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Abstract

Objective—Studies of behavioral weight loss intervention in psychotic patients are sparse and its efficacy compared to other obese patients is unknown. Therefore, we compared the effect of a cognitive-behavioral weight loss intervention in obese subjects with psychotic disorders, other psychiatric diagnoses and without psychiatric disorders.

Methods—12-month, naturalistic study of weekly group or individual cognitive-behavioral weight management in 222 consecutively enrolled obese patients (body mass index (BMI): 43.7±9.6) with psychotic-spectrum disorders (PSD, n=47), other psychiatric disorders (OPD, n=49) and no psychiatric disorder (NPD, n=126).

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Results—PSD patients had greater treatment persistence (48.9%) and longer treatment duration (8.7±4.4 months) than OPD (22.4%, 5.4±4.3 months) and NPD (22.2%, 4.9±4.7 months) patients (p's<.01, number-needed-to-treat (NNT)=3). In last-observation-carried-forward analyses, PSD patients had greater percent baseline weight loss at 12 months (5.1±9.3%) than OPD and NPD patients (2.7±5.5% and 2.4±6.3%); greater percent BMI loss at 9 and 12 months than both groups (p's<.05), and greater BMI loss at 9 months (2.1±3.5) and 12 months (2.3±4.1) than NPD patients (1.1±2.3 and 1.2±2.4). Furthermore, weight loss 5%, occurred in 42.6% of PSD patients vs. 18.4% and 23.0% in OPD and NPD patients (p's<.01, NNT=5 and 6). The strongest weight loss predictor was treatment duration (β=.51–.54, p<.001). Attrition was predicted by NPD (p=.001) and OPD group status (p=.036), lower proportion of group sessions (p=.002), higher depression (p=.028), and lower baseline BMI (p=0.030).

Conclusions—Psychosis-spectrum disorder patients had greater weight loss than other obese patients. Non-adherence and depression should be targeted to enhance weight loss success.

Introduction

Obesity is a risk factor for many serious health problems, including diabetes mellitus, coronary heart disease (CHD), hypertension, stroke, and cancer[1, 2]. Patients with psychotic disorders are susceptible to developing obesity due to illness-related factors, unhealthy life style and medication side effects[3]. Treatment with mood stabilizers and second-generation antipsychotics (SGA), can lead to weight gain, obesity, and/or metabolic syndrome[4–6]. Pharmacological treatment for obesity in schizophrenia patients are only modestly effective[7,8] and potential side effects and drug-drug interactions limit its utilization, although metformin and topiramate usually do not interfere with antipsychotic drug levels. In contrast, non-pharmacological treatments, such as cognitive-behavioral therapy, life style modification, exercise training and nutritional counseling, are considered safe. Most non-pharmacological weight loss studies in psychiatric patients to date had relatively short follow-up periods[7, 9, 10] and have generally included only patients with schizophrenia or schizoaffective disorders. The efficacy of these treatment programs in patients with other psychiatric diagnoses has not been studied. Moreover, the relative success of behavioral weight management programs in severely mentally ill patients compared to obese without psychiatric disorders is not known.

Studies conducted in the general population have demonstrated that more comprehensive weight loss interventions are more successful[11]. For both the behavior therapy and cognitive-behavior therapy, the effect appears to be larger when diet and/or exercise treatments were added. A meta-analysis of 24 behavioral weight loss intervention trials in obese, US multi-ethnic and minority adults (n=13,326) found that single and dual component interventions had a small effect size, whereas three-component interventions achieved a moderate effect size[12]. The extent to which these findings apply to treatment of obesity in the mentally ill is not clear. One of the few studies in this area found higher attrition from a behavioral weight management program among obese subjects with comorbid mental disorders at 6 months[13]. Conversely, results regarding baseline depression as a moderating variable of weight loss success at 6 and 12 months have been inconclusive[14, 15].

In the present study, we aimed to examine whether a cognitive-behavioral weight management program is effective in obese patients with psychotic disorders in a 12-month naturalistic prospective trial. We further aimed to test whether patients with psychotic

disorders were able to lose as much weight as obese patients without major psychotic disorders or those without any psychiatric illness.

Methods

Setting and Subjects

This was a 12-month, naturalistic, prospective cohort study conducted in an integrated clinical weight management program. Patients were recruited consecutively at the Center for Weight Management of the North Shore-Long Island Jewish Health System, New Hyde Park, NY, between 2003 and 2005, for long-term group or individual cognitive-behavior therapy as well as nutrition and exercise physiology services. Patients were either self-referred or referred by other healthcare professionals. Patients' insurance, either Medicaid or Medicare, paid for the weight management program. All patients who enrolled in the weight management program agreed to participate in the study. Weight and BMI data were collected prospectively as part of general clinical treatment. The study was approved by the North Shore-Long Island Jewish Medical Center Institutional Review Board, Manhasset, NY.

