Psychosocial outcomes in a weight loss camp for overweight youth

NICOLE P. QUINLAN[1], **RONETTE L. KOLOTKIN**[2,3], **BERNARD F. FUEMMELER**[3], and **PHILIP R. COSTANZO**[4]

[1]Geisinger Medical Center, Danville, PA

[2]Obesity and Quality of Life Consulting, Durham, NC

[3]Department of Community and Family Medicine, Duke University Medical Center, Durham, NC

[4]Department of Psychology and Neuroscience, Duke University, Durham, NC

Abstract

Objective—There is good evidence that youth attending weight loss camps in the UK and US are successful at achieving weight loss. Limited research suggests improvement in body image and self-esteem as well. This study evaluated changes in eight psychosocial variables following participation in a weight loss camp and examined the role of gender, age, length of stay, and body mass index (BMI) in these changes.

Methods—This was an observational and self-report study of 130 participants (mean age=12.8; mean BMI=33.5; 70% female; 77% Caucasian). The program consisted of an 1 800 kcal/day diet, daily supervised physical activities, cooking/nutrition classes, and weekly psycho-educational/ support groups led by psychology staff. Participants completed measures of anti-fat attitudes, values (e.g., value placed on appearance, athletic ability, popularity), body- and self-esteem, weight- and health-related quality of life, self-efficacy, and depressive symptoms.

Results—Participants experienced significant BMI reduction (average decrease of 7.5 kg [standard deviation, SD=4.2] and 2.9 BMI points [SD=1.4]). Participants also exhibited significant improvements in body esteem, self-esteem, self-efficacy, generic and weight-related quality of life, anti-fat attitudes, and the importance placed on appearance. Changes in self-efficacy, physical functioning and social functioning remained significant even after adjusting for initial zBMI, BMI change, and length of stay. Gender differences were found on changes in self-efficacy, depressive symptoms, and social functioning.

Conclusion—Participation in weight loss programs in a group setting, such as a camp, may have added benefit beyond BMI reduction. Greater attention to changes in psychosocial variables may be warranted when designing such programs for youth.

Correspondence: Ronette L. Kolotkin, Obesity and Quality of Life Consulting, 1004 Norwood Avenue, Durham, NC 27707, USA. Fax: 1 919 493 9925. rkolotkin@qualityoflifeconsulting.com.

Keywords

Weight loss program; psychosocial factors; childhood obesity; quality of life

Introduction

There are a variety of treatments available for pediatric obesity (1), including summer residential treatment programs, also known as weight loss camps. Studies indicate that youth who participate in weight loss camps are successful at achieving weight loss (2–5). The camp experience may also have corollary effects on psychosocial well-being. After attending camp, campers reported decreased body shape dissatisfaction and improved self-esteem (2). These authors also reported that campers who experienced the greatest weight reductions experienced the greatest psychological improvements. In another study, participants in a summer residential program in the UK were compared with a reference group of youth who had never attended one of these camps (3). Participants in camp had greater improvements in self-esteem relative to those youth who had never attended camp over a similar period of time. An additional study of obese adolescents attending a weight loss camp in the UK reported a significant reduction in the number of negative automatic thoughts and an increase in the number of positive thoughts, especially related to exercise and appearance (5).

One psychosocial variable not addressed in the above studies is negative attitudes about overweight. Research has shown that obesity in youth is viewed negatively by peers (e.g., [6–8]). From a cognitive-behavioral perspective (9), Crandall (10) proposed that negative attitudes are part of a larger ideology that attributes control to individuals and blames individuals who are overweight for their weight status. Overweight individuals themselves have also been found to hold these negative ideological attitudes about weight (10). This ideological bias might be especially important to address in the treatment of overweight children and adolescents for whom self-stigmatization may constitute an impediment to the formation of an efficacious identity. Other psychosocial variables, such as quality of life and depressive symptoms, have been investigated in studies of overweight youth, but these variables have received little attention in the weight loss camp literature (11–19).

Thus, there are a number of psychosocial variables that are important correlates of increased weight and understanding how these variables are affected in the context of weight loss could be important in the development of successful treatments. Additionally, a child's gender may be an important factor to consider when assessing psychosocial outcomes in the context of weight loss. Overweight girls report lower levels of self-esteem compared with overweight boys (20,21). During early to middle adolescence, rates of depressive symptoms appear to be higher among girls (22,23), and the link between obesity and depression is more pronounced among females, while either absent or inversely related among males (24–26).

The present paper extends findings from the weight loss camp literature by reporting on changes in a broader range of psychosocial variables, many of which have not been included in this literature (e.g., quality of life and anti-fat attitudes). The purpose of this study is to

describe psychosocial changes that occur in youth who participate in a residential summer weight loss camp. An understanding of the collateral psychosocial consequences of camp-based weight loss treatment is important in both constructing camp-based treatment approaches and in targeting factors that might well be involved in sustaining weight loss following the camp experience. In this study, we evaluate changes in eight psychosocial variables, as well as the role of gender, age, length of stay, and BMI on these changes.

