

A Comprehensive Review of Behavioral Interventions for Weight Management in Schizophrenia

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Background. Obesity in patients with schizophrenia has been associated with both lifestyle habits and the side effects of medications, with serious implications for physical and mental health, and mortality. Behavioral techniques to mitigate weight gain have been employed with variable success in patients with schizophrenia. This review seeks to assess the potential of behavioral therapy for the management of obesity in individuals diagnosed with schizophrenia through a comprehensive review of all available literature on this subject.

Methods. An electronic search of published articles pertaining to the use of behavioral interventions in individuals with schizophrenia was conducted using PsycINFO and Medline.

Results. The search strategy produced 23 articles that met inclusion criteria, with an aggregate sample of 701 participants. The types of behavioral interventions consisted of behavioral modification techniques, caloric restriction, and psychoeducation. Weight loss was reported in 19 studies, while the remaining studies showed either maintenance of baseline weight or minimal weight gain.

Conclusions. Much of the literature is anecdotal, methodologically unsound, poorly documented, or applicable only to inpatient settings. Nonetheless, recent data from controlled studies suggest that behavioral interventions in patients diagnosed with schizophrenia may prevent future weight gain, and in some instances promote weight loss. High drop-out rates, and the absence of extended post-treatment follow-up still limit the conclusions regarding general efficacy of behavioral treatment of obesity in patients with schizophrenia.

Keywords Schizophrenia, Weight, Behavioral intervention, Review

INTRODUCTION

Obesity has become a major public health problem in westernized societies, with an exponential rise in prevalence over the past forty years. In the United States, it is estimated that at least one third of adults have a body mass index (BMI) of 30 kg/m² or greater, meeting the World Health Association

definition of obesity (1). Obesity has become the focus of concern because it increases all-cause mortality and the risk for numerous health conditions such as type 2 diabetes mellitus, hypertension, cardiovascular disease, cholelithiasis, breast cancer (2).

Patients with schizophrenia appear to be at equal or greater risk for obesity than the general population. Retrospective analysis of data from national health studies in the United States indicates that male patients with schizophrenia have nearly equal prevalences of obesity as their age-matched counterparts in the general population, while female patients with schizophrenia have significantly greater prevalences of obesity

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(3). Multiple factors contribute to the risk for obesity among patients with schizophrenia, including poor dietary habits, inactivity, and the effects of psychotropic medications (4–7). Obesity poses unique problems for individuals with severe mental illness (SMI), in part because patients with schizophrenia recognize the problem but are often disinclined to change behavior (8). By increasing medical comorbidity, obesity may also contribute to greater severity of psychiatric symptoms, and lower ratings of mental and physical health in patients with schizophrenia (9–11). Obesity and medication-related weight gain may also have a direct impact on the course of severe mental illness by decreasing medication compliance. Recent data indicate that obese patients with schizophrenia are 2.5 times more likely to miss taking their antipsychotic than those with BMI in the normal range ($<25 \text{ kg/m}^2$), with distress over weight gain a primary component of medication nonadherence (12).

For clinicians confronted with obese patients with schizophrenia, several options are available. Emerging data from open-label switch studies indicate that switching patients to metabolically more neutral antipsychotic medication may decrease weight, improve lipid profiles, and reduce risk of cardiovascular (CV) disease and type 2 diabetes mellitus (DM) by decreasing the prevalence of the metabolic syndrome (13,14). Yet, many stable patients are reluctant to switch antipsychotic medication, and refractory patients on clozapine may be unable to switch, forcing mental health providers to consider behavioral approaches or adjunctive pharmacological treatments.

Over the past decade a variety of agents have been studied for the treatment of obesity in patients with schizophrenia. Stimulants and sympathomimetic amines have been eschewed due to risk of psychotic exacerbation, so investigators have sought other classes of agents including amantadine, histamine H_2 antagonists, metformin, topiramate, orlistat and sibutramine (15). Unfortunately, most of the data for these agents appeared as unpublished meeting abstracts, published anecdotal cases, or open-label studies from small sample sizes, with little to no double-blind data to suggest any of the above list of medications as an acceptable and effective means for long term weight loss or prevention of antipsychotic-induced weight gain in patients with schizophrenia. Moreover, some of these medications are often accompanied by troubling side effects, such as increased blood pressure (e.g., sibutramine), gastrointestinal side effects (e.g., orlistat), and cognitive slowing or sedation combined with metabolic acidosis (e.g., topiramate) (16).