The subjects were divided into three groups: patients with psychotic spectrum disorders; patients with other psychiatric disorders; and patients without a classifiable psychiatric disorder. Eating Disorder, Not Otherwise Specified, was not used in this categorization and is reported separately per group. The grouping was based on subjects' DSM-IV diagnoses from chart review. Schizophrenia, affective disorders with psychotic features, and psychosis NOS were classified as psychotic spectrum disorders.

Assessments

Prior to the initial session, patients were mailed a comprehensive questionnaire that covered information about demographic variables, psychiatric illness, psychological functioning, sleep apnea, binge eating behaviors, weight loss history, exercise and nutrition behavior, and quality of life, the Depression Inventory (BDI)[16], SCL-90[17], the Satisfaction with Life Scale (SLS)[18], and the Borderline Syndrome Index (BSI)[19]. The psychiatric diagnoses and treatments were established by clinical interview and review of medical records at intake.

Interventions

The treatment consisted of cognitive behavior therapy from the Northwestern University Medical School's People at Risk Weight Control Program[20]. Weekly treatment was delivered by a team consisting of psychotherapists, a nutritionist, and an exercise physiologist in individual sessions, lasting 45–50 minutes, and group sessions, lasting 60–75 minutes. The assignment of group or individual treatment was based on clinical judgment and consideration of patient preference. The treatment provided enhanced self monitoring of food intake and exercise habits, behavioral contracting, cognitive restructuring, and stimulus control. The same treatment was delivered to all three diagnostic groups. Group sessions were composed of patients with and without psychotic spectrum disorders separately. There were no differences in how patient groups paid for treatment services.

Outcome Measures

The primary outcome measures were the absolute and relative change in weight and body mass index (BMI). Measurement of height and weight were taken during the intake visit, and weight was measured during weekly follow-up sessions. BMI was calculated as weight in kilogram divided by squared height in meter (kg/m^2). Secondary outcome measures included percentage of patients with 5% weight loss at the end of treatment and treatment persistence, defined as staying in treatment, as opposed to dropping out.

Statistical Analyses

The three groups were compared across demographic and clinical variables using chi-square test and t-test for categorical and continuous variables, respectively. The outcome variables were examined at 3, 6, 9 and 12 months of treatment after baseline. For within-group effects of the change from baseline to endpoint, we calculated the effect size as Cohen's d[21], as well as their 95% confidence intervals. Analysis of variance was used to test the differences in outcome variables among the three groups. Multivariate regression analysis was conducted to identify baseline variables that were moderators[22] of change in BMI that utilized all factors from prior univariate analyses with a significance level of p<0.10 plus age, race, and sex. The p value of <0.10 was only used to select baseline variables that were moderators of change in BMI as a pre-requisite for the multivariate analyses. All final results were significant only if p<0.05. To deal with attrition, both the last observation carried forward (LOCF) and mixed modeling of repeated measures methods were used. Since results were similar, we only present LOCF results. We analyzed "all-completers" (i.e., patients with data at each of the four 3-montly time intervals), and compared their data with the LOCF results. Retention in the program was assessed using Kaplan-Meier survival analysis and Cox regression. Statistical analyses were conducted using the SPSS version 17.0 (SPSS Inc, Chicago, IL).

Results

The 222 subjects in this study were 49.2±14.1 years old with BMI of 43.7±9.6. Forty-seven (21.2%) had psychotic disorders, 49 (22.1%) had other psychiatric disorders, and 126 (56.8%) had no psychiatric disorders. Patients with psychotic disorders had lower educational levels, were less likely to be employed and had a lower general assessment of function score than the other two groups.

Treatment Persistence

At the 12-month follow-up, 62 patients (27.9%) remained in treatment. Patients with psychotic disorders had significantly greater persistence (48.9%) and a longer treatment duration (8.7±4.4 months) than patients with other psychiatric disorders (22.4%, 5.4±4.3 months) and subjects without mental illness (22.2%, 4.9±4.7 months) (p's<.01, number-needed-to-treat (NNT)=3). Figures 1 shows the Kaplan-Meyer survival curves for treatment persistence. Median treatment duration until drop-out was 11.5, 4.2, and 3.0 months for the three groups (Log Rank test=18.22, p<0.001).

Body Weight and Body Mass Index Changes

The entire sample lost 3.54±9.02 lbs from baseline (i.e., 1.34±3.39% loss of baseline weight) at the 3-month follow-up, 6.27±14.62 lbs (2.33±5.22%) at 6 months, 7.98±17.21 lbs (2.96±6.23%) at 9 months, and 8.47±18.75 lbs (3.15±6.70%) lbs at 12 months (p<.001) (Figures 2a–2b).

In observed cases, study groups did not differ regarding absolute or relative decrease in weight at any time point (Figures 2a). In the LOCF analyses there was no statistically significant difference in absolute weight loss among the three groups at 12-month follow-up, i.e., 13.17±24.21 lbs (ES=0.24, 95% CI:0.11–0.37) in the psychotic disorders group, as compared with 7.67±21.22 lbs (ES=0.16, 95% CI:0.04–0.29) in the non-psychotic psychiatric group and 7.02±14.92 lbs (ES=0.21, 95%CI:0.13–0.29) in the group without psychiatric disorders. However, the psychotic disorders group had significantly greater decreases in percent baseline weight at 12-month follow-up (5.1±9.3%) compared to the other two groups (2.7±5.5% and 2.4±6.3%, p=0.032 and p=0.048, respectively) (Figure 2b). The Group x Time interaction was significant in repeated measures ANOVA (p=0.002). The

results of BMI changes (Figures 3a–3b) were similar to those of body weight changes reported above (Figures 2a–2b).

