Published in final edited form as:
Eat Weight Disord. 2010 September ; 15(3): e166–e172.

Weight Loss Following a Clinic-Based Weight Loss Program Among Adults with Attention Deficit/Hyperactivity Disorder Symptoms

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Abstract

Objective—The purpose of the present study was to compare obese patients screening positive or negative for attention deficit/hyperactivity disorder (ADHD) on pre-treatment body mass index (BMI), weight loss following a 16 week clinic-based behavioral weight loss program, weight loss attempts, dietary and physical activity habits, perceived difficulty of weight control skills, and eating self-efficacy.

Design—Patients who completed a behavioral weight loss program were approached to complete questionnaires on ADHD and eating habits. Medical charts were reviewed to obtain weight at pre- and post-treatment.

Results—Participants (N=63) were 75% female, mean age was 49 (standard deviation = 10.3), mean body mass index (BMI) was 41.4 kg/m^2(standard deviation = 6.8) and 30% screened positive for ADHD on the Adult ADHD Symptom Rating Scale. Participants screening positive for ADHD did not have a higher BMI at baseline (p =.41), but reported more previous weight loss attempts (p=.01) and lost less weight (p= .02) than participants who screened negative. Participants screening positive also reported consuming fast food meals more frequently (p=.04), higher levels of emotional eating (p=.002), greater difficulty with weight control skills (p=.01), and lower eating self-efficacy (p=.001).

Conclusion—Attention-related problems appear to be common among weight treatment-seeking samples and represent a significant barrier to weight control that has not yet been addressed in the literature.

Keywords

attention deficit hyperactivity disorder; obesity; weight loss; adults; weight behaviors

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Introduction

Obesity affects almost a third of the adult US population (1) and certain psychological disorders are associated with higher prevalence of obesity (2) and greater difficulty losing weight (3). Psychological disorders that are characterized by appetite and/or affect dysregulation, such as binge eating disorder (4) and depression (3) have been the primary targets of study in relation to obesity. Affect dysregulation is also characteristic of attention deficit/hyperactivity disorder (ADHD), and a growing body of evidence suggests that ADHD increases risk for obesity (5, 6).

One of the most common neurobehavioral disorders of childhood, ADHD has been shown to persist into adulthood 30-50% of the time (7), affecting over 9 million US adults (8). Adults with ADHD have difficulties with inattentiveness, impulsivity, procrastination, disorganization, boredom intolerance, difficulty completing tasks at work and home, forgetfulness, impatience, and emotional reactivity (9). ADHD has been associated with conduct problems, arrest histories, depression, anxiety, traffic accidents, occupational and academic problems, tobacco use, and substance abuse (10). Some research has also suggested that ADHD be a risk factor for health problems (11). Four population-based studies have examined the association between ADHD and risk for obesity, with two reporting positive associations (5, 6), one reporting no association (12), and one reporting an association only among unmedicated individuals with ADHD (13). Individuals with ADHD also appear to be overrepresented among samples of obese patients presenting for weight loss treatment. Four studies examined the prevalence of ADHD in obese adults and teens and reported higher-than-expected prevalence of ADHD in obese patients, ranging from 13.3% to 57.7% (14-17). This is in stark contrast to the prevalence of ADHD in the general population, estimated to be 3-5% (8). One study reported that obese patients with ADHD lost significantly less weight than their counterparts without ADHD following weight loss intervention, although the intervention was not specified (14).

The goal of the present study was twofold. First, we aimed to replicate previous clinic study findings by determining if patients enrolled in our evidence-based behavioral weight loss program who reported symptoms consistent with ADHD were heavier and lost less weight than patients without ADHD symptoms following 4 months of treatment. Second, to extend the literature, we also compared patients with and without symptoms of ADHD on dietary and physical activity habits (e.g., skipping meals, fast food consumption, and regular exercise), emotional eating, perceived difficulty of behavioral weight loss skills, and eating self-efficacy following treatment. We hypothesized that individuals with ADHD symptoms will lose less weight, and they will have worse dietary and physical activity habits, more emotional eating, greater perceived difficulty with weight control, and lower self-efficacy, despite participating in a weight loss treatment aimed to address these areas.