There is one study of surgical intervention for obese patients with schizophrenia patients. Hamoui (17) reported performing bariatric surgery on 5 morbidly obese (median BMI 54 kg/m^2) patients with schizophrenia, all of whom were deemed psychiatrically stable on medication. Patients were followed up for 2–18 months, and the percentage of weight loss was comparable to that of non-psychotic patients who underwent bariatric procedures in the same year. Although these results may be promising, they may not be generalized to all patients with schizophrenia, as the participants in this study

were all stable on medications, living independently and had social support from family and friends. There is also limited data on long-term outcomes after bariatric surgery, since four of five patients were lost to follow-up at 12 months.

The remaining option to treat obesity in patients with schizophrenia is cognitive behaviorally oriented programs. The National Heart Lung and Blood Institute recommends an approach to obesity which combines low calorie diet with increased physical activity and behavioral strategies to help reinforce lifestyle changes. Over the past forty years, a number of investigators have published case reports and more formal controlled studies outlining results of behavioral treatments specifically targeted at weight loss in individuals with schizophrenia. Several recent reviews on the management of obesity in schizophrenia have commented on portions of this literature (18,19), with one review devoted solely to behavioral management of obesity (20), but the coverage of the older literature omits multiple small studies worthy of attention, and there is no discussion of recent controlled studies published in 2003 and 2004. For these reasons, we sought to expand and update prior reviews on this subject to provide the mental health community with a comprehensive critical review of behavioral programs for treating obesity in patients with schizophrenia.

METHODS

An electronic search of published articles pertaining to the use of behavioral interventions in individuals with schizophrenia was conducted of the following databases: PsycINFO (1872–August 2004) and Medline (1951–August 2004). The search was conducted using a keyword search strategy with the following terms: “Schizophrenia,” “Obesity,” “Weight,” “Weight loss,” “Weight gain,” “Prevention,” “Intervention,” “Antipsychotic,” “Cognitive,” “Behavioral,” “Behavioural,” “Therapy,” “Exercise,” “Diet.” All papers resulting from the electronic search were then reviewed for relevant references.

Inclusion of studies was determined based on the following criteria: 1] the study was written in English and published in a peer review journal, 2] participants included individuals diagnosed or classified with schizophrenia or schizoaffective disorder, 3] weight loss was an outcome goal, and 4] weight loss was assessed using some standard measure (e.g., weight, BMI, waist circumference). The following presentation of results provides a general overview, with specific sections analyzing the reports on the basis of study duration and setting, methodology or study design, and treatment strategy.

RESULTS

Overview

The search strategy produced 23 articles that met inclusion criteria (Table 1), comprising a group of 701 participants.

Table 1 Summary of Published Behavioral Interventions for Weight Loss in Schizophrenia Patients