Methods

Participants

Study participants consisted of 130 overweight or obese children and adolescents seeking treatment at a residential summer weight loss program in the US. The 130 participants represent approximately 85% of the total number of children at the camp over the 2 years. All registered camp participants between the ages of 9 and 18 were recruited for this study if they met the following criteria: parental endorsement of child's independent reading ability, willingness to comply with study procedures, and willingness to provide written informed consent/assent. The research was conducted over two summers at the residential program, and for those participants enrolled for both summers, only the data from their first year of participation were included in this analysis. Analysis of the cohorts from the two summers revealed no significant differences in demographic composition, initial body weight (t=0.13, p=n.s.), initial zBMI (t=−0.64, p=n.s.), weight loss during treatment (t=−0.84, p=n.s.), or BMI change during treatment (t=−0.93, p=n.s.). As a result, the cohorts were combined for all statistical analyses. A summary of participant characteristics is presented in Table I. Although not specifically assessed, campers were presumed to be middle to upper class based on their ability to pay for this self-pay program.

Procedures

Participants were weighed and measured on intake and discharge on the same calibrated doctor's scale, and they completed the assessment battery of psychosocial questionnaires described below, both at intake and at discharge. Over half of the participants (n=90) also completed the PedsQL and the IWQOL-Kids, which were added during the second year of the study. Participants were not compensated for participating in the study. We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research. This research was carried out in accordance with the Declaration of Helsinki in 1995 and was approved by the Duke University Institutional Review Board.

Measures

Demographics questionnaire—Participants completed a background questionnaire to provide information about age, sex, race, grade in school, and family living situation.

BMI—Camp nursing and nutrition staff trained in methods of obtaining accurate anthropometric measures obtained height and weight from participants upon camp intake and discharge. Participants were weighed and measured in athletic apparel without shoes. These data were used to calculate BMI (kilograms per meter squared) and standardized BMI

(zBMI) using age- (to the nearest month) and sex-specific median and standard deviations (SD), based on national norms from the Centers for Disease Control.

Anti-Fat Attitudes questionnaire (AFA) (10)—The AFA is a 13-item measure that assesses attitudes about overweight people and being overweight. For the present study this measure was renamed "Attitudes about Weight and Dieting" to eliminate the potential negative impact the original title might have on this particular population. Although the AFA has been shown to be valid in an overweight adult population (10), no published studies have utilized this measure with children or adolescents, and Cronbach's alpha coefficients with this youth sample were less than ideal (0.53).

Values—This is a self-report measure of values adapted from the eighteen instrumental values of the Rokeach Value Survey (27) and designed specifically for this study. Three additional values of particular interest were added to Rokeach's eighteen: appearance (looking good), athletic ability, and popularity. It was also believed that these three "values" would be particularly salient for this age group. The values were presented in alphabetical order and participants were first asked to rate on a scale of 1–5 how important each value was to them. Next, participants were asked to rank their three most important values and three least important values. Participants were considered to have improved if they placed less value on appearance after treatment.

Body-Esteem Scale (21)—The Body-Esteem Scale is a 24-item measure of physical-appearance self-concept; how individuals value their appearance and body. It utilizes a two-item response set (yes/no) that assesses overall, nonspecific body esteem (e.g., "I like what I look like in pictures", "I'm proud of my body") and has been found to be suitable for use with all age ranges, including young children. This instrument has been shown to have good split-half reliability in a sample including healthy weight and overweight youngsters (21); Cronbach's alpha with this sample was 0.84.

Rosenberg Self-Esteem Scale (28)—This is a 10-item measure that assesses overall feelings about the self. The Rosenberg Self-Esteem Scale is perhaps the most widely used self-esteem measure in social science research. It was originally developed on an adolescent sample and has been validated with numerous populations. This scale has demonstrated good internal consistency reliability (28), as well as good test-retest reliability (29). Convergent and discriminant validity have also been reported for this instrument (30,31), supporting its validity. Cronbach's alpha with this sample was 0.84.

IWQOL-Kids (32)—The IWQOL-Kids is a 27-item measure of weight-related quality of life valid for adolescents aged 11 to 19. Each item begins with the phrase, "Because of my weight," and contains five response options, ranging from "always true" to "never true." In addition to a total score, there are scores on four domains: Physical Comfort, Body Esteem, Social Life, and Family Relations. Scores range from 0–100, with higher scores representing better quality of life. The IWQOL-Kids has demonstrated good internal consistency, as well as sensitivity and responsiveness (32). The IWQOL-Kids was administered to participants aged 11 and older. Analyses of the four domain scales showed more than adequate reliability; Cronbach's alpha coefficients ranged from 0.84–0.93.