The LOCF analysis showed that at the 12-month follow-up, 42.6% of patients from the psychotic disorders group lost 5% body weight compared to 18.4% in the group with non-psychotic psychiatric disorders and 23.0% in subjects without mental illness (p's<.01, NNT=5 and 6)). The odds ratio for the psychotic group to lose 5% body weight was 2.48 (95%CI: 1.22–5.05, p=0.014) compared to the non-psychotic patients and 3.29 (95%CI: 1.32–8.18, p=0.004) compared to the non-psychiatric patients.

Predictors of BMI Reduction

Baseline demographic and clinical characteristics as well as treatment duration were used to predict change in BMI in separate LOCF multiple regression analyses. The results were similar whether the outcome was absolute or relative BMI change from baseline. When treatment duration was not included in the model, patient group was the most significant predictor of absolute weight loss, with the psychotic group improving their BMI more than each of the other two groups (p=.007 and p=.003, respectively). In all groups, treatment duration was the most significant predictor of weight loss (β's=.51–.54, p<0.001). The only additional predictor of weight loss that was consistently significant in all outcome variables in multiple regression analyses was the past number of times patients had lost >20 lbs. Taking weight gain producing medications at baseline predicted lower absolute and relative BMI reductions, but the medication variable dropped out of the final models for weight change.

Predictors of Treatment Persistence

A Cox regression analysis was conducted with univariate baseline characteristics at a significance level of <0.10 and four variables remained significant in the final model of earlier dropout (chi-square=37.17, df=5, p<.001): non-psychotic group status (hazard ratio=2.29, p=0.001) or non-psychiatric group status (hazard ratio=1.81, p=0.036), higher baseline Beck Depression Inventory score (hazard ratio=1.02, p=.028), lower baseline BMI (hazard ratio=.98, p=0.030), and greater proportion of group sessions (hazard ratio=.99, p=0.002).

Discussion

We examined whether a 12-month, multi-component, mixed group and individual cognitive behavior weight management program was effective in a consecutively enrolled obese patient cohort with psychotic disorders and compared the efficacy to the outcomes in patients with other psychiatric diagnoses and subjects without mental illness. The results showed that patients with psychotic disorders had superior weight and BMI outcomes than the other two groups in LOCF analyses. The NNT for losing at least 5% of baseline body weight was 5–6. Patients with psychotic disorders had better treatment adherence, resulting in longer treatment exposure (approximately 9 months vs 5 months) than patients in the other two groups, and the NNT for remaining in treatment at 1 year was 3. The significance of treatment duration as a mediator of weight reduction was confirmed by the multiple regression analyses. Of interest is also the fact that in all treatment groups a higher severity of depressive state, assessed with the Beck Depression Inventory, predicted shorter treatment duration.

To our knowledge, this is the first study to compare weight loss outcomes of a non-pharmacological treatment program between patients with psychotic disorders and individuals with non-psychotic psychiatric conditions or no psychiatric illness at all.

Previous studies examined weight loss interventions for patients with schizophrenia or patients taking antipsychotic medications[5, 6, 9, 10, 23–27], or, separately, in the general obese population[11–15]. Although non-pharmacological interventions have been shown to help patients with schizophrenia and those treated with antipsychotics lose weight, subjects enrolled in these trials were likely to be quite motivated, as they were consenting to intense monitoring in a structured research program. Thus, it is relatively unknown how these intervention programs perform in psychiatrically ill patients treated in real-world, naturalistic settings.

Our study showed significant weight loss in a 12-month program delivered in a real-world, naturalistic setting, regardless of patient diagnosis and medication treatment. The magnitude of weight loss was comparable or larger than in previous studies. Menza et al[26] reported on a similar study, and their 12-month data showed that patients lost 6.6 lbs in average (3.0% of baseline body weight) with a 1.7 BMI unit decrease. In the Brar et al[24] study, patients in the behavioral treatment group lost 2.0 kg (about 4.4 lbs, 2.0% of baseline body weight) at the end of 14-week treatment. In contrast, patients in the present study lost about 5.23 lbs (1.98% of body weight) at 3- months and 20.01 lbs (7.92% of body weight) at 12-month treatment. Even with the conservative LOCF analysis, our sample still lost 8.47 lbs on average (3.15% of body weight) at 12-months. However, the effect sizes in our study were somewhat smaller than those reported for obese patients in the general population consenting to a structured weight loss program[11, 12] in that the effect sizes were between 0.16 and 0.24 for weight loss and 0.12 and 0.29 for BMI reduction, which was comparable only to the dual intervention program in obese patients, which had an average effect size of 0.22 in a previous meta-analysis[12]. By contrast, three-component interventions resulted in an average effect size of 0.52 in general population samples, but these were selected to consent to an intensive treatment program.

