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Early-treatment weight loss predicts 6-month weight loss in women with obesity and depression: implications for stepped care

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Abstract

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Conflicts of interest

All authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf and declare that Dr. Appelhans receives grant support from Hillshire Brands Company, and that Dr. Pagoto was on the advisory board of Mobile Wellbeing, Inc. during the preparation of the initial version of this manuscript and is currently on the advisory board of Empower Fitness and has a contract with Sears FitStudio, which would be perceived as a conflict of interest. The authors have no other competing interests to disclose.

Objective—Some adults with comorbid depression and obesity respond well to lifestyle interventions while others have poor outcomes. The objective of this study was to evaluate whether early-treatment weight loss progress predicts clinically significant 6-month weight loss among women with obesity and depression.

Methods—We conducted a secondary analysis of data from 75 women with obesity and depression who received a standard lifestyle intervention. Relative risks (RRs) and 95% confidence intervals (CIs) for achieving ≥5% weight loss by 6 months were calculated based on whether they achieved ≥1 pound/week weight loss in weeks 2–8. Among those on target at week 3, we examined potential subsequent time points at which weight loss progress might identify additional individuals at risk for treatment failure.

Results—At week 2, women who averaged ≥1 pound/week loss were twice as likely to achieve 5% weight loss by 6 months than those who did not (RR=2.40; 95% CI: 2.32–4.29); weight loss at weeks 3–8 was similarly predictive (RRs=2.02–3.20). Examining weight loss progress at week 3 and subsequently a time point during weeks 4–8, 52–67% of participants were not on target with their weight loss, and those on target were 2–3 times as likely to achieve 5% weight loss by 6 months (RRs=1.82–2.92).

Conclusion—Weight loss progress as early as week 2 of treatment predicts weight loss outcomes for women with comorbid obesity and depression, which supports the feasibility of developing stepped care interventions that adjust treatment intensity based on early progress in this population.

Keywords

behavioral weight loss; depression; obesity; stepped care

Introduction

In clinical settings, up to 34% of adults who seek weight loss treatment present with clinical depression, and these individuals lose less weight in intensive lifestyle interventions relative to those without depression.[1] Depression presents a challenge in the context of obesity treatment because depression is often accompanied by low motivation, poor adherence, poor attendance, negative thinking, fatigue, increased appetite, and sleep problems which may interfere with adoption and maintenance of healthy lifestyle changes.[2] Innovative treatment approaches for obesity are needed to improve outcomes in this hard-to-treat population.

Two trials tested weight loss interventions in women with comorbid obesity and depression.[3,4] One tested an integrated combination of lifestyle intervention and cognitive behavioral therapy.[4] The other, conducted by our group, tested a sequential approach to treatment in which behavior therapy for depression was administered prior to a lifestyle intervention and compared to a lifestyle intervention alone.[3] Neither found differences in weight loss by treatment condition and mean weight losses in both studies were lower than what is observed in samples not complicated by depression.[5] However, in our trial, a significant portion of women receiving a lifestyle intervention lost 5% or greater by 6 months, suggesting that some women with obesity and depression appear to respond well to a lifestyle intervention, but others may require additional or alternate treatment.

Early identification of those at high risk for treatment failure is needed so that additional treatment strategies can be offered to those who need it and not given unnecessarily to those that do not. In such stepped care approaches, individuals for whom a standard treatment is insufficient are transitioned, or "stepped", into more intensive treatment, while those achieving treatment goals continue to receive the standard treatment.[6] Stepped care approaches can be resource- and cost-efficient as only those patients who require additional care are provided it. Compared to standard treatments, stepped care approaches for weight loss in general populations have produced superior outcomes,[7] or similar weight loss but at lower cost.[8] However, stepped care approaches have not been explored for adults with obesity and depression. Because individuals with depression are at higher risk of poor outcomes, identifying time points at which treatment failure can be predicted can inform future treatment approaches. Because adults with depression are more likely to drop out of behavioral weight loss treatment,[1] stepped care approaches may also help keep patients engaged in treatment. The aim of this study was to determine time points early in behavioral weight loss treatment at which weight loss progress predicts clinically significant weight loss at 6 months for women with obesity and depression. To achieve this goal, we first examined the association between weight loss progress at weeks 2–8 of treatment and 6-month weight loss. Because some women with early weight loss success may subsequently encounter challenges that stymie their progress, we then examined subsequent time points to capture additional individuals at risk for treatment failure.