PedsQL (33)—The PedsQL is a general health related quality of life self-report measure with complementary scales for children (ages 8–12) and adolescents (ages 13–18) (33). The measure assesses physical, emotional, social, and school functioning, and provides a psychosocial summary score as well as a total score. Scores range from 0–100, with higher scores representing better quality of life. The PedsQL has been shown to be both reliable and valid, with internal consistency reliability coefficients exceeding 0.70 (in this sample Cronbach's α=0.86–0.87). The PedsQL Child Report was administered to participants aged 9–12; the PedsQL Teen Report was administered to participants aged 13 and up.

Weight Efficacy Lifestyle questionnaire (WEL) (34)—The WEL assesses self-reported eating habits and perceived self-efficacy in regards to eating and weight loss. The WEL consists of 20 items designed to measure five hypothetical dimensions of efficacy for weight management: availability, negative emotions, physical discomfort, positive activities, and social pressure. The items were slightly reworded to make them easily understandable to a pre-adolescent population. Good reliability and validity have been reported for the WEL in adult populations (34,35) and although no previously published studies have reported use of the WEL with children, Cronbach's alpha showed more than adequate scale reliability in this sample (α=0.94).

CES-D—The Center for Epidemiologic Studies Depression Scale (CES-D) (36) was originally developed for use with adults, but it has proven to be reliable and valid in previous research with adolescents (37). The CES-D consists of twenty items that were selected for inclusion from previously validated depression scales and are considered to represent the major components of depressive symptomatology, as identified from clinical literature and analytic studies. Cronbach's alpha with this sample was 0.88.

Components of the treatment program

Although the length of stay in the residential camp program ranged from one to eight weeks (M=4.3 weeks, SD=1.9), the majority of participants (54%) stayed three or four weeks, with 33% of participants staying 5–8 weeks.

The camp diet consisted of a nutritionally balanced 1 800 kcal/day diet of three meals (400 kcal/breakfast, 500 kcal/lunch, 600 kcal/dinner) and two snacks (~150 kcal each). The diet was based upon the Food Pyramid and developed with the guidance of a nutritionist. Nutrition classes were held twice weekly and cooking classes took place once a week. Physical fitness activities consisted of daily, supervised activity in five one-hour sessions per day, including cardiovascular, weight-training, and sport-specific exercise. The psychosocial component consisted of weekly, one-hour sessions in which the participants were grouped by gender and age. The sessions covered issues, such as self-esteem, body esteem, body image, emotional eating, teasing, family and peer support, and other interpersonal issues introduced by group participants. Trained psychology staff served as the moderator/facilitator for these weekly groups, and provided psycho-education and therapeutic support during the group process when appropriate.

Statistical analyses

Descriptive analyses were calculated for all self-report and observational (height, weight, etc.) measures (see Table II for a correlation matrix of all variables studied). Paired samples t-tests were run comparing pre-test and post-test means to address the primary objective of evaluating whether campers experienced significant changes in BMI, zBMI (age-and sex-standardized BMI) and psychosocial functioning. The alpha level (0.05) was divided by the number of tests performed (18) to control for multiple comparisons (0.05/18=0.003). Cohen's effect sizes were calculated for significant effects (small=0.2, medium=0.5, and large=0.8) (38).

The main analyses were designed to 1) evaluate psychosocial outcomes at the end of camp while taking into account baseline scores, and 2) examine the differential effects of gender on these outcomes. Although the primary purpose was to examine these outcomes independently of participants' pre-camp BMI, weight loss, and length of stay, we were also interested in evaluating if weight loss moderated the post-camp outcomes. For the initial analyses, pre- and post-camp changes were analyzed using repeated measures Analysis of Covariance (AN-COVA). In this ANCOVA, time (two levels) was a within subjects factor and gender (two levels) was the between subject factor with initial zBMI, change in BMI, and length of stay as the covariates. Significant gender effects were tested using a within subjects contrast (independent t-tests) with the alpha (0.05) being divided by the number of tests performed (19) to control for multiple contrasts. The ANCOVA procedure also allowed for examination of the effects of weight loss (BMI change), and these results are reported as well. Analyses were performed using statistical software (SPSS version 14.0; SPSS Inc., Chicago, IL).

Results

Changes in weight and BMI

The means and standard deviations for all self-report psychosocial measures and observed measures (BMI, zBMI) both pre- and post-treatment are reported in Table III along with effect sizes. Participants achieved significant weight loss (M=7.5 kg, SD=4.2; t=20.5, $p<0.001$) and BMI reduction (M=2.9, SD=1.4; t=23.8, $p<0.001$; zBMI: M=0.23, SD=0.11, t=21.8, p<0.001) over treatment. Length of stay at the treatment camp correlated significantly with weight loss (r=0.79, $p<0.001$). Participants who were enrolled in camp for three to four weeks lost an average of 2.35 BMI units (SD= 0.61), and participants who were enrolled seven to eight weeks lost an average of 5.17 BMI units (SD= 1.37). Both males and females showed significant changes in BMI over the course of time. Males were on average heavier than females at baseline and showed greater changes over time than females (effect size of 0.61 for males and 0.45 for females).