In observed cases, we found a BMI reduction of 3.58 at 12 months. Based on studies that reported a 1 point reduction in BMI to be associated with an 8% reduction in coronary heart disease (CHD) risk [28], patients in our sample achieved an estimated average 28% CHD risk reduction after 1 year of treatment.

A clinically important finding of the study is that patients with psychotic disorders, such as schizophrenia and bipolar disorder, were able to lose as much weight when receiving a multi-component weight loss intervention, if not more, as other obese patients, and did so by staying in treatment longer. Almost half of the psychotic disorder group patients stayed in treatment for 12 months, compared to less than 25% of the other patients, leading to the superior weight outcome for this patient group at LOCF endpoint, as treatment duration was the most significant predictor of weight loss, regardless of psychiatric diagnosis and psychotropic treatment. This is consistent with the all-completer analysis, showing that patients who stayed in treatment for 12 months in all three groups lost similar amount of weight. This finding underscores that treatment adherence is a key factor for the success of a weight management program, as has also been shown in the general obese population where higher treatment intensity was associated with better outcomes[11]. This finding is further consistent with a recent report that in a naturalistic treatment setting, the only correlate of weight loss in a sample of 113 severely mentally ill patients was the number of attended treatment sessions[29].

Another relevant result in our study is that the severity of depressive symptoms at baseline was associated with shorter treatment duration. Although this finding needs to be replicated, it may suggest that depression interferes with treatment adherence and that, in turn, treating depression might improve treatment engagement and persistence. Findings in the general obese population have been inconclusive so far, but have, to our knowledge, not focused on

the relationship of depression with treatment adherence, but rather with weight loss. While in a Portuguese study, pre-treatment depression was not a significant moderating variable[14], a large US study of 1172 female and 460 male obese patients found that baseline depression predicted less weight loss success in females, but not in males[15]. In addition, in our multivariate model, lower baseline BMI was also related to greater attrition, suggesting that those with less severe obesity may have had less motivation to remain in treatment. In the same context, in our second multiple regression analysis, the degree of BMI reduction was significantly associated with the number of past weight loss attempts resulting in >20 lbs weight reduction in addition to psychotic disorder group status and treatment duration. This result appears to be consistent with observations in the general obese population where unrealistic weight loss expectations were associated with greater dropout rates over a 12 month period, especially in the first 6 months. For example, in an Italian sample of 1785 help seeking, middle aged, obese subjects, each expected BMI unit decrease increased the drop out by 12%[30]. Thus, patients who already had the experience that they could lose a considerable amount of weight might be more realistic in their goal-setting and might also get less easily discouraged by a slow progress or times of little success. Finally, in contrast with previous findings in the general obese population,[16] individual sessions were not more effective than group sessions for BMI loss, as we found that a greater proportion of group treatment sessions was associated with longer treatment duration. We acknowledge, however, that a selection bias could explain in part our finding, in that patients who were perceived to be more difficult to treat and engage with might preferentially have been assigned to individual treatment.

Our findings need to be interpreted within the limitations of our naturalistic study, which allowed the comparison of a cognitive behavioral weight loss intervention in three different patient populations. A major limitation of the study is the lack of randomization, the lack of blindness, and the possibility that patients with psychotic spectrum disorders received more clinical attention, resulting in them staying in the program longer, which in turn played a role in their greater weight loss. However, it is actually not possible to randomize by group as they are distinct and the same treatment was delivered by the same personnel in the same setting. Moreover, blinding was not needed as the same treatment was delivered. While the outcome could have been blinded, the outcome was an objective measure, i.e., weight change. Nevertheless, we cannot exclude that PSD patients received more attention, which might have mediated the results. However, the objectives of this study were not to identify mediators and moderators of weight change; these analyses were all secondary and hypothesis generating. The primary outcome of our study is that PSD patients referred to a weight management program are at least as likely under regular clinical conditions to benefit from such a program as patients who neither have a psychotic-spectrum disorder not take medications known to increase (and maintain abnormally elevated) weight. Furthermore, the treatment retention rate was low, only 48.9% for the PSD group and about 22% for the other two groups at one year. Thus, data from the study need to be interpreted with caution. However, these retention rates were similar to those from other real-world observational studies. In addition, we did not have sufficient data to assess changes in antipsychotic and mood stabilizer medications during the study, but it is likely that clinicians referred patients after they attempted medication adjustments. Moreover, we did not have metabolic data to evaluate downstream effects of weight loss, and could not assess dietary restraint and behavioral disinhibition, which have been associated with weight loss results in the general obese population[30]. Finally, we did not have data on the persistence of weight loss after treatment discontinuation beyond the 1-year study period or on patients who dropped out the study. Such data should be collected in psychiatrically ill patients to identify high-risk patients in whom longer treatment and/or refresher interventions might be beneficial.