Study	N	Control	Randomized	Method	Drop Outs	Mean Weight Change
Ayllon, 1963(33)	1	No	No	Case study of behavior modification for food stealing over 14 months	N/A	BT: -70 lbs
Sletten et al., 1967(34)	14	Yes	No	Inpatients assigned to one of two groups: Group A was allowed to eat at least 2000 calories per day, Group B was restricted to 1000 calories per day. After 4 weeks, the groups were switched	Not reported	Pts on the 1000 calorie diet lost an average of 10 lbs over 4 weeks, compared to patients on the unrestricted diet, who lost 7.4 lbs (not significant). Lack of differences between groups attributed to high motivation of all participants and selection bias. BT: -102.0 lbs
Bernard, 1968(35)	1	No	No	Case study of operant 26 week reinforcement program including 6-week extinction period	N/A	At end of treatment: Diet only: +0.98 lbs Diet + group therapy: -5.89 lbs* Diet + behavior mod: -7.80 lbs* At Follow-up Diet only: 0.00 lbs Diet + group therapy: -2.95 lbs Diet + behavior mod: -13.66 lbs* *Significant when compared to diet only group
Harmatz & Lapuc, 1968(36)	21	Yes	Yes	Inpatients assigned to one of 3 groups: 1800 calorie diet only, group therapy +diet, or behavior modification +diet for 6 week treatment and 4 week follow-up	Not reported	BT: -35.0 lbs
Moore & Crum, 1969(37)	1	No	No	Case study of successful result from 26 week uncontrolled operant reinforcement program with chronic inpatient	Not reported	Subject 1: -63 lbs over 28 weeks Subject 2: -31 lbs over 26 weeks BT: -10.8 lbs Significant when compared to pre-treatment weight
Upper & Newton, 1971(38)	2	No	No	Case studies of successful results from uncontrolled incentive and token program with chronic inpatients	N/A	70% lost weight (18% attained ideal weight) 24.3% gained weight BT: -7.28 lbs Controls: +5.60 lbs Between group difference significant
Klein et al., 1972(22)	5	No	No	180 day uncontrolled incentive token program with chronic inpatients	Not reported	Diet: -6.48 lbs Control: +9.00 lbs Between group difference significant
Knox, 1980 (23)	74	No	No	Data on results of 6 month 1000 kcal caloric restriction for chronic inpatients. No restriction on food gifts or purchases from hospital shop	Not reported	
Rotatori et al., 1980(40)	14	Yes	Yes	Prospective 14 wk study of chronic inpatients (7 BT, 7 controls)	Not reported	
Heimberg et al., 1995(39)	40	Yes	No	Chronic inpatients assessed for weight reduction diet (1400-1500 calories) or lipid lowering diet (2200-2500 calories) compared to non-dieting controls	Not reported	

(Continued)

Table 1 (Continued)

Study	N	Control	Randomized	Method	Drop Outs	Mean Weight Change
Merriman et al., 1995(26)	6	No	No	Group therapy involving diet, exercise and self-assertiveness training over 12 weeks with 4 week follow-up	16.6%	Completer results: at end of treatment -2 kg* at follow-up +2 kg* 3 patients lost weight during treatment (mean -2.3 kg) and maintained weight loss at follow-up (mean -2.1 kg) *not significant
Wirshing et al., 1999(41)	92	No	No	Retrospective chart review of graded interventions for outpatients with varying lengths of treatment exposure (range 6–18 mos)	Not reported	Weight loss: Clozapine -2.7 lbs Olanzapine -11.6 lbs Risperidone -4.9 lbs Haloperidol -4.7 lbs Sertindole -5.1 lbs <i>Comparison for all groups significant</i>
Aquila & Emmanuel, 2000 (25)	31	No	No	1.5 year trial of healthy diet, dietary counseling with support groups	9.7%	BT: No significant weight loss at 12 mos (-0.46%) or 18 mos (-0.28%)
Ball et al., 2001(27)	21	Yes	No	10 week uncontrolled trial of Weight Watcher program vs. comparison group with usual care	47.6%	Completer results: BT: -5.1 lbs Controls: +0.5 lbs <i>Between group difference was not significant</i>
Umbricht et al., 2001(28)	10	No	No	7–9 individual cognitive-behavioral therapy sessions or 16 biweekly group therapy sessions for weight reduction and maintenance	30%	Completer results: Significant mean BMI loss of 4.5 kg/m ² (N = 6, no retrospective data available for 1 patient)
Archie et al., 2003(29)	10	Yes	Yes	Initial fitness assessment and information about exercise and nutrition (one session). Participants given 6 month pass to YMCA	90%	Completer results: 15 kg weight loss Participants cited lack of motivation as primary reason for noncompliance.
Feeney et al., 2003(21)	89	Yes	No	Outpatients given the option to attend a weight management program, assessed at 3-year follow-up	42.7%	Completer Results: BT: -1.6 kg/m ² (BMI) Controls: +0.2 kg/m ² (BMI) <i>Between group difference significant</i>