Changes in psychosocial outcomes

Table III presents pre- and post-treatment means and standard deviations of the psychosocial measures. Participants significantly decreased anti-fat attitudes (t=4.1, $p<0.001$) and the value they placed on appearance (t=4.2, $p<0.001$), and significantly increased body esteem (t=−7.0, $p< 0.001$), self-esteem (t=−5.3, $p<0.001$), and weight and eating efficacy (t=−4.2,

p<0.001). The magnitude of these changes was generally small to moderate, with the greatest effect size occurring for Body Esteem. On the weight-related measure of quality of life (IWQOL-Kids), participants showed significant improvements in all domains except Family Relationships. The magnitude of these changes was generally moderate, with effect sizes ranging from 0.48 (Physical Comfort) to 0.62 (Body Esteem). Participants also showed significant improvements in general health-related quality of life (PedsQL) on all domains except School functioning. The magnitude of these changes was generally moderate, with effect sizes ranging from 0.44 (Physical Functioning) to 0.54 (Emotional Functioning). Length of stay was not significantly correlated with any of these psychosocial outcomes.

Changes in psychosocial outcomes controlling for changes in BMI

Results of the ANCOVA controlling for baseline zBMI, changes in BMI, and length of stay indicated a significant main effect of time for Weight and Lifestyle Efficacy (F [1,95]=7.07, *p*<0.009) and a significant time by gender interaction (F [1,95]= 10.16, *p*<0.002). A *post-hoc* probe of the significant time x gender interaction revealed the change in WEL from pre to post was significant for girls (*p*< 0.0001) but not for boys (*t*=0.92). A significant time x gender interaction was also found for CES-D (depressive symptoms) (F [1,95]=7.80, *p*<0.006). A *post-hoc* probe of the significant time x gender interaction revealed the change in CES-D from pre to post was significant for girls (*p*<0.004) but not for boys (*p*=0.12).

Results of the ANCOVA also indicated a significant main effect of time on two general quality of life scales of the PedsQL: Physical Functioning (F [1,70]=11.69, p<0.001), and Social Functioning (F [1,70]=13.17, p<0.001). A significant time by gender interaction was found for Social Functioning (F [1,70]=8.25, *p*=0.01). A *post-hoc* probe of the interaction revealed the change in Social Functioning from pre to post was greater for boys (*p*< 0.0001) than for girls (*p*<0.032).

Effects of BMI changes on psychosocial outcomes

For the most part changes in BMI were not related to post-camp psychosocial outcomes. However, there was one exception. Results of the ANCOVA revealed a significant time by BMI reduction interaction for the Physical Comfort scale of the IWQOL-Kids, (F [1,70]=8.39, *p*=0.005). A *post-hoc* probe of this interaction using a median split on BMI change revealed that improvements in IWQOL-Kids Physical Comfort from pre to post were significant for those campers who lost more than the median in BMI (*p*<0.001) but not for those campers who lost the median in BMI or less (*p*=n.s.).

Discussion

This study investigated changes in psychosocial variables among overweight youth attending a summer residential program for weight loss in the US. A unique aspect of this study was the inclusion of a broad range of psychosocial measures, such as measures of anti-fat attitudes (negative attitudes about the overweight), the value placed on appearance, body- and self-esteem, weight-related quality of life, health-related quality of life, self-efficacy, and depressive symptoms. Campers reported significant improvements in multiple aspects of psychosocial functioning, with the greatest improvements occurring with respect to body

esteem and emotional functioning. Length of stay was not associated with the magnitude of these psychosocial changes. Of particular note is that some improvements in psychosocial functioning occurred even after controlling for amount of BMI change (weight and eating efficacy, physical functioning, and social functioning). Also noteworthy are the differential effects of gender on some of the psychosocial and quality of life outcomes. Girls reported significant improvements in depressive symptoms and weight and eating efficacy, whereas boys reported significant improvements in social interactions.

Consistent with previous research (2,3), campers in the present study improved psychosocial functioning without increasing appearance concerns. Similar to Walker and colleagues (2), we found significant improvements in physical appearance esteem (two measures) and self-esteem, and no change in school functioning. However, unlike the Walker et al. study, which found no significant changes in social acceptance, campers in the present study reported improvements in social and emotional functioning, as well as improvements in many other aspects of quality of life. Also noteworthy was the observed reduction in negative attitudes about overweight over the course of treatment. Holding these negative attitudes is likely to be especially problematic for overweight individuals, possibly leading to self-stigmatization and lower self-esteem, which in turn may serve as an impediment to successful weight loss and lifestyle change. Although reduction in anti-fat attitudes was not independent of magnitude of weight loss, the fact that these ideological attitudes were amenable to change is promising.