Method

Sample

We conducted a secondary analysis of data from a behavioral weight loss trial of women with obesity and major depression.[3] The design and methods of this trial have been published elsewhere.[9] Briefly, from July 2007 through March 2010 women with class I or II obesity (BMI 30–40 kg/m^2) and major depressive disorder aged 21–65 years were recruited from the community and primary care clinics at the University of Massachusetts Memorial Health Care. Exclusion criteria included current smoking, pregnant or trying to become pregnant, bipolar disorder, psychotic disorder, bulimia nervosa, post-traumatic stress disorder, type 1 or 2 diabetes, or medications that affect weight (the most common of which were tricyclic antidepressants and mood stabilizers). The University of Massachusetts Medical School Institutional Review Board approved this study.

Participants were randomized to one of two treatment conditions: behavior therapy with lifestyle intervention or lifestyle intervention only. Only participants randomized to the lifestyle intervention only condition were included in this analysis, as this is the standard behavioral weight loss approach. A dietitian and clinical exercise physiologist delivered the Diabetes Prevention Program (DPP) Lifestyle Intervention protocol via 16 weekly group sessions over 6 months.[10] Participants received calorie goals estimated to produce a weight loss of 1–2 pounds per week and asked to work toward the goal of 30 minutes of moderate physical activity on 5 days/week. Participants in this condition also received an attention control component, which consisted of ten 60-minute individual health education sessions with health educators interspersed between lifestyle intervention group sessions. Participants

could select from 23 different women's health topics including menopause, skin health, and breast self-exams. Participants in the lifestyle intervention only condition did not receive any depression treatment as part of the trial.

Measures

The primary outcome for this analysis was clinically significantly weight loss from treatment initiation to 6 months defined as 5% or greater weight loss;[11,12] participants were categorized as having achieved this degree of weight loss or not. Weight was measured without shoes using a digital Tronix scale at study entry and at the 6-month assessment by research staff and at weekly treatment sessions by intervention group leaders. For eight women who did not attend their first treatment session and did not have measured weight available during the first week of treatment, we used weight measured at the study entry (M[SD]: 29.4 [31.3] days before their scheduled first treatment session) to calculate 6-month weight loss.

We examined weight loss progress at weeks 2–8 of treatment. By the eighth week, half of the treatment protocol had been delivered, and given our goal of identifying treatment non-responders as early as possible, we did not consider time points after 8 weeks. Because participants were given calorie goals to produce a weight loss of 1–2 pounds per week,[9] weight loss averaging one pound per week or greater was considered to be "on target". Cumulative weekly rate of weight loss was calculated, and early-treatment weight loss progress was categorized at each week (on target versus not on target). To deal with intermittent non-attendance at treatment sessions, if weight measured at the current session was unavailable, the rate of weight loss at the previous week's session was used to determine weight loss progress. If neither weight at the current nor previous week were available, we assumed that the participant was not on target with her weight loss. This approach mimics procedures that would be feasible in clinical settings.

Depression severity was assessed using the BDI-II,[13] a 21-item self-report questionnaire of depressive symptoms which participants completed at the baseline and 6-month study assessments. Depression remission was defined as return to the normal range (BDI-II≤12)[14] at the 6-month study assessment. We calculated body mass index (BMI) from height and weight measured at treatment initiation and categorized participants as overweight/class I obesity versus class II/III obesity.[15] Demographics, history of smoking, and use of antidepressant medications were self-reported at study entry. Attendance at each treatment session was recorded. Participants were classified as a "drop-out" at the first treatment session if they missed without attending any later treatment session through session 16.

Statistical analysis

We calculated the sensitivity and specificity of weight loss progress at each week as an indicator of that time point's ability to identify participants who would achieve versus fail to achieve 5% or greater weight loss at 6 months. Sensitivity was calculated as the proportion of women failing to achieve 5% or greater weight loss at 6 months who were not on target with their weight loss at a given time point early in treatment. Specificity was calculated as

the proportion of women achieving 5% or greater weight loss at 6 months who were on target with their weight loss at a given week early in treatment.