(Continued)

Table 1 (Continued)

		Yes	No	Yes	4 month trial of intensive diet and exercise education vs. usual care, plus 2 mos f/u	Not reported	4 month data: BT: +0.81 lbs Controls: +7.17 lbs* 6 month data: BT: -0.60 lbs Controls: +9.57 lbs* *Between group difference significant Mean weight: +5.27 lbs
Litrell et al., 2003(42)		70		Yes			
Nguyen et al., 2003(24)		22	No	No	5 minute diet and exercise education on outpatient basis with 2 minute educational reminder on subsequent visits over 7 months for patients starting olanzapine therapy Retrospective chart review of results from nutritional counseling, and self-motivated weight loss/diet over 5 year period	Not reported	
O'Keefe et al., 2003(30)		35	No	No	12 week study of diet, nutrition education and behavioral strategies in a partial hospitalization program	6 month f/u data reported for only 11/35	Mean weight loss of 14.11% (31.5 lbs) for the 11 pts with 6 mo data. Endpoint BMI 39.1 kg/m ²
Vreeland et al., 2003(31)		46	Yes	No		87.1%	BT: -6.0 lbs Controls: +6.4 lbs Between group difference significant
Menza et al., 2004(32)		51	Yes	No	24 week program with 6 month maintenance phase of diet and nutrition education and behavioral strategies in a day treatment setting vs. usual care	35.5%	BT: -6.6 lbs Controls: +7.0 lbs Between group difference significant
Ohlsen et al., 2004(43)		44	No	No	6 week program involving dietary planning, exercise, and motivational interviewing. With outpatients. Patients encouraged to continue for weight monitoring and "encouragement" for 1 year	Not reported	After 1 year: BT: -6.83 lbs (not significant)

Age and gender are not reported for four studies (21–24). Of the remaining 19 reports, 179 participants were female, and 329 were male, with an average age of 37.78 years. Only 9 studies reported drop-out rates (21,25–32) with mean attrition rate of 47.52%, and a range from 9.7% – 90%. Ten studies were conducted with inpatient populations (22,23,26,33–39), 4 studies were conducted in residential treatment settings (25,40), partial hospitalization (31) or day treatment centers (32), and 9 were conducted with outpatient populations (21,24,27–30,41–43). Two reports were chart reviews (30,41), 4 were case studies (33,35,37,38), 7 studies utilized a pre-post design (22–26,28,43), 6 were quasi experimental, using a cross-over (34) or case control design (21,27,31,32,39), and 4 studies utilized a randomized controlled design (29,36,40,42).

Mean duration of treatment was 25.68 weeks, excluding two studies which examined short educational interventions (21,24), and a retrospective study examining self-directed weight loss of varying lengths (30). Six studies included follow-up assessments after termination of treatment (21,24,26,36,42,43), with a mean duration of 41.33 weeks, but a median duration of 8 weeks, due to one study, which had a follow-up period of 3 years (21).

Various treatment strategies were employed across the studies and case reports. Three studies examined the effects of behavioral modification alone (22,33,37), three studies examined the effects of calorie restriction alone (23,34,39), ten studies examined the effects of psychoeducation alone (21,24,26–29,31,32,42,43), four studies examined calorie restriction combined with psychoeducation (25,36) or behavioral modification (35,36,38), and one study examined the effects of behavior modification and psychoeducation (40). The most common forms of behavioral modification used were token economies (22,35,38,40), followed by response cost (33,36) and social reinforcement (37). Calorie restriction ranged from 1000–2500 calories per day (23,25,34–36,38,39). Psychoeducational interventions included information, practice and homework involving diet, exercise, and maintenance of weight loss, and was conducted in both individual and group formats, with group therapy being more common (21,24–29,31,32,36,40,42,43).