In summary, a multimodal cognitive behavior weight management program was useful in helping obese patients lose weight, regardless of psychiatric diagnosis and psychotropic treatment. Although we cannot exclude a potential selection bias of more adherent psychiatrically ill patients, these data should counter the behavioral weight management nihilism that many treating clinicians seem to have adopted. More research is needed to adapt weight management strategies to also reach less motivated patient groups. Our data further suggest that improving adherence, setting realistic expectations, and addressing depression could enhance weight management treatment success in the obese. Further studies focusing on these aspects are needed to facilitate the development and implementation of successful weight management programs that can be applied to a broad array of clinical settings.

Acknowledgments

References

1. Sacks FM. Metabolic syndrome: epidemiology and consequences. J Clin Psychiatry. 2004; 65 (Suppl 18):3–12. [PubMed: 15600380]

2. Flegal KM, Graubard BI, Williamson DF, et al. Cause-specific excess deaths associated with underweight, overweight, and obesity. JAMA. 2007; 298(17):2028–2037. [PubMed: 17986696]

3. De Hert M, Correll CU, Bobes J, et al. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry. 2011; 10(1):52–77. [PubMed: 21379357]

4. Correll CU, Lencz T, Malhotra AK. Antipsychotic drugs and obesity. Trends Mol Med. 2011; 17(2): 97–107. [PubMed: 21185230]

5. Newcomer JW. Second-generation (atypical) antipsychotics and metabolic effects: a comprehensive literature review. CNS Drugs. 2005; 19 (Suppl 1):1–93. [PubMed: 15998156]

6. Correll CU, Sheridan EM, DelBello MP. Antipsychotic and mood stabilizer efficacy and tolerability in pediatric and adult patients with bipolar I mania: a comparative analysis of acute, randomized, placebo-controlled trials. Bipolar Disord. 2010; 12(2):116–141. [PubMed: 20402706]

7. Maayan L, Vakhrusheva J, Correll CU. Effectiveness of medications used to attenuate antipsychotic-related weight gain and metabolic abnormalities: a systematic review and meta-analysis. Neuropsychopharmacology. 2010; 35(7):1520–1530. [PubMed: 20336059]

8. Faulkner G, Cohn T, Remington G. Interventions to reduce weight gain in schizophrenia. Schizophr Bull. 2007; 33(3):654–656. [PubMed: 17449900]

9. Maayan L, Correll CU. Management of antipsychotic-related weight gain. Expert Rev Neurother. 2010; 10(7):1175–1200. [PubMed: 20586697]

10. Faulkner G, Cohn TA. Pharmacologic and nonpharmacologic strategies for weight gain and metabolic disturbance in patients treated with antipsychotic medications. Canad J Psychiatry. 2006; 51(8):502–511. [PubMed: 16933587]

11. Shaw K, O'Rourke P, Del Mar C, et al. Psychological interventions for overweight or obesity. Cochrane database of systematic reviews (Online). 2005; (2):CD003818. [PubMed: 15846683]

12. Seo DC, Sa J. A meta-analysis of psycho-behavioral obesity interventions among US multiethnic and minority adults. Prev Med. 2008; 47(6):573–582. [PubMed: 18201758]

13. De Panfilis C, Torre M, Cero S, et al. Personality and attrition from behavioral weight-loss treatment for obesity. Gen Hosp Psychiatry. 2008; 30(6):515–520. [PubMed: 19061677]

14. Teixeira PJ, Going SB, Sardinha LB, et al. A review of psychosocial pre-treatment predictors of weight control. Obes Rev. 2005; 6(1):43–65. [PubMed: 15655038]

15. Linde JA, Jeffery RW, Levy RL, et al. Binge eating disorder, weight control self-efficacy, and depression in overweight men and women. Int J Obes Relat Metab Disord. 2004; 28(3):418–425. [PubMed: 14724662]

16. Beck AT, Ward CH, Mendelson M, et al. An inventory for measuring depression. Arch Gen Psychiatry. 1961; 4:561–571. [PubMed: 13688369]

17. Derogatis LR, Lipman RS, Covi L. SCL-90: an outpatient psychiatric rating scale-- preliminary report. Psychopharmacol Bull. 1973; 9(1):13–28. [PubMed: 4682398]

18. Diener E, Emmons RA, Larsen RJ, et al. The Satisfaction With Life Scale. J Pers Assess. 1985; 49(1):71–75. [PubMed: 16367493]

19. Conte HR, Plutchik R, Karasu TB, et al. A self-report Borderline Scale. Discriminative validity and preliminary norms. J Nerv Mental Dis. 1980; 168(7):428–435.

20. Beliard D, Kirschenbaum DS, Fitzgibbon ML. Evaluation of an intensive weight control program using a priori criteria to determine outcome. Int J Obes Relat Metab Disord. 1992; 16(7):505–517. [PubMed: 1323547]

21. Cohen, J. Statistical Power Analysis for the Behavioral Sciences. 2. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.

22. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychology. 1986; 51(6): 1173–1182.

