negative affect, impaired HRQOL, and disturbed eating behaviors require a more intensive or multifaceted intervention to achieve long-term weight control. Further research is warranted to evaluate whether behavioral weight loss interventions could be enhanced for this high-risk subset.

Acknowledgments

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