Weight was the most common treatment outcome, with only 2 studies reporting BMI as the outcome measure (21,28). Weight loss or decreased BMI was observed in 20 reports (21–23,26–41,43), but was not statistically significant in 3 reports (26,27,43). Statistical significance of weight loss was not reported for the case studies (33,35,37,38), one of the chart review studies (30), one pre-post design study (28), and one experimental study (29). The remaining three studies (24,25,42) reported weight gain (mean +2.33 lbs) over a period between 4–18 months (mean 9.67 months). Although Nguyen (24) did not report statistical significance of weight gain, weight gain was not significant in the other 2 studies (24,25,42). Finally, of the 2 studies that utilized BMI as the primary outcome measure, both reported statistically significant BMI decreases (mean -3.05 kg/m^2) (21,28).

Duration and Setting

Studies that reported duration of 26 weeks or longer had an average weight loss of -30.94 lbs , with a range of -102 lbs to $+0.9 \text{ lbs}$ (22,25,32,33,35,37–39,41), compared to an average weight loss of -3.94 lbs (range $-7.8 - +5.27$) in studies 16 weeks or less in duration (24,26,27,31,34,36,40,42,43). When the influence of case studies is removed, interventions 26 weeks or longer resulted in an average weight loss of -10.31 lbs , with a range of -33.07 to $+0.9 \text{ lbs}$ (22,25,32,39,41). In addition, studies conducted with inpatient populations demonstrated consistent weight loss (mean -32.27 lbs) (22,23,26,33–39), while those conducted with outpatient populations showed variable results, and reported both weight loss (mean -16.46 lbs) (27,29,30,41,43) and weight gain (mean $+3.04 \text{ lbs}$) (24,42). Similarly, those in residential treatment showed both weight loss (mean -6.23) (31,32,40) and one study showed weight gain ($+0.9 \text{ lbs}$) (25).

Methodology and Study Design

Two of the studies included were retrospective chart reviews of outpatients (30,41), with a total of 127 individuals and an average age of 43.22. Although the attrition rate was not reported by Wirshing (41), O'Keefe (30) reported a 68.5% attrition rate. On average, the 103 participants in the remaining studies lost 18.65 lbs (range $-5.8 \text{ lbs} - -31.5 \text{ lbs}$) over varied periods of time using a variety of interventions. Wirshing (41) reported a series of graded interventions, from self-report of weight gain to psychoeducation and support groups for weight loss, with advancement to more intensive treatment based upon on failure to maintain weight. O'Keefe (30) examined self-initiated weight loss interventions, and found that the most common were dietician visits, self-directed diets, and weight loss as a goal in treatment plans.

A total of 5 participants, all from inpatient settings, with an average age of 34.14 years were involved in the 4 case studies reviewed (33,35,37,38). The most dramatic weight loss was reported in the case studies, with an average of -63.5 lbs (range $-35 \text{ lbs} - -102 \text{ lbs}$), representing 23.57% of initial weight over a period between 6–14 months (mean 9 months). All four case studies utilized behavioral modification techniques, with two studies also using calorie restriction (35,38).

Seven studies examined 192 participants from inpatient (22,23,26), outpatient (24,28,43), and residential facilities (25), using a simple pre-post design with neither a control group nor randomization. Average age of participants was not reported for three studies (22–24), but was 35.64 years for the remainder of the studies. Four studies examined the utility of psychoeducation alone (24,26,28,43), one examined the use of token economy alone (22), one examined the use of caloric restriction alone (23) and one examined the combination of caloric restriction and psychoeducation (25). Four studies did not report attrition rates (22–24,43), but the average dropout rate

for the remaining studies was 18.8% (range 9.7%–30%). One study measured weight change using BMI, rather than weight (28), and noted that the participants lost 4.6 kg/m² over a period of 16 weeks. Two studies did not report weight change immediately following the intervention (24,43) and one study did not report numbers for weight loss (23). The remaining 38 participants lost an average of 3.45 lbs (range +0.90 – –10.80) over a period of 38.67 weeks (range 12–78 weeks). Although Knox (23) did not report numbers for weight loss, 74% lost weight during the trial and 17.5 % of the total sample attained their ideal weight over 6 months. Both Nguyen (24) and Ohlsen (43) reported follow-up data over an average of 38 weeks (range 30–46 weeks), with Ohlsen (43) reporting a non-significant mean weight loss of 6.83 lbs for 44 patients, and Nguyen (24) reporting a weight gain of 5.27 lbs for 22 patients.