We calculated relative risks (RRs) and 95% confidence intervals (CIs) for 5% or greater weight loss at 6 months using the approach developed by Spiegelman et al.[16] with the RELRISK9 SAS macro available at http://www.hsph.harvard.edu/donna-spiegelman/software/relrisk8/. We first examined the association between baseline characteristics and 6-month weight loss. Then, we calculated RRs to estimate the association between early-treatment weight loss progress at weeks 2–8 and 6-month weight loss in the full sample (N=75). We examined potential confounding of these associations by participant characteristics using a 10% change-in-estimate approach to model building. Variables whose inclusion changed the estimated RR by at least 10% were retained in the model. Due to small cell sizes, we were unable to assess potential confounding by race/ethnicity. Covariates included in adjusted models are listed in Table footnotes. Baseline depression severity (either continuous BDI score or moderate depression indicated by BDI score of 19 or greater) only materially confounded the association between early-treatment weight loss and clinically-significant weight loss at only one pair of time points (see Table footnotes).

We selected an initial time point to evaluate weight loss progress and examined potential subsequent time points at which to capture additional individuals at risk for treatment failure, among the subsample of women whose initial weight loss progress was on target at this initial time point. We calculated crude and adjusted RRs and 95% CIs for 6-month weight loss using the analytic approach described above. Finally, based on results of the above-described analyses, we calculated crude and adjusted RRs for clinically significant weight loss at 6 months in relation to weight loss progress at pairs of time points using the model building approach described above. We selected week 3 as this initial time point at which to evaluate weight loss progress. Even though weight loss progress at week 2 was associated with treatment success in this analysis, in practice, patients may feel alienated or frustrated if they are identified as needing additional treatment after only one week in the treatment program. We additionally conducted a sensitivity analysis in which week 2 served as the first time point at which to evaluate weight loss progress; we examined subsequent time points of weeks 3–8 using the analytic approach above.

To explore whether non-attendance was driving the prediction of treatment failure, we conducted sensitivity analyses limited to participants with available (a) weight measured at the current week, and (b) weight measured at the current or previous week. Analyses were conducted in SAS (Version 9.2, SAS Institute, Inc., Cary, NC).

Results

Of the 83 women randomized to the lifestyle intervention condition, we excluded four women who did not attend any treatment sessions and four women who were missing 6-month weights, resulting in an analytic sample of 75 women. Women were on average aged 46.6 (SD: 11.0) years (Table 1). The majority (87%) were Non-Hispanic white. Sixty-three percent were married or living with their partner, and 54% had at least a college education (Table 1). Women started treatment with an average BMI of 35.1 kg/m^2 (SD: 3.4 kg/m^2). At

6 months, women lost an average of 9.5 lbs (SD: 11.2 lbs), corresponding to 4.7% weight loss (SD: 5.6%). Forty-three percent (n=32) achieved 5% weight loss by 6 months. Older women (RR=1.03 for each year older) and women with a race/ethnicity other than non-Hispanic white (RR=1.82) were more likely to achieve 5% weight loss by 6 months. No other characteristics were associated with clinically significant weight loss at 6 months (Table 1).

At weeks 2–8, 43–63% of women had failed to lose an average of one pound/week (Table 2). Attendance declined from 87% at week 2 to 69% at week 8, and drop-out increased with time, exceeding 10% at week 8. At week 2, 44% of women were not on target with their weight loss. Sensitivity, i.e., proportion of women failing to achieve 5% or greater weight loss at 6 months who were not on target with their weight loss at a given week early in treatment, increased from 53% at week 3 to 84% at week 8. Conversely, specificity decreased from 72% to 66% across weeks 2–8. Women whose weight loss was on target at week 2 were 2.40 times as likely to achieve 5% weight loss by 6 months compared to women whose weight loss was not on target at week 3 (55% versus 27%; RR = 2.40; 95% CI: 2.32–4.35; Table 2). At weeks 3 through 8, women whose early-treatment weight loss was on target were 2.02–3.20 times as likely to achieve clinically significant weight loss by 6 months compared to women whose early-treatment weight loss was not on target (Table 2).