While the primary motivation for having children attend weight loss camps is to promote dietary and weight change, our study indicates that the associated changes in psychosocial functioning are important collateral effects. These results are in line with what campers report wanting out of the camp experience. For instance, Holt (39), using semi-structured interviews to identify psychosocial issues of concern, found that desiring improvements in self-esteem was highly valued. Campers in that study also reported the following to be positive elements of a camp experience: having fun at camp, being among similar people, having a choice of activities, and receiving staff support. Although we cannot determine which elements of the camp program led to improved psychosocial outcomes, it is possible that positive elements of the camp experience may have played a role.

Gender differences in favor of girls were also found on changes in self-efficacy and depressive symptoms. There was a tendency for girls to enter camp with lower levels of weight-related self-efficacy and higher levels of depressive symptoms, thus providing more opportunity for improvement for girls. The other gender difference was a greater improvement in social functioning for boys. Previous research on a nationally representative sample of adolescents has indicated that girls are more likely than boys to report better social functioning (22). In the current study, boys started treatment with lower scores on social functioning than girls (though not statistically significant) and their scores increased to the level obtained by girls at the end of treatment.

A notable limitation of this study is the absence of a control group and the observational study design. A randomized design was not feasible for this study due to ethical, financial and organizational parameters of the summer camp program where this took place.

Unfortunately, the effect of these constraints is that we cannot determine the efficacy of this camp for producing psychosocial changes or weight loss. Given these constraints, the study is important in that it extends previous research findings in weight loss camps by evaluating a broader range of psychosocial outcomes and by examining potential effects of gender on these outcomes. Also, due to the absence of long term follow-up we are unable to say whether the observed effects persist over time. Finally, participants were self-selected, mainly Caucasian females, from primarily dual-parent households. Understanding the degree to which changes in psychosocial outcomes occur among a more multi-ethnic lower socio-economic sample in response to a weight loss program is ripe for further investigation. It is possible that the findings presented here may not generalize to other groups.

In spite of these limitations, the study has some important clinical implications. Evidence from numerous studies indicates that overweight teens have a higher incidence of mental health problems, such as poor body image, low self-esteem, and depression (6,11,40,41). The corollary psychosocial components of overweight in children and adolescents may have an impact on the potential for recidivism following diet-based interventions, such as those enacted by camp regimens. Once children return from the camp environment in which most of their peers are overweight, the social comparison circumstances they confront will change drastically and will likely challenge the gains made in self-esteem, efficacy, positive affect and attitudes buffering self-stigmatization. The good news from the current study is that well-constructed weight loss camps provide a context for positive psychosocial change as well as weight loss. However, given the importance of psychosocial dimensions in affecting the patterns of behavior that lead to weight gain and regain, it would seem important to capitalize on the kinds of changes observed in this study by developing and clinically testing more structured psychosocial treatment regimens in the camp contexts, and/or by including a structured plan for home-based follow-up or "booster" treatment to protect against the potential re-emergence of the psychosocial vulnerabilities that are associated with dysfunctional weight-related behaviors.

In summary, we observed numerous improvements in psychosocial variables in overweight adolescents attending a summer residential treatment program. Further, changes in weight and eating efficacy, social functioning and physical functioning occurred even after controlling for changes in BMI, initial zBMI, and length of stay. Indeed, psychosocial improvements may have a distinct role to play in creating the psychological conditions that aid in the maintenance of weight loss outcomes, and greater attention to changes in psychosocial factors may be warranted when designing such programs for youth.

Acknowledgments

References

1. Jelalian E, Saelens BE. Empirically supported treatments in pediatric psychology: pediatric obesity. J Pediatr Psychol. 1999; 24(3):223–48. [PubMed: 10379137]

2. Walker LL, Gately PJ, Bewick BM, Hill AJ. Children's weight-loss camps: psychological benefit or jeopardy? Int J Obes Relat Metab Disord. 2003; 27(6):748–54. [PubMed: 12833121]

3. Gately PJ, Cooke CB, Barth JH, Bewick BM, Radley D, Hill AJ. Children's residential weight-loss programs can work: a prospective cohort study of short-term outcomes for overweight and obese children. Pediatrics. 2005; 116(1):73–7. [PubMed: 15995034]

4. Gately PJ, Cooke CB, Butterly RJ, Mackreth P, Carroll S. The effects of a children's summer camp programme on weight loss, with a 10 month follow-up. Int J Obes Relat Metab Disord. 2000; 24(11):1445–52. [PubMed: 11126341]

5. Barton SB, Walker LL, Lambert G, Gately PJ, Hill AJ. Cognitive change in obese adolescents losing weight. Obes Res. 2004; 12(2):313–9. [PubMed: 14981224]

6. Bell SK, Morgan SB. Children's attitudes and behavioral intentions toward a peer presented as obese: does a medical explanation for the obesity make a difference? J Pediatr Psychol. 2000; 25(3): 137–45. [PubMed: 10780140]