23. Alvarez-Jimenez M, Hetrick SE, Gonzalez-Blanch C, et al. Non-pharmacological management of antipsychotic-induced weight gain: systematic review and meta-analysis of randomised controlled trials. Br J Psychiatry. 2008; 193(2):101–107. [PubMed: 18669990]

24. Brar JS, Ganguli R, Pandina G, et al. Effects of behavioral therapy on weight loss in overweight and obese patients with schizophrenia or schizoaffective disorder. J Clin Psychiatry. 2005; 66(2): 205–212. [PubMed: 15705006]

25. Alvarez-Jimenez M, Gonzalez-Blanch C, Vazquez-Barquero JL, et al. Attenuation of antipsychotic-induced weight gain with early behavioral intervention in drug-naive first-episode psychosis patients: A randomized controlled trial. J Clin Psychiatry. 2006; 67(8):1253–1260. [PubMed: 16965204]

26. Menza M, Vreeland B, Minsky S, et al. Managing atypical antipsychotic-associated weight gain: 12-month data on a multimodal weight control program. J Clin Psychiatry. 2004; 65(4):471–477. [PubMed: 15119908]

27. Wu MK, Wang CK, Bai YM, et al. Outcomes of obese, clozapine-treated inpatients with schizophrenia placed on a six-month diet and physical activity program. Psychiatric Services. 2007; 58(4):544–550. [PubMed: 17412858]

28. Correll CU. Balancing efficacy and safety in treatment with antipsychotics. CNS Spectrums. 2007; 12(10 Suppl 17):12–20. [PubMed: 17934385]

29. Holt RI, Pendlebury J, Wildgust HJ, et al. Intentional weight loss in overweight and obese patients with severe mental illness: 8-year experience of a behavioral treatment program. J Clin Psychiatry. 2010; 71(6):800–805. [PubMed: 20361917]

30. Dalle Grave R, Calugi S, Molinari E, et al. Weight loss expectations in obese patients and treatment attrition: an observational multicenter study. Obes Res. 2005; 13(11):1961–1969. [PubMed: 16339128]
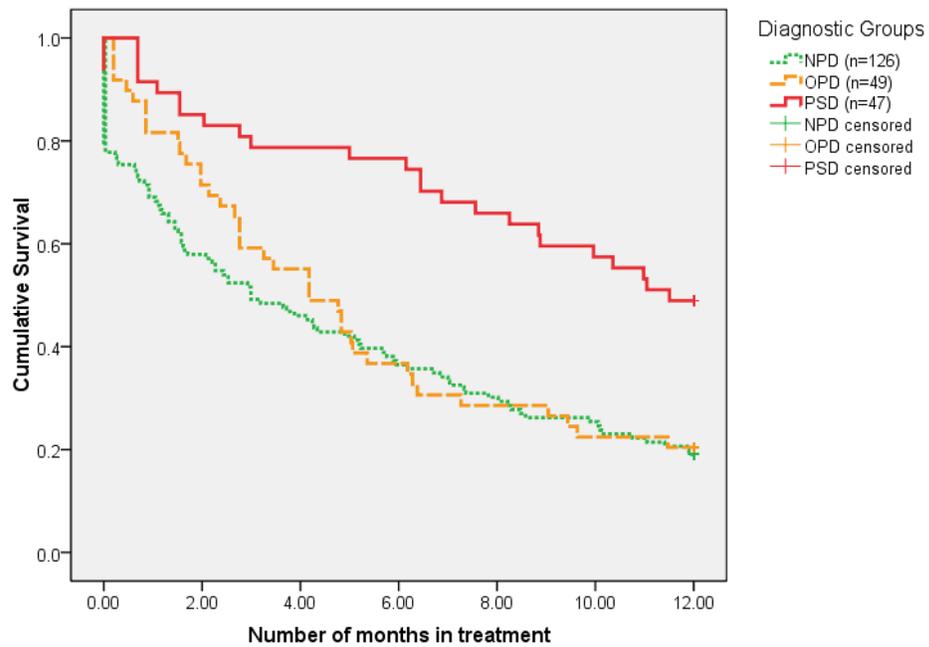
Figure 1.
Kaplan-Meier survival curves for the three patient groups. (PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders)
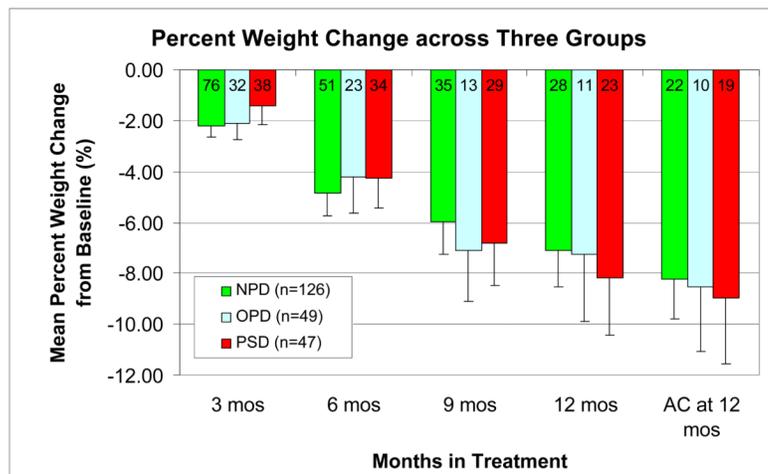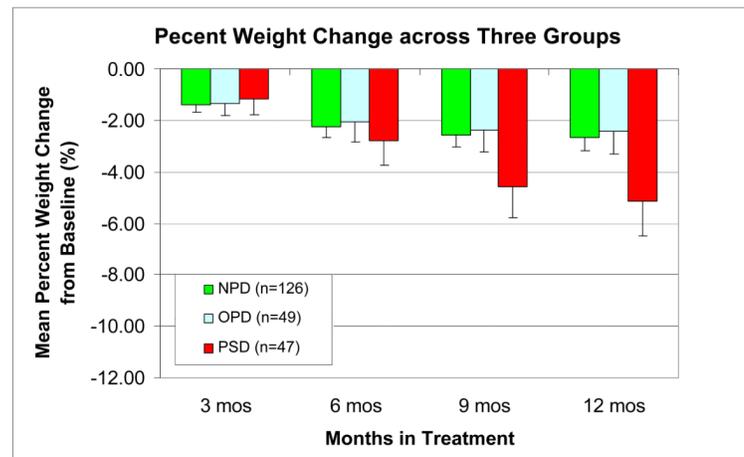
Figure 2a.