We next examined subsequent time points at which to re-evaluate progress among those whose weight loss was on target at week 3. Among the 43 women whose weight loss was on target at week 3, 16–42% of women were no longer on target with their weight loss at weeks 4–8 (Table 3). Attendance was high at weeks 4–8 and only one woman dropped out of treatment by week 8 (Table 3). At week 6, 7, and 8, there were statistically significant differences in achievement of 5% or greater weight loss at 6 months between participants whose early-treatment weight loss was target and those not on target (Table 3).

Fifty-two to 67% of the sample was not on target with their weight loss at either week 3 or the subsequent time point from week 4 to week 8 (Table 4). Pairs of time points at which to evaluate weight loss progress ranged from 65–86% sensitive and 59–66% specific. Evaluating weight loss progress at week 3 and again at week 8 was 86% sensitive and 59% specific (Table 4). Women whose weight loss was on target at both weeks 3 and 8 were 2.92 times as likely to achieve 5% or greater weight loss by 6 months compared to women who were not on target at either week 3 or week 8 (76% versus 25%, RR=2.92, 95% CI: 1.74–4.90; Table 4).

At weeks 3–8, respectively, 3, 8, 15, 16, 15, and 13% had missed two consecutive treatment sessions and were assumed to not be on target with their weight loss goals. We explored whether non-attendance was driving the prediction of treatment failure. In sensitivity analyses limited to participants with available (a) weight measured at the current week, and (b) weight measured at the current or previous week, early-treatment weight loss was associated with 6-month weight loss in the same pattern as the main results (data not shown). Results from a sensitivity analysis in which weight loss progress was examined at

week 2 and subsequently at weeks 3–8 were nearly identical to our main analysis (data not shown).

Discussion

We sought to determine time points early in behavioral weight loss treatment at which progress would predict clinically significant 6-month weight loss in women with obesity and depression in order to inform stepped care approaches for this hard-to-treat population. Using data from our trial of behavioral weight loss for women with obesity and depression, we found that as early as the second week of treatment, weight loss progress predicted end-of-treatment weight loss. Women whose weight loss was on target at week 2 were more than twice as likely to achieve 5% weight loss by 6 months as women whose weight loss was not on track at this point in treatment. Stepping patients into additional care early in treatment has the potential to thwart treatment failure and the discouragement that often accompanies it. Re-evaluating weight loss progress at a second time point would allow identification of patients who experienced initial weight loss success but whose progress slowed. Based on our data, stepping points at weeks 3 and 8 were best able to identify individuals likely to fail to achieve 5% or greater weight loss at 6 months (i.e., had highest sensitivity); evaluating weight loss at these time points would identify 67% of the sample as needing additional care. Currently no standards of care for weight loss treatment have been established for people with depression even though the literature shows that they have higher failure rates.[1] A stepped care approach would allow treatment efforts to be focused on the subsample not likely to achieve clinically significant weight loss with a standard lifestyle intervention alone, an approach which is more cost-effective than designing an intensive treatment for this population simply based on their meeting criteria for depression at baseline.

Rapid response associated with later treatment success has also been observed in the context of treatment for binge eating disorder.[17] Previous studies of adults who did not have depression also found that faster rates of initial weight loss are predictive of long-term weight loss,[18,19] and altering treatment strategy based on early-treatment weight loss has been suggested.[20] We found that while age and non-white race/ethnicity were associated with a higher likelihood of achieving 5% or greater weight loss by 6 months, early-treatment weight loss progress was a stronger predictor of weight loss than any baseline characteristic, similar to previous research.[19] While other pre-treatment factors, such as sleep or disordered eating behavior, may be useful in predicting treatment outcome, in many clinical settings little time and resources are available to assess these constructs. Early treatment weight loss progress is a feasible prognosticator of treatment outcome given that these data are already available due to weekly weigh-ins typically performed by clinical weight loss programs.