A total of 262 participants from both inpatient and outpatient settings with an average age of 43.27 years were involved in the 6 studies that included a nonrandomized control group (21,27,31,32,34,39). Two studies examined the utility of dieting alone (34,39), while the remaining four studies assessed the use of psychoeducational programs (21,27,31,32). Two studies did not report drop out rates (34,39), but the average attrition rate for the remaining studies was 35.5%. One study measured weight change using BMI (21), where 51 participants lost an average of 1.6 kg/m² over a period of 3 years. The remaining 105 participants lost an average of 6.84 lbs (range –5.10 lbs – –10 lbs) over a period of 20.8 weeks.

Finally, only four experimental studies included a randomized control group, with a total of 115 participants and an average age of 33.86 (29,36,40,42). Two of these studies were conducted on inpatients or those residing in a residential facility (36,40) and two were conducted with outpatient population. (29,42). All of these studies included a psychoeducational component, with Rotatori (40) also using a token economy, and Harmatz (36) comparing the utility of dieting alone with the combination of either dieting and response cost or dieting and group therapy. Although Archie (29) reported an attrition rate of 90%, the other studies did not report dropout rates. The remaining 106 participants lost an average of 11.60 lbs (range +0.81 lbs – –33.07 lbs), over a period of 15.5 weeks. However, the average weight loss is skewed by the results from Archie (29), where the attrition rate of 90% left 1 patient at follow-up who lost a total of 33.07 lbs. Furthermore, while Littrell (42) reported a nonsignificant weight gain in the experimental group, there were significant between group differences, with participants in the control group gaining substantially more weight than participants in the experimental group. In addition, two studies (36,42) reported follow-up data over an average of 6 weeks (range 4–8 weeks). The intervention group in the Littrell (42) study lost a nonsignificant amount of weight (–0.2 lbs) at 8 week follow-up, while the control group continued to gain weight (+9.57 lbs). Harmatz (36) reported that at 4 week follow-up, participants in the response cost group continued to lose weight (–13.66 lbs), while those in group therapy had regained some weight (–2.95).

Intervention Strategy

In general, studies reporting the use of behavioral modification techniques, such as response cost or token economies, showed the greatest weight loss (mean –39.98 lbs, range –7.28 lbs – –102 lbs) (22,33,35–38,40). Studies involving caloric restriction showed mixed results in terms of weight loss; with caloric restriction alone resulting in weight loss (23,34,39), and the combination of caloric restriction and behavioral modification showing weight loss (mean –52.27 lbs) (35,36,38), but the combination of caloric restriction and psychoeducation showing mixed results (range –5.89 to +0.9 lbs) (25,36). Finally, findings from studies involving the use of psychoeducation were mixed with respect to weight change, with psychoeducation alone resulting in both weight gain (mean +3.04 lbs) (24,42) as well as weight loss (mean –9.67 lbs) (26,27,29,31,32,43). Only one study reported the use of both behavioral modification and psychoeducation, which resulted in weight loss (–7.28 lbs) (40).

DISCUSSION

Although evidence advocates that antipsychotic-induced weight gain may be treated by medication switch (44), the use of antipsychotic medications with weight gain liability may be necessary in some individuals due to tolerability, efficacy or safety issues. The results of our review suggest that behavioral interventions for obesity in patients with schizophrenia may be helpful in both preventative and treatment efforts. In the present review, 10 studies reported either statistically significant weight loss or significant post-treatment between group differences in weight or BMI. The average length of treatment was approximately 6 months in duration and consisted of behavioral modification techniques, calorie restriction, or psychoeducational components, either alone or in combination. Interventions that incorporate external reward and/or punishment systems (e.g., token systems with or without response cost) appear to be the most effective in producing weight loss; however, they also require the greatest investment of resources, such as staff time and effort, and are only applicable in inpatient or day treatment settings. In addition, the efficacy of behavioral modification techniques may be biased by the fact that all the case studies involved a behavioral modification component, and the case studies clearly represent weight loss that is greater than the norm.