7. DeJong W. Obesity as a characterological stigma: the issue of responsibility and judgments of task performance. Psychol Rep. 1993; 73(3 Pt 1):963–70. [PubMed: 8303000]

8. Hill AJ, Silver EK. Fat, friendless and unhealthy: 9-year old children's perception of body shape stereotypes. Int J Obes Relat Metab Disord. 1995; 19(6):423–30. [PubMed: 7550528]

9. Beck, AT.; Rush, AJ.; Shaw, BF.; Emery, G. Cognitive Therapy of Depression. New York: Guilford Press; 1979.

10. Crandall CS. Prejudice against fat people: ideology and self-interest. J Pers Soc Psychol. 1994; 66(5):882–94. [PubMed: 8014833]

11. Friedlander SL, Larkin EK, Rosen CL, Palermo TM, Redline S. Decreased quality of life associated with obesity in school-aged children. Arch Pediatr Adolesc Med. 2003; 157(12):1206–11. [PubMed: 14662577]

12. Wake M, Salmon L, Waters E, Wright M, Hesketh K. Parent-reported health status of overweight and obese Australian primary school children: a cross-sectional population survey. Int J Obes Relat Metab Disord. 2002; 26(5):717–24. [PubMed: 12032758]

13. Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. JAMA. 2003; 289(14):1813–9. [PubMed: 12684360]

14. Hughes AR, Farewell K, Harris D, Reilly JJ. Quality of life in a clinical sample of obese children. Int J Obes (Lond). 2007; 31(1):39–44. [PubMed: 16733522]

15. Zeller MH, Modi AC. Predictors of health-related quality of life in obese youth. Obesity (Silver Spring). 2006; 14(1):122–30. [PubMed: 16493130]

16. Sheslow D, Hassink S, Wallace W, DeLancey E. The relationship between self-esteem and depression in obese children. Ann N Y Acad Sci. 1993; 699:289–91. [PubMed: 8267330]

17. Wallace WJ, Sheslow D, Hassink S. Obesity in children: a risk for depression. Ann N Y Acad Sci. 1993; 699:301–3. [PubMed: 8267334]

18. Zeller MH, Roehrig HR, Modi AC, Daniels SR, Inge TH. Health-related quality of life and depressive symptoms in adolescents with extreme obesity presenting for bariatric surgery. Pediatrics. 2006; 117(4):1155–61. [PubMed: 16585310]

19. Melnyk BM, Small L, Morrison-Beedy D, Strasser A, Spath L, Kreipe R, et al. Mental health correlates of healthy lifestyle attitudes, beliefs, choices, and behaviors in overweight adolescents. J Pediatr Health Care. 2006; 20(6):401–6. [PubMed: 17071371]

20. Israel AC, Ivanova MY. Global and dimensional self-esteem in preadolescent and early adolescent children who are overweight. Int J Eat Disord. 2002; 31:424–429. [PubMed: 11948647]

21. Mendelson BK, White DR. Development of self-body-esteem in overweight youngsters. Dev Psychol. 1985; 21:90–96.

22. Swallen KC, Reither EN, Haas SA, Meier AM. Overweight, obesity, and health-related quality of life among adolescents: the National Longitudinal Study of Adolescent Health. Pediatrics. 2005; 115(2):340–7. [PubMed: 15687442]

23. Angold A, Costello EJ, Worthman CM. Puberty and depression: the roles of age, pubertal status and pubertal timing. Psychol Med. 1998; 28:51–61. [PubMed: 9483683]

24. Faith MS, Matz PE, Jorge MA. Obesity-depression associations in the population. J Psychosom Res. 2002; 53(4):935–42. [PubMed: 12377306]

25. Stunkard AJ, Faith MS, Allison KC. Depression and obesity. Biol Psychiatry. 2003; 54(3):330–7. [PubMed: 12893108]

26. McHale SM, Corneal DA, Crouter AC, Birch LL. Gender and weight concerns in early and middle adolescence: Links with well-being and family characteristics. J Clin Child Psychol. 2001; 30:338–348. [PubMed: 11501251]

27. Rokeach, M. The nature of human values. New York: Free Press; 1973.

28. Rosenberg, M. Society and the Adolescent Self-Image. Princeton: Princeton University Press; 1965.

29. Wylie, RC. Measures of Self-Concept. Lincoln: University of Nebraska Press; 1989.

30. Byrne BM. Investigating measures of self-concept. Meas Eval Guid. 1983; 16:115–126.

31. Byrne BM, Shavelson RJ. On the structure of adolescent self concept. J Educ Psychol. 1986; 78:474–481.

32. Kolotkin RL, Zeller M, Modi AC, Samsa GP, Quinlan NP, Yanovski JA, et al. Assessing weight-related quality of life in adolescents. Obesity (Silver Spring). 2006; 14(3):448–57. [PubMed: 16648616]

33. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. Med Care. 2001; 39(8):800–12. [PubMed: 11468499]

34. Clark MM, Abrams DB, Niaura RS, Eaton CA, Rossi JS. Self-efficacy in weight management. J Consult Clin Psychol. 1991; 59(5):739–44. [PubMed: 1955608]

35. Prochaska JO, Norcross JC, Fowler JL, Follick MJ, Abrams DB. Attendance and outcome in a work site weight control program: Processes and stages of change as process and predictor variables. Add Beh. 1992; 17:35–45.