Time points to evaluate weight loss progress should occur before attendance wanes or patients drop out, common consequences of poor progress.[21] Conversely, stepping patients into additional care too soon may leave patients feeling alienated or frustrated if they are identified as needing additional treatment after only one week in the treatment program. Thus, although weight loss progress as soon as week 2 significantly predicted treatment failure, we selected week 3 as an initial time point to evaluate weight loss progress. Thus, we recommend a first stepping point at week 3 of treatment. Previous stepped care

approaches to obesity treatment among samples not complicated by depression also assessed progress at week 3 of treatment.[7,22] We conducted a sensitivity analysis in which weight loss progress was examined at week 2 and subsequently at weeks 3–8 were nearly identical to our main analysis with week 3 as the first stepping point (data not shown). Identifying likely treatment failures early in treatment allows us to enhance care before participants get discouraged and drop out of treatment, and in this study, demonstrated the highest predicted success rate among whose weight loss was on target (i.e., would not be stepped). Waiting longer before supplementing treatment may prevent patients from achieving weight loss goals because they lack sufficient time to "catch-up" with their weight loss.[23] For example, while using a stepping point at week 8 alone or alternatively, using stepping points at both week 3 and week 8, would be able to detect individuals unlikely to achieve clinically significant weight loss at 6 months (84% and 85% sensitivity, respectively), waiting until week 8 to evaluate weight loss allows a greater proportion of participants to drop out of treatment, and may hamper the ability of retained participants to achieve their weight loss goals. Because some patients who initially achieve their weight loss targets may falter as treatment continues, a second stepping point would allow identification of additional individuals likely to benefit from additional treatment.

While week 3 and week 8 represent the most sensitive time points to evaluate weight loss progress, researchers may want to incorporate additional considerations into the design of a stepped care approach for adults with comorbid obesity and depression. These considerations include cost of or resources available to provide the additional or alternative treatment, whether the additional or alternative treatment complements or supplants the lifestyle intervention, and characteristics of the particular patient population. Research is needed to identify the type of treatment likely to be beneficial for adults with comorbid obesity and depression. Previous randomized trials that tested stepped care approaches for patients with obesity not complicated by depression started with a full-intensity lifestyle intervention and then stepped poor responders into motivational interviewing[7] or problem solving therapy[22]. Both were superior to standard lifestyle intervention alone. These approaches might be helpful in depressed adults with obesity as well. Other stepped care approaches simply increased the intensity of weight loss counseling[8] as opposed to adding a different treatment approach. In the parent trial, we found that women who experienced a reliable improvement in depression lost significantly more weight than women whose depression did not improve[24] which suggests that addressing depression in a stepped care manner may be a promising strategy for adults with comorbid depression. People with comorbid obesity and depression often experience chronic pain, poor sleep quality, and/or comorbid medical conditions which may impact weight loss treatment response and therefore may also be useful treatment targets in a stepped care approach.[2] Research identifying specific barriers to weight loss experienced by adults with obesity and depression may inform stepped care approaches for weight loss in this patient population.

The study has strengths and limitations. Participants who had not attended either the current nor previous week's treatment session were considered to be not on target with their weight loss goals across weeks 3 through 8 (n=2–12; 3–16%). However, in only 2 of the total 42 instances in which women missed two consecutive weeks during weeks 3–7 was she on target with her weight loss the following week. Additionally, sensitivity analyses indicated

that those who did not achieve clinically significant weight loss by 6 months had poor outcomes despite receiving treatment, and do not merely represent untreated patients. The study had a modest sample size which limits precision of statistical analyses, especially analyses identifying the second stepping point since those only included women whose weight loss was on target at week 3 (n=43). Finally, findings cannot be generalized to men or ethnic minorities given that the sample was exclusively women and largely Caucasian. Future studies should include these population subgroups.

In a sample of women with comorbid obesity and depression, we can identify by week 2 of behavioral weight loss treatment which patients are at elevated risk of treatment failure at 6 months. With stepping points at weeks 3 and 8, two out of three patients would be stepped into additional care; only 26% of these patients were able to achieve 5% weight loss with a lifestyle intervention alone, compared to 76% of those whose weight loss was on target at both weeks 3 and 8. A stepped care approach may be an effective approach to treating obesity in this hard-to-treat population. Further research is needed to identify beneficial adjunctive treatment for women with comorbid obesity and depression who fail to achieve clinically meaningful weight loss with a lifestyle intervention.