In the reports that we examined, caloric restriction alone was sufficient to demonstrate weight loss, yet, other studies have shown contradictory findings, demonstrating that caloric restriction alone is inadequate for weight loss in patients with antipsychotic-induced weight gain (45). At the present time, it is difficult to assess the utility of interventions that involve caloric restriction alone, as studies vary greatly in terms of the maximum daily calorie allowance, and do not address the issue of dietary restriction in outpatients. Furthermore, there are few

studies that assess the impact of caloric restriction independent of other types of intervention in schizophrenia populations. Most data and expert panels suggest that the best approach to weight loss involves a combination of diet and exercise (46), but these interventions do not consistently produce weight loss among patients with schizophrenia. Nonetheless, this combined approach may serve to limit weight gain, and may be useful as a harm reduction technique for patients prescribed psychotropic medications that carry weight gain liability.

Many of the studies included in this review have inherent biases due to design, attrition, or selection. For example, four of the included studies are case reports, which may have been published on the basis of the substantial weight loss demonstrated by these patients (33,35,37,38). The value of case studies to the literature may also be limited by the types of treatment and investment in resources necessary to produce change. The behavioral modification used in the case studies reported here all involved reinforcement, response cost, or token economies, all of which involve significant contributions of staff time and other resources. The case studies reviewed were also all conducted on patients from inpatient population, where the controlled environment allows for administration of these programs. Adapting these programs for use with short-stay inpatients or outpatient populations is impractical, as attested to by the fact that the last study utilizing structured behavioral modification for weight loss in patients with schizophrenia was conducted by Klein (22) in 1972. In short, the older learning-based behavioral modification techniques may not be applicable or amendable for use in outpatient settings, or modern inpatient with shorter lengths of stay.

Another significant limitation to the literature in this area is the fact that only four published studies (29,36,40,42) utilized a randomized controlled design, with the remainder lacking either a control group or randomization procedures, or both. In addition, high attrition rates, even among those who report high motivation, is also a problem regarding the studies reviewed here. Approximately half ($n = 11$) of these studies reported an attrition rate, ranging from 9.7% to 90%. Since results are only available for those who completed these studies, it is difficult to ascertain the net benefit for any group of patients with schizophrenia enrolled in a behavioral program to promote weight loss. Another limitation inherent in these reports is the predominant use of weight as an outcome measure, rather than BMI or a measure of abdominal adiposity (e.g., waist circumference), which would be useful for indicating cardiovascular risk. As such, it is difficult to assess the total extent of reduction in cardiovascular risk. Future research should consider the inclusion of more than one measure of weight loss as outcome measures, in order to assess for other health risks.

Although the present review is limited by the quality of the literature, it does appear that behavioral interventions may be useful for prevention of weight gain in patients with schizophrenia. While subjects in some of the controlled studies demonstrated minimal weight gain or weight loss, those in the

control groups invariably gained weight over time. Whether this benefit justifies the investment in resources must be considered, particularly when attrition rates may be high. Some psychoeducational interventions may be as short as 5 minutes (24) or an hour (21), but the resources necessary to implement some of these programs may be significant, especially for community mental health centers wrestling with limited budgets and staff.

Unfortunately, much of the research involving behavioral interventions for obesity in schizophrenia patients is methodologically flawed. Further longitudinal, randomized, controlled studies are crucial to determine whether the differences in weight resulting from behavioral programs accrue to sustainable health benefits over time. The National Institute of Mental Health has recently funded a long-term study examining the effects of behavioral therapy for weight gain in schizophrenia patients. Understandably, there is high interest in this project, which may serve to clarify this issue, and identify the type of behavioral intervention and patient characteristics which will lead to successful long-term control of weight. As of this writing, the feasibility and long-term benefit of behavioral therapy programs in outpatient settings still remains an open question. There is clearly a need for behavioral therapy to treat obesity in schizophrenia patients for whom antipsychotic switching (or other pharmacological intervention) is not possible, but in the current era of budgetary limitations, clinic directors need compelling data to justify the expense of such programs.

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