Methods

All patients who completed a 16-week behavioral weight loss program at the University of Massachusetts Medical Center (UMMC) were sent a packet with a letter inviting them to participate in a study on barriers to weight loss, a consent form, the study questionnaires, and a self-addressed stamped envelope. A total of 155 patients were contacted. Patients who did not return packets within 1 month were sent a second packet and those who did not return the second packet within 1 month were sent a third packet. The packet included the Adult ADHD Self-Report Scale, version 1.1 (ASRS) (18), the Perceived Difficulty Index (created for this study and described below), the Weight Lifestyle Self-Efficacy Scale (WEL) (19), and the Weight and Lifestyle Inventory (WALI) (20). Because these measures were completed following the behavioral weight loss program, responses reflect post-

program behavior. Data on baseline characteristics and weight loss after treatment were collected from medical records for patients consenting to participate. Upon completion, participants were mailed a $25 gift card. The study protocol was reviewed and approved by the University of Massachusetts Medical School Institutional Review Board.

Behavioral Weight Loss Program

The behavioral weight loss program at the UMMC Weight Center is based on the Diabetes Prevention Program (DPP) lifestyle intervention (21), which has demonstrated efficacy on medical endpoints including weight loss (22), diabetes prevention (22), metabolic syndrome (23), and cardiovascular disease risk reduction (24). A detailed description of the UMMC implementation of the DPP and its outcomes are provided elsewhere (25). The UMMC DPP intensive core phase involved 16 weekly sessions administered in groups by dietitians, exercise physiologists, and clinical psychologists. The program goal for 16 weeks was 7% loss of body weight. Dietary recommendations emphasized a reduced fat and calorie diet; participants were given a goal to reduce their consumption by 500-1000 calories a day depending on sex and body weight. Participants were also given a physical activity goal of engaging in 150 minutes of moderate physical activity per week. Only those cleared by both their primary care physician and the Weight Center physician to participate in moderate intensity physical activity were permitted to enroll in the weight loss program.

Measures

Weight—Retrospective medical chart reviews were performed to collect information on baseline weight, height, and weight loss following treatment. As part of the behavioral weight loss program, participants attended medical and psychological intake examinations where weight and co-morbidities were evaluated by a physician and a clinical psychologist. Weight was measured at the medical intake and every treatment session. Total weight loss was computed by subtracting weight at the final treatment session from weight at their initial intake.

Baseline Characteristics—Depression and binge eating disorder were assessed via semi-structured clinical interview (addressing DSM-IV criteria for each disorder) by licensed clinical psychologists during their psychological intake exam. Patients diagnosed with a psychological condition were given referrals for treatment but permitted to enroll in the weight loss program.

ADHD Symptoms—The Adult ADHD Self-Report Scale (ASRS) symptom checklist is an 18-item scale used to screen for ADHD symptoms in adults (18). The ASRS assesses the frequency of the DSM-IV criteria for ADHD. Individuals who earned scores of 4 or more were considered to have symptoms consistent with ADHD (ASRS-positive) and individuals with scores less than 4 were considered to not have significant symptoms (ASRS-negative). The ASRS has been shown to be a reliable and valid scale for evaluating ADHD in adults and shows a high internal consistency and high concurrent validity with the rater-administered ADHD rating scale (26). In the current sample, items showed high internal reliability (Cronbach alpha = .92).

Perceived Difficulty Index—The Perceived Difficulty Index was developed by the authors to assess perceived difficulty of the basic components of a behavioral weight loss program. The authors devised a series of 12 items to assess participants' self-reported difficulty level of keeping track of calories, keeping a diet diary, planning meals ahead of time, following a prescribed diet, measuring foods, weighing themselves daily, shopping for healthy foods, preparing meals in the home, attending a weight-loss group, making time for physical activity, making time to eat healthy foods, and attending an exercise class.

Participants were asked to rate each weight loss skill on a 5-point scale ranging from 0 - not at all difficult to 4 – extremely difficult. Items showed high reliability (Cronbach alpha = .87). This instrument is available from the authors upon request.

Weight Lifestyle Self-Efficacy (WEL)—The WEL is a 20-item instrument measuring the ability to resist eating during 5 different situations: negative emotions, availability, social pressure, physical discomfort, and positive activities (19). The instrument has been validated in clinical populations and it is sensitive to changes in obese patients pre- and post-treatment (27). Items showed high reliability in the present sample (Cronbach alpha = .95).

Weight and Lifestyle Inventory (WALI)—The WALI is a self-report instrument that includes a variety of items about weight and dieting history and eating and physical activity habits (20). For the present study, we used items on the WALI relevant to fast food consumption, meal skipping, and emotional eating. Fast food consumption was assessed via 3 items that asked individuals to report the weekly frequency of eating at fast food restaurants for breakfast, lunch, and dinner. The total weekly frequency of fast food consumption was computed by totaling these items.