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Highlights

- Weight loss as early as during first week of treatment predicts 5% loss at 6 months
- Assessing early progress can identify those unlikely to lose significant weight
- Results support stepped care approaches for women with obesity and depression

Table 1

Characteristics of the sample and 6-month weight loss in relation to sample characteristics among women with comorbid obesity and major depression (N=75)

		5% or greater weight loss at 6 months, by baseline characteristics	
	Total sample, N (%) or M±SD	**N (%)**	**RR (95% CI)**
Age (years)	46.6±11.0		1.03 (1.00–1.05)
Race/ethnicity			
Not white	10 (13)	7 (70)	1.82 (1.09–3.03)
White	65 (87)	25 (39)	(Referent)
Marital status			
Married or living with partner	47 (63)	19 (40)	(Referent)
Single	13 (17)	8 (62)	1.52 (0.88–2.64)
Widowed, divorced, or separated	15 (20)	5 (33)	0.82 (0.37–1.83)
Education			
HS/some college/Associate's	35 (47)	13 (37)	(Referent)
Bachelor's	17 (23)	5 (29)	0.79 (0.34–1.86)
Some/graduate degree	23 (31)	14 (61)	1.64 (0.95–2.82)
Annual household income*[a]			
<$50,000	30 (41)	10 (33)	(Referent)
$50,000<$75,000	18 (24)	11 (61)	1.83 (0.98–3.43)
$75,000+	26 (35)	10 (38)	1.15 (0.57–2.33)
Employment status			
Does not work full time	27 (36)	13 (48)	1.22 (0.72–2.06)
Works full time	48 (64)	19 (40)	(Referent)
Smoking status[a]			
Never smoker	36 (52)	17 (47)	(Referent)
Former smoker	33 (48)	11 (33)	0.71 (0.39–1.28)
BMI at treatment initiation	35.1±3.4		0.95 (0.88–1.03)
BMI at treatment initiation			
Overweight or class I obesity	35 (47)	18 (51)	(Referent)
Class II or III obesity	40 (53)	14 (35)	0.68 (0.40–1.16)
Depression severity (BDI-II) at study baseline	20.6±5.8		1.02 (0.98–1.07)
Depression severity at study baseline			
Mild (<19 BDI-II)	32 (43)	12 (38)	(Referent)
Moderate (19+ BDI-II)	43 (57)	20 (47)	1.24 (0.72–2.15)

	Total sample, N (%) or M±SD	5% or greater weight loss at 6 months, by baseline characteristics	
		N (%)	RR (95% CI)
Antidepressant use at study baseline			
No	52 (69)	22 (42)	0.97 (0.55–1.71)
Yes	23 (31)	10 (43)	(Referent)

[a] Missing information for household income (n=1) and smoking status (n=6).

Table 2

Potential time points early in behavioral weight loss treatment to evaluate weight loss progress among women with obesity and depression (N=75)

				Clinically significant weight loss at 6 months, by early-treatment weight loss					
Week of treatment	**Weight loss not on target, N (%)**	**Weekly attendance, N (%)**	**Drop-out, N (%)**	**Se, %**	**Sp, %**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was on target N (%)**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was not on target N (%)**	**Crude RR (95% CI)**	**Adjusted RR (95% CI)**
Week 2	33 (44)	65 (87)	2 (3)	56	72	23 (55)	9 (27)	2.01 (1.08–3.74)	2.40 (2.32–4.35)[a]
Week 3	32 (43)	64 (85)	5 (7)	53	72	23 (54)	9 (28)	1.90 (1.02–3.54)	2.32 (1.25–4.29)[b]
Week 4	35 (47)	58 (77)	7 (9)	60	72	23 (58)	9 (26)	2.24 (1.20–4.17)	2.02 (1.05–3.92)[c]
Week 5	40 (53)	54 (72)	7 (9)	70	69	22 (63)	10 (25)	2.51 (1.39–4.55)	2.51 (1.39–4.55)
Week 6	44 (59)	54 (69)	7 (9)	77	66	21 (68)	11 (25)	2.71 (1.54–4.77)	2.71 (1.54–4.77)
Week 7	45 (60)	48 (64)	7 (9)	77	63	20 (67)	12 (27)	2.50 (1.45–4.32)	2.85 (1.60–5.09)[d]
Week 8	47 (63)	52 (69)	8 (11)	84	66	21 (75)	11 (23)	3.20 (1.83–5.61)	3.20 (1.83–5.61)

Se: sensitvity, i.e., proportion of women failing to achieve 5% or greater weight loss at 6 months who were not on target with their weight loss at a given week early in treatment; Sp: specificity, i.e., proportion of women achieving 5% or greater weight loss at 6 months who were on target with their weight loss at a given week early in treatment.