Figure 2b.

Figure 2.
Figure 2a. Weight loss for observed cases at each time point: Percent weight change from baseline.
Note: The numbers in the legend are the sample sizes for the three groups. PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders. The numbers inside the bars are the sample sizes for the group at each time point. AC at 12 mos = All Completers, ie., cases whose weight data are available for baseline and all four follow-up time points. Error bars represent standard errors. No significant differences among the groups at any time point.
Figure 2b. Weight loss for all cases (LOCF) at each time point: Percent weight change from baseline.
Note: PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders. There were no significant differences among the three groups at 3 months and 6 months. At 9 months, PSD was marginally significant than the other two groups, p's = .05–.10. At 12 months, PSD lost significantly more weight than the other two groups, p's = .032 and .048.
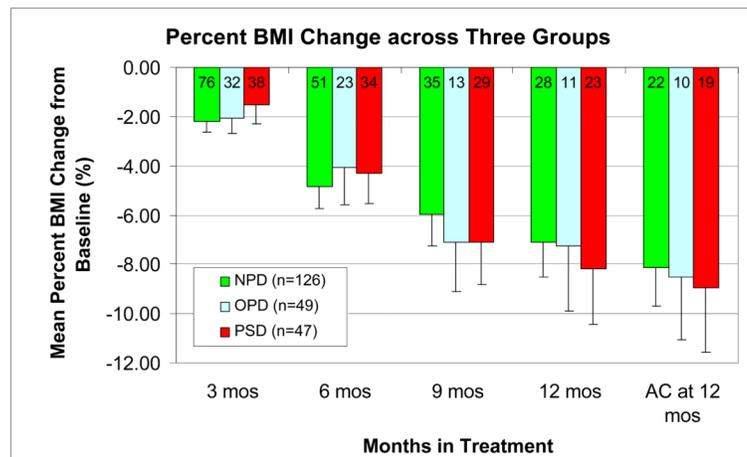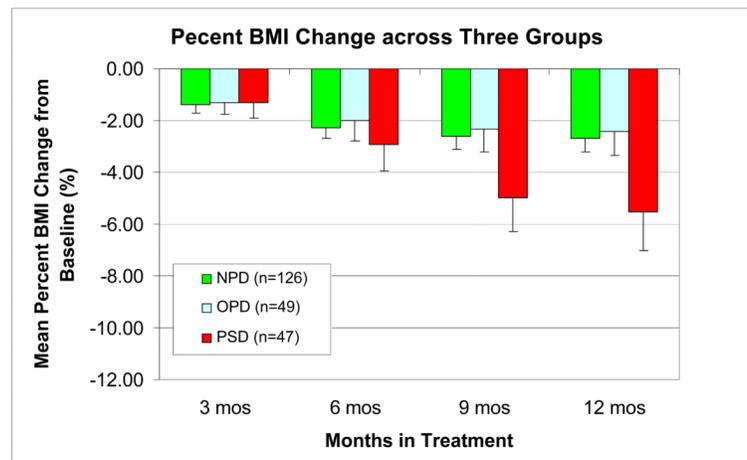
Figure 3a.

Figure 3b.

Figure 3.

Figure 3a. Weight loss for observed cases at each time point: Percent BMI change from baseline.

Note: The numbers in the legend are the sample sizes for the three groups. PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders. The numbers inside the bars are the sample sizes for the group at each time point. AC at 12 mos = All Completers, ie., cases whose weight data are available for baseline and all four follow-up time points. Error bars represent standard errors. No significant differences among the groups at any time point.