Meal skipping was assessed with 3 items that asked individuals to report how many days per week they consumed breakfast, lunch, and dinner. The number of meals skipped was calculated by subtracting the number of days the meal was consumed per week by 7. For example, if the participant reported consuming breakfast 5 times per week, then the total number of breakfasts skipped per week was 2 (i.e., 7 minus 5). The number of breakfasts, lunches, and dinners skipped per week was then totaled to determine the total number of meals skipped per week.

The emotional eating scale in the WALI involved 7 items relevant to how much eating during different negative moods (i.e., stress, depression, angry, alone, anxious, tired, bored) contributes to their weight gain. This factor analytically derived subscale demonstrates good internal consistency and test-retest reliability as well as initial evidence of convergent validity based on whether participants met criteria for binge eating disorder (28). The seven items showed high reliability in the present sample (Cronbach alpha = .90).

Statistical Analyses

The two groups were compared on pre-program BMI, percent weight lost during the program, percent losing at least 5% of body weight, number of weight loss attempts in the previous year, diet (meal skipping, fast food consumption, and emotional eating), physical activity habits, perceived difficulty of weight loss skills, and self-efficacy for weight and lifestyle behaviors. Pre-program BMI and percent weight loss was analyzed via analysis of variance (ANOVA). The percent of participants losing at least 5% of body weight was analyzed via Chi-square test. All variables from the WALI were analyzed together via multivariate analysis of variance (MANOVA). Participants were asked to rate on a scale of 1-10 how accurate they believed their report of their weight history was in the WALI. This item was entered as a covariate in the MANOVA of dependent variables from the WALI. Because total scores on the Perceived Difficulty Scale and the WEL were correlated ($r = .44$, $p<.001$), they were analyzed together via MANOVA. Sex and age were entered as covariates in all models. Data were analyzed with SPSS 16.0 for Windows (Chicago, Illinois).

Results

Of 155 patients contacted, 63 returned completed questionnaires, resulting in a response rate of 40%. No differences were observed in age ($p=.29$), baseline weight ($p = .11$), or percent

weight loss (p= .48) between responders and non-responders. Participants were 75% female and almost entirely Caucasian (99%); mean age was 50 [standard deviation (sd) = 10] and mean baseline body mass index (BMI) was 41.4 (sd= 6.8). Most participants were nonsmokers (99%); however, 37% reported to have smoked in the past and quit. About 24% met criteria for major depressive disorder, 23% met criteria for binge eating disorder, and 10% of the sample had type 2 diabetes. Thirty percent (30%) reported symptoms consistent with ADHD on the ASRS. ASRS-positive participants were not more likely to have depression (p=.34) or type 2 diabetes (p=.26). Overall, mean weight loss following 4-months of treatment was 5.6 kg (sd = 4.3, range = -15.4 to +4.9 kg) or 5% (sd = 3.5%, range = -14% to +4%).

Outcomes

The ANOVA model comparing groups on pre-program BMI was not significant, F(1,62)= . 51, p =.47 (See Table 1), suggesting that groups were not different on BMI at the beginning of the program. However, the ANOVA model comparing groups on percent weight loss following the 4-month program was significant, F(1,62)= 5.68, p =.02, such that ASRS-positive participants lost less weight (M=3.3%; sd = 3.5) than ASRS-negative participants (M=5.6%; sd= 3.4). The chi square test on percent losing at least 5% of body weight was significant ($\chi^2(1)= 4.72$, p=.03), such that almost twice as many ASRS-negative participants (61%) achieved clinically significant weight loss (5% or more) as ASRS-positive participants (31%).

The MANOVA that included all variables from the WALI was significant, F (6, 53) = 3.05, p= .01. Univariate tests revealed that ASRS-positive participants reported significantly more short-lived (fewer than 3 days) weight loss attempts than ASRS-negative participants, F(1, 62) = 7.74, p=.007, but the difference in sustained weight loss attempts was not statistically significant, F(1, 62) = 3.03, p=.08. ASRS-positive participants also reported consuming more fast food meals per week than ASRS-negative participants, F(1, 62) = 4.02, p=.04, but they were not more likely to skip meals, F(1, 62) = .28, p=.59. ASRS-positive participants also had higher emotional eating scores than ASRS-negative participants, F(1, 62) = 10.07, p=.002. Physical activity frequency did not differ between the groups, F(1, 62) = 1.28, p = . 26.

The MANOVA including the perceived difficulty of weight loss skills and eating self-efficacy measures was also significant, F(2, 57) = 6.94, p= .002. The univariate model for perceived difficulty of weight loss skills was significant such that ASRS-positive participants rated weight loss skills more difficult to carry out than ASRS-negative participants, F(1, 62) = 6.88, p= .01. The univariate model for eating self-efficacy revealed that ASRS-positive participants reported lower self-efficacy to control their eating than ASRS-negative participants, F(1, 62) = 12.46, p=.001.