[a] Adjusted for BMI category (class II or III obesity versus overweight or class I obeisty) at treatment initiation;

[b] Adjusted for BMI (continuous) at treatment initiation;

[c] Adjusted for education (categories);

[d] Adjusted for smoking (never versus former smoking)

Table 3

Weight loss progress, attendance, and drop-out at weeks 4–8 of behavioral weight loss treatment among women with obesity and depression whose weight loss was on target at week 3 of treatment (N=43)

				Clinically significant weight loss at 6 months, by early-treatment weight loss					
Week of treatment	**Weight loss not on target, N (%)**	**Weekly attendance, N (%)**	**Drop-out, N (%)**	**Se, %**	**Sp, %**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was on target N (%)**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was not on target N (%)**	**Crude RR (95% CI)**	**Adjusted RR (95% CI)**
Week 4	7 (16)	38 (88)	--	25	91	21 (58)	2 (29)	2.04 (0.61–6.80)	4.23 (0.65–27.45)[a]
Week 5	9 (21)	36 (84)	--	35	91	21 (62)	2 (22)	2.78 (0.80–9.71)	4.71 (0.72–30.92)[b]
Week 6	15 (35)	33 (77)	--	55	83	19 (68)	4 (27)	2.54 (1.06–6.12)	2.88 (1.02–8.12) [a]
Week 7	15 (35)	31 (72)	--	55	83	19 (68)	4 (27)	2.52 (1.06–6.12)	3.34 (1.21–9.20) [a]
Week 8	18 (42)	33 (77)	1 (2)	70	83	19 (76)	4 (22)	3.42 (1.40–8.34)	4.03 (1.41–11.52) [a]

Se: sensitvity, i.e., proportion of women failing to achieve 5% or greater weight loss at 6 months who were not on target with their weight loss at a given week early in treatment; Sp: specificity, i.e., proportion of women achieving 5% or greater weight loss at 6 months who were on target with their weight loss at a given week early in treatment.

[a] Adjusted for smoking (never versus former smoking);

[b] Adjusted for smoking (never versus former smoking) and depressive symptoms (BDI; continuous) at study baseline.

Table 4

6-month weight loss in relation to weight loss progress evaluated at week 3 and a subsequent week of behavioral weight loss treatment among women with obesity and depression (N=75)

				Clinically significant weight loss at 6 months, by early-treatment weight loss			
Weeks of treatment	**Weight loss not on target at either week 3 or later week, N (%)**	**Se, %**	**Sp, %**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was on target at week 3 and subsequent week, N (%)**	**5% or greater weight loss at 6 months among those whose early-treatment weight loss was not on target at either week 3 and/or subsequent week, N (%)**	**Crude RR (95% CI)**	**Adjusted RR (95% CI)**
Weeks 3 & 4	39 (52)	65	66	21 (58)	11 (28)	2.07 (1.17–3.66)	1.82 (0.99–3.36)[a]
Weeks 3 & 5	41 (55)	70	66	21 (62)	11 (27)	2.30 (1.30–4.07)	2.30 (1.30–4.07)
Weeks 3 & 6	47 (63)	79	59	19 (68)	13 (28)	2.45 (1.45–4.16)	2.45 (1.45–4.16)
Weeks 3 & 7	47 (63)	79	59	19 (68)	13 (28)	2.45 (1.45–4.16)	2.85 (1.60–5.09)[b]
Weeks 3 & 8	50 (67)	86	59	19 (76)	13 (26)	2.92 (1.74–4.90)	2.92 (1.74–4.90)

Se: sensitvity, i.e., proportion of women failing to achieve 5% or greater weight loss at 6 months who were not on target with their weight loss at a given week early in treatment; Sp: specificity, i.e., proportion of women achieving 5% or greater weight loss at 6 months who were on target with their weight loss at a given week early in treatment.

[a] Adjusted for education (graduate, bachelor's, or HS/some college versus less than HS);

[b] Adjusted for smoking (never versus former smoking).