Figure 3b. Weight loss for all cases (LOCF) at each time point: Percent BMI change from baseline.

Note: PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders. There were no significant differences among the three groups at 3 months and 6 months. At 9 months, PSD was significant than the other two groups, p's = . 035 and .046. At 12 months, PSD was significant than the other two groups, p's = .019 and . 028.

Table 1

Demographic and Clinical Study Sample Characteristics

	Total (n=222)	PSD (n=47)	OPD (n=49)	NPD (n=126)	Total p
Age mean (sd)	49.2 (14.1)	43.1 (10.5)	47.2 (12.2)	52.2 (15.2)	<.001
Male n	75 (34%)	18 (38%)	15 (31%)	42 (33%)	0.72
Race: n (%) Caucasian	184 (83%)	33 (70%)	38 (78%)	113 (90%)	0.08
Employed n	93 (59%)	9 (36%)	20 (65%)	64 (63%)	**0.04**
Baseline GAF mean (sd)	63.7 (9.3)	57.4 (10.3)	60.5 (6.5)	67.3 (8.0)	**<.001**
Mean Months to dropout, mean (sd)	5.8 (4.8)	8.7 (4.4)	5.4 (4.3)	4.9 (4.7)	**<.001**
Eating disorder NOS	39 (18%)	6 (13%)	15 (31%)	18 (14%)	**0.02**
Psychiatric DX, n					
Schizophrenia spectrum disorder	32 (14%)	32 (68%)	0	0	**<.001**
Depressive disorder	43 (19%)	2 (4%)	41 (84%)	0	**<.001**
Anxiety disorder	10 (5%)	5 (11%)	5 (10%)	0	**<.001**
Bipolar disorder	15 (7%)	15 (32%)	0	0	**<.001**
Substance use disorder	7 (3%)	5 (11%)	2 (4%)	0	**<.001**
Psychiatric Medication Frequency n					
Number of medications, mean (sd)	1.1 (1.6)	3.1 (1.8)	1.3 (1.5)	0.4 (0.7)	**<.001**
Antipsychotics	36 (17%)	31 (74%)	5 (10%)	0	**<.001**
Antidepressants	83 (38%)	28 (66%)	26 (54%)	29 (23%)	**<.001**
Mood Stabilizers	31 (14%)	20 (48%)	7 (14%)	1 (<1%)	**<.001**
Stimulants	3 (<1%)	1 (<1%)	2 (<1%)	0	0.10
Weight Gain Producing Medications	48 (22%)	34 (81%)	7 (14%)	7 (6%)	**<.001**
Weight Neutral Medications	74 (34%)	31 (73%)	19 (39%)	24 (19%)	**<.001**
Weight Loss Producing Medications	39 (18%)	12 (29%)	17 (35%)	10 (8%)	**<.001**
Weight Information mean (sd)					
Baseline Weight (lbs)	268.4 (65.2)	259.9 (52.8)	284.5 (69.1)	265.4 (67.2)	0.13
Baseline BMI	43.6 (9.6)	42.5 (7.1)	45.1 (10.6)	43.5 (10.0)	0.44
Number of times lost 20 lbs in past	4.7 (4.2)	3.6 (4.1)	6.3 (4.6)	4.4 (3.9)	**0.03**
Psychosocial predictors					

	Total (n=222)	PSD (n=47)	OPD (n=49)	NPD (n =126)	Total p
BDI total score, mean (sd)	15.0 (9.9)	20.1 (12.9)	18.7 (10.0)	12.4 (8.1)	**<.001**
SCL-90 total score, mean (sd)	0.9 (0.6)	1.2 (0.8)	1.2 (0.6)	0.7 (0.5)	**<.001**
Life Satisfaction, mean (sd)	16.9 (7.7)	14.1 (6.6)	14.4 (7.4)	18.5 (7.7)	**.002**
Treatment modality					
# Group sessions, mean (sd)	11.6 (21.7)	30.1 (29.8)	5.2 (15.2)	7.2 (15.8)	**<.001**
# Individual sessions, mean (sd)	10.1 (18.4)	7.3 (16.8)	13.1 (21.4)	10.0 (17.7)	.29
% Group sessions, mean (sd)	41.0 (46.5)	72.8 (40.4)	28.9 (44.9)	32.9 (43.8)	**<.001**

Note: PSD = Psychosis Spectrum Disorders, OPD = Other Psychiatric Disorders, NPD = No Psychiatric Disorders. GAF = Global Assessment of Function. BMI = Body Mass Index. BDI = Beck Depression Inventory. SCL = Symptoms Checklist. Weight neutral medications: citalopram, escitalopram, sertraline, benzodiazepines, anticholinergics, hyponotics. Weight gain producing medications: aripiprazole, clozapine, ziprasidone, risperidone, quetiapine, olanzapine, lithium, valproic acid, gabapentin, lamotrigine, fluoxetine, paroxetine, venlafaxine, duloxetine, mirtazapine. Weight loss producing medications: stimulants, bupropion, topiramate, zonisamide.