Discussion

The present study revealed that 30% of a sample of patients enrolled in a weight loss program reported symptoms consistent with ADHD. Relative to their counterparts screening negative, patients screening positive for ADHD lost less weight following a structured behavioral weight loss program, were half as likely to lose clinically significant weight (at least 5% of weight), consumed fast food more often, were more likely to eat in response to negative moods, perceived weight loss skills as more difficult, and reported lower eating self-efficacy. These patients also reported nearly 5 times as many short-lived weight loss attempts (i.e., lasting less than 3 days) and twice the number of sustained weight loss attempts (i.e., lasting more than 3 days) as their counterparts without symptoms, although the latter was not statistically significant. In spite of these differences, ADHD-positive

patients were not more likely to skip meals and they did not report less frequent physical activity.

The finding that 30% of patients reported symptoms of ADHD is consistent with previous studies of obese clinic samples. Fleming and colleagues (15) administered standardized measures of ADHD to 75 consecutive patients (BMI ≥ 35) referred for non-surgical treatment of obesity in a Canadian weight loss clinic (15). On the Conner's Adult ADHD Rating Scale (29), 30.7% of their sample showed clinical elevations on the ADHD Index subscale. Because childhood symptoms are necessary for the diagnosis of ADHD in adulthood, they administered the Wender Utah Rating Scale and 38.6% of the sample met criteria. Overall, 26.7% of their sample reported symptoms consistent with a diagnosis of ADHD in both childhood and adulthood. Inattentive symptoms, but not hyperactive symptoms of ADHD, were most frequently reported. Similar findings were reported in a study by Altfas (14), where medical charts of 215 weight loss clinic patients were reviewed retrospectively to investigate the prevalence of ADHD and to test the association between ADHD diagnosis and weight loss following treatment. To be diagnosed with ADHD, patients had to report 6 or more DSM-IV inattentive symptoms as well as report symptoms starting prior to 12 years old in semi-structured clinical interviews of DSM-IV diagnostic criteria. The prevalence of ADHD was 27.4%, six times higher than what has been observed in the general population, i.e., 4.4% (14). Among those with class III obesity, 42.6% met criteria for ADHD. All patients with the ADHD diagnosis had inattentive sub-type; none had the hyperactive-impulsive sub-type. Patients with ADHD also had a significantly higher baseline BMI than those without ADHD (mean = 39.6 vs. 34.2 kg/m^2) and lost just over half of the weight (mean = 3.34%) of their counterparts without ADHD (mean = 5.59%). Although ADHD-positive participants in the present study were not heavier at baseline, as in Altfas (14), they lost just over half of the weight as their counterparts without ADHD symptoms.

Adults screening positive for ADHD appear to have greater difficulty losing weight in spite of more frequent attempts to do so. In the present study, ADHD-positive participants reported an average of 10 short-lived weight loss attempts (i.e., lasting less than 3 days) in the previous year compared to about 2 short-lived attempts as reported by ADHD-negative participants. Deficits in working memory and persistence, which can manifest in poor follow through with intentions, plans, and goals (9) may be a factor. When combined with a greater tendency toward impulsivity, this might result in greater vulnerability to the lure of fad diets and greater reactivity to external cues to overeat, which could lead to diet relapse. Emotional reactivity may also be a factor. ADHD-positive participants reported a greater tendency to eat in response to negative moods including sadness, boredom, tiredness, anger, and anxiety.

ADHD-positive participants rated weight loss skills as more challenging than their ADHD-negative counterparts. Weight loss skills such as tracking calories, keeping a diet diary, planning meals ahead of time, and other skills require a degree of conscientiousness, memory, and organizational skills, areas that are often deficient in ADHD (9). Additional guidance and support around applying these skills to weight management may be indicated for adults with ADHD.

Referral for evaluation and treatment of ADHD should be a consideration for adults with signs of ADHD who present for weight loss treatment. A recent clinical observational study found that severely obese patients with ADHD who received pharmacological treatment for their ADHD had a 12% weight loss over 466 days of medication relative to a 2% weight gain in ADHD controls who refused or discontinued medication (30). Weight loss might be enhanced further if pharmacological treatment for ADHD is supplemented with a behavioral weight loss program. Randomized trials are needed to evaluate the use of ADHD medication

and the combination of medication and behavioral treatment on weight loss in this population.