36. Radloff LS. The CES-D scale: A self report depression scale for research in the general population. Appl Psychol Meas. 1977; 1:385–401.

37. Radloff LS. The use of the Center of Epidemiologic Studies depression scale in adolescents and young adults. J Youth Adolesc. 1991; 20:149–166. [PubMed: 24265004]

38. Cohen, J. Statistical Power Analysis for the Behavior Sciences. 2. Hillsdale, NJ: Lawrence Erlbaum; 1988.

39. Holt NL, Bewick BM, Gately PJ. Children's perceptions of attending a residential weight-loss camp in the UK. Child Care Health Dev. 2005; 31(2):223–31. [PubMed: 15715701]

40. Goodman E, Whitaker R. A prospective study of the role of depression in the development and persistence of adolescent obesity. Pediatrics. 2002; 109:497–504. [PubMed: 12205250]

41. Sjober RL, Nilsson KW, Leppert J. Obesity, shame, and depression in school-aged children: A population based study. Pediatrics. 2005; 116:e389–92. [PubMed: 16140683]

Table I

Baseline characteristics of study participants (*n*=130).

	N	*%*	**Mean (SD)**
Age			12.8 (1.90)
Sex			
Girls	91	70	
Boys	39	30	
Race			
White	100	77	
African American	13	10	
Hispanic	10	8	
Bi-racial/other	7	5	
Anthropometric data			
BMI			33.5 (5.95)
zBMI			2.2 (0.37)
Participating caregiver			
Mother	124	95	
Father	101	78	
Two parent household	96	74	
Length of stay in weeks			4.3 (1.90)

SD: Standard deviation; BMI: Body mass index.

Table II

Intercorrelations of Variables Pre-Treatment (upper diagonal) and Post-Treatment (lower diagonal).

	zBMI	AFA	Val	BES	S-E	IWQP	IWQB	IWQS	IWQF	IWQT	PEDH	PEDF	PEDO	PEDS	PEDP	PEDT	WEL	CES
zBMI2		−0.07	−0.06	−0.05	−0.11	−0.41★★	−0.16	−0.22	−0.04	−0.25★	−0.12	−0.04	−0.14	0.19	−0.02	−0.01	−0.15	0.21★
AFA2	0.02		0.16	−0.19★	−0.26★★	−0.14	−0.10	−0.18	−0.07	−0.17	−0.12	−0.22★	−0.24★	−0.19	−0.24★	−0.32★★	−0.22★	0.15
Val2	−0.04	0.20★		−0.15	−0.12	0.12	0.08	−0.01	0.15	0.10	−0.04	−0.06	−0.12	−0.21	−0.15	−0.14	−0.01	−0.02
BES2	−0.12	−0.41★★	−0.05		0.56★★	0.22★	0.59★★	0.48★★	0.25★	0.47★★	0.38★★	0.45★★	0.48★★	0.23★	0.49★★	0.49★★	0.23★★	−0.35★★
S-E2	−0.14	−0.38★★	−0.07	0.56★★		0.27★	0.61★★	0.51★★	0.38★★	0.55★★	0.29★★	0.64★★	0.44★★	0.32★★	0.55★★	0.58★★	0.30★★	−0.57★★
IWQP2	−0.14	−0.28★	−0.04	0.23	0.38★★		0.61★★	0.70★★	0.35★★	0.80★★	0.63★★	0.36★★	0.58★★	0.12	0.48★★	0.47★★	0.48★★	−0.42★★
IWQB2	0.05	−0.29★	−0.04	0.55★★	0.57★★	0.54★★		0.81★★	0.48★★	0.91★★	0.40★★	0.59★★	0.59★★	0.23★	0.60★★	0.55★★	0.41★★	−0.44★★
IWQS2	−0.03	−0.18	−0.17	0.38★★	0.46★★	0.62★★	0.76★★		0.51★★	0.92★★	0.47★★	0.52★★	0.80★★	0.29★	0.69★★	0.64★★	0.42★★	−0.53★★
IWQF2	−0.06	−0.09	−0.08	0.17	0.19	0.26★	0.37★★	0.47★★		0.67★★	0.14	0.30★★	0.34★★	0.33★★	0.38★★	0.39★★	0.16	−0.34★★
IWQT2	−0.07	−0.29★	−0.09	0.42★★	0.51★★	0.62★★	0.79★★	0.82★★	0.76★★		0.44★★	0.55★★	0.69★★	0.28★	0.65★★	0.61★★	0.44★★	−0.51★★
PEDH2	−0.33★★	−0.36★★	0.08	0.36★★	0.36★★	0.32★★	0.30★	0.27★	0.03	0.25★		0.52★★	0.69★★	0.34★★	0.67★★	0.81★★	0.35★★	−0.49★★
PEDF2	−0.07	−0.47★★	0.00	0.48★★	0.53★★	0.22	0.38★★	0.25★	0.06	0.26★	0.60★★		0.58★★	0.48★★	0.85★★	0.78★★	0.39★★	−0.61★★
PEDO2	−0.23★	−0.29★	−0.13	0.41★★	0.38★★	0.39★★	0.37★★	0.48★★	0.15	0.38★★	0.68★★	0.47★★		0.39★★	0.84★★	0.85★★	0.38★★	−0.57★★
PEDS2	0.07	−0.37★	−0.22★	0.24★	0.29★★	0.30★★	0.35★★	0.25★	0.06	0.26★	0.42★★	0.54★★	0.34★★		0.75★★	0.68★★	0.14	−0.31★★
PEDP2	−0.11	−0.51★★	−0.13	0.45★★	0.50★★	0.40★★	0.47★★	0.42★★	0.15	0.39★★	0.72★★	0.85★★	0.75★★	0.80★★		0.96★★	0.39★★	−0.64★★
PEDT2	−0.17	−0.50★★	−0.10	0.45★★	0.48★★	0.39★★	0.43★★	0.37★★	0.08	0.35★★	0.87★★	0.81★★	0.81★★	0.71★★	0.96★★		0.39★★	−0.59★★
WEL2	0.15	−0.17	−0.19★	0.19★	0.23★	0.42★★	0.35★★	0.32★★	0.08	0.34★★	0.13	0.31★★	0.14	0.37★★	0.34★★	0.29★★		−0.26★★
CES2	0.14	0.40★★	0.05	−0.43★★	−0.65★★	−0.51★★	−0.53★★	−0.57★★	−0.33★★	−0.62★★	−0.39★★	−0.58★★	−0.41★★	−0.41★★	−0.59★★	−0.51★★	−0.26★★	

★
p<0.05;

★★
p<0.01.

zBMI=ZBMI; AFA=Anti-fat Attitudes; Val=Value of Appearance; BES=Body Esteem Scale; S-E=Self-Esteem; IWQP=IWQOL-Kids Physical Comfort; IWQB=IWQOL-Kids Body Esteem; IWQS=IWQOL-Kids Social Life; IWQF=IWQOL-Kids Family Relations; IWQT=IWQOL-Kids Total; PEDH=PEDSQL Health and Activities; PEDF=PEDSQL Feelings; PEDO=PEDSQL Getting Along with Others; PEDS=PEDSQL School; PEDP=PEDSQL Psychosocial Health; PEDT=PEDSQL Total; WEL=Weight Efficacy Lifestyle Questionnaire; CES=Center for Epidemiologic Studies Depression Scale.

Table III

Observed and self-report changes over treatment.

n=130	Pre-treatment		Post-treatment			Effect size Cohen's d
	Mean	(SD)	Mean	(SD)		
BMI						
Females	32.8	(5.7)	30.3	(5.3) ★		0.45
Males	34.5	(6.4)	30.9	(5.3) ★		0.61
All subjects	33.5	(5.9)	30.6	(5.3) ★		0.52
zBMI all subjects	2.2	(0.4)	2.0	(0.4) ★		0.57
Anti-fat attitudes	33.1	(3.8)	31.8	(3.4) ★		0.36
Valuing of appearance	3.5	(1.7)	2.8	(1.8) ★		0.40
Body esteem	6.9	(4.8)	9.6	(5.3) ★		0.53
Self-esteem	29.6	(5.8)	32.1	(5.0) ★		0.46
Weight/eating efficacy	109.5	(36.1)	121.4	(35.0) ★		0.33
Depressive symptoms	35.9	(10.6)	34.6	(9.5)		
IWQOL–Kids n=90						
Physical comfort	75.1	(26.4)	85.9	(17.3) ★		0.48
Body esteem	54.7	(28.6)	71.5	(25.1) ★		0.62
Social life	65.8	(29.5)	79.6	(23.7) ★		0.51
Family relationships	83.2	(26.8)	90.8	(19.2)		
Total	67.9	(24.0)	79.8	(20.2) ★		0.53
PedsQL n=90						
Physical	71.9	(16.6)	79.6	(18.0) ★		0.44
Emotional	59.9	(23.3)	72.4	(23.0) ★		0.54
Social	67.3	(26.3)	78.2	(21.6) ★		0.45
School	70.0	(21.0)	73.6	(22.5)		
Psychosocial summary	65.5	(19.5)	74.6	(17.7) ★		0.49
Total	68.4	(15.7)	76.7	(16.2) ★		0.52

Author Manuscript

SD: Standard deviation; BMI: Body mass index.

★
p<0.001.

Author Manuscript

Author Manuscript

Author Manuscript