The present study has a number of limitations, with the most important being that self-report data was collected after participants completed the treatment program which means that responses on non-trait variables were likely impacted by the program. Data for self-efficacy, diet habits, physical activity, and perceived difficulty reflect how participants were feeling following, not prior to, the structured weight loss program. Responses to the ASRS were not likely impacted as items refer to stable patterns of behavior experienced by participants. However, the ASRS was used to predict outcomes from weight treatment that occurred previous to the ASRS being administered, where typically predictors are assessed prior to the outcome they are being used to predict.

Second, the ASRS does not diagnose ADHD but rather is a screener for ADHD symptoms in adults (18). Scores of 4 or greater on the ASRS have been shown to be highly predictive of ADHD diagnosis (18). The ASRS is a quick and simple screening tool that is more feasible than diagnostic interviews in medical settings such as a weight loss clinic where assessment time is very limited. Whether symptoms are a function of an underlying medical or other psychiatric condition is not possible to discern, and the ASRS does not assess childhood symptoms. For these reasons, the ASRS likely errs toward over-estimating ADHD. Two studies have reported similar rates of ADHD in samples that included all enrolled patients and used more intensive assessment of ADHD diagnosis (e.g., (14, 15)). Weight loss clinics that incorporate the ASRS into their pre-treatment evaluation should interpret scores cautiously and refer positive screens for more comprehensive diagnostic assessment. Although depression is highly co-morbid with obesity and ADHD, in the present study, individuals with ADHD symptoms were not more likely to be depressed ($p = .34$).

A third limitation is that reports of past behavior might be less accurate among adults with symptoms of ADHD given that they might have greater difficulty recalling past behavior (e.g., number of weight loss attempts in the past year). To explore this phenomenon, participants were asked to rate the accuracy of their weight loss history recall on a scale of 1 to 10. ASRS-positive participants rated themselves significantly less accurate at recalling their history (mean = 4.9, sd= 2.6) than ASRS-negative participants (mean = 6.8, sd=1.9; $p=.003$). As such, this variable was entered as a covariate in the model of relevant items. Fourth, although all patients were approached after completing the program, the sample does not include all patients only the 40% who agreed to participate in the study. Although the focus of the study on ADHD was not mentioned in study materials, individuals volunteering to participate may not have been representative of the entire population of people who participated in the weight loss program. Finally, the sample size was fairly small, limiting power to answer some of the questions of interest. Nevertheless, our findings suggest that future research of the impact of ADHD on weight loss and related behaviors on larger samples is merited.

The association between ADHD and risk for obesity is now well-established. Our findings and others strongly suggest that ADHD may be a risk factor for treatment resistant obesity. Further research is needed to clearly establish this as well as the mechanisms of weight treatment failure in these individuals. Assessment of ADHD using screening devices such as the ASRS is recommended in clinical settings to identify patients who may benefit from ADHD assessment and treatment and who might require extra support around attention-related challenges during their weight loss attempt. Controlling ADHD symptoms might be a necessary first step to addressing weight control in this population.

Acknowledgments

This research was supported by NIH grant K23 HL073381 and Health Resources and Services Administration (HRSA) ADD grant 90DD062501.

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Table 1

Comparison of attention deficit/hyperactivity disorder (ADHD)-present and ADHD-absent participants on dependent variables

	ADHD present (N=19) Mean (sd)	ADHD absent (N=44) Mean (sd)	F-value or X^2
WEIGHT			
Pre-treatment BMI	40.75 (6.51)	41.67 (6.94)	.51
Percent weight change	-3.34% (3.53)	-5.59% (3.43)	5.68†
Percent meeting 5% weight loss goal	31%	61%	4.72†
WEIGHT LOSS ATTEMPTS			
Number lasting <3 days in past year	10.07 (15.28)	2.18 (4.08)	7.74‡
Number lasting >3 days in past year	5.00 (5.78)	2.37 (2.81)	3.03
DIET HABITS			
Meals skipped per week	1.57 (2.00)	1.40 (2.17)	.28
Fast food meals per week	1.94 (1.92)	.81 (1.78)	4.02†
Emotional eating	19.36 (5.31)	13.27 (6.77)	10.07‡
PHYSICAL ACTIVITY			
Days per week of >20 minutes moderate physical activity	2.50 (2.61)	3.48 (1.79)	1.28
PERCEIVED DIFFICULTY			
Total score	29.78 (6.35)	23.02 (8.53)	6.88†
SELF-EFFICACY			
Total score	75.73 (42.72)	103.87 (29.32)	12.46‡

Note.

The pre-treatment BMI results are from the analysis of variance models and all other results are from the multivariate analysis of variance models adjusted for age and sex.

† $p < .05$

‡ $p < .01$.