SELF REPORTED HEALTH PROMOTION BEHAVIORS OF INDIVIDUALS WITH PSYCHIATRIC DISABILITIES IN A WEIGHT LOSS INTERVENTION

Elyse Biethman

Faculty Mentor: Edna Hamera PhD APRN

University of Kansas School of Nursing

Abstract

Introduction: Research shows that individuals with psychiatric disabilities, particularly those with schizophrenia, die on average 25 years earlier than the general population (Marder et al., 2004). Excess mortality is due primarily to cardiovascular disease but also from other comorbid conditions exacerbated by obesity. Limited income in combination with poor diet, lack of exercise, and psychiatric medications often contribute to obesity in individuals with psychiatric disabilities. **Purpose**: this study examines if individuals in a weight loss program report an increase in healthy eating and physical activity over time compared to those in a control group. **Methods:** scores from two subscales of the Health-Promoting Lifestyle Profile II (HPLPII) were administered at baseline, 3 months, 6 months and 12 months to individuals who were randomly assigned to a Psychiatric Rehabilitation Approach to Weight Loss program or a control group. Scores were analyzed using a repeated measure ANOVA. **Findings**: change in self-report of nutrition between the control and intervention groups did not significantly change over the course of the study. However, change in self-report of physical activity between the intervention and the control group was significant, with significant changes between baseline and three months, baseline and six months, but not between baseline and twelve months. **Discussion:** Participants in the Psychiatric Rehabilitation Approach to Weight Loss program reported increased physical activity, but reported no changes in nutrition compared to the control group**.** Further study is needed to determine if self-report of increased physical activity is confirmed with actual increase in activity.

Introduction

Of the numerous comorbid diseases that individuals with serious and persistent mental illness (SPMI) die from annually, the largest cause of natural death is cardiovascular disease (CVD) secondary to obesity (Hausswolff-Juhlin et al., 2008). It is common for individuals with SPMI to be overweight, specifically those with schizophrenia; however, each year these numbers continue to rise above the accepted average. Additionally, a large number of individuals with mental illness are seen to be overweight when compared to overweight individuals in the general population, specifically 29% of men and 60% of women with SPMI are obese when compared to the general population (Allison et. al, 2000). It should be noted that many modifiable risk factors for CVD have been identified in this population such as obesity, smoking, hypertension, and hyperglycemia, yet antipsychotic medications also cause excess weight gain. In addition some antipsychotics cause sedation, leading individuals with severe psychiatric mental illness to be less inclined to exercise.

Individuals with severe mental illness, specifically those with schizophrenia, are known to exercise less due to the nature of their mental illness. Negative symptoms of schizophrenia such as apathy and depression reduce motivation to be physically active. In addition individuals with schizophrenia are less likely to seek social activities and social interaction further reducing potential opportunities to be physically active (Hausswolff-Juhlin et al., 2008).

Individuals with serious mental illness, especially those with bipolar and schizophrenic disorders may have cognitive deficits. Common deficits include problems with attention, concentration and executive functioning that are needed for planning and executing healthy behaviors like exercising and preparing healthy meals. Since these disorders commonly emerge in late adolescence and young adulthood, knowledge and skills needed for selecting and developing healthy habits have not been established.

Generally individuals in this population are uninsured or under insured and live below the poverty line. Without adequate funds, it is difficult for individuals with serious mental illness to make healthy meal decisions. Often these individuals choose fast food or junk food, since these items are easy to access and relatively cheap. Consumption of food with little to no nutritional value is yet another factor contributing to obesity in this population.

Problem

Individuals with SPMI have higher levels of obesity, cardiovascular disease and die at an earlier age than individuals without serious mental illness. Many factors contribute to their increase in medical morbidity and mortality; lack of knowledge, lower income, availability of healthy foods and conducive environments for exercise. In addition medication used to treat individuals with serious mental illness often contribute to weight gain. Few weight loss programs have been evaluated to address the unique needs of this population.

Purpose

A current federally funded grant is examining Psychiatric Rehabilitation Approach to Weight Loss (Brown, 2006). This study followed people with SPMI for 12 months. As part of that larger study, self reported health behaviors were assessed at four times: baseline, 3 months, 6 months, and 1 year. Healthy behaviors are defined as health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management and measured with the Health-Promoting Lifestyle Profile Scale (Walker, Sechrist, Pender, 1987). The purpose of this study is to examine if individuals with serious mental illness who participated in a weight loss study reported engaging in more healthy behaviors, specifically physical activity and nutrition, over time.

Hypothesis

Individuals with severe mental illness who participate in a weight loss study will report an increase in the healthy behaviors nutrition and physical activity from baseline to 3, 6, and 12 months compared to individuals in the control group.

Literature Review

Several research studies focusing on the relationship between obesity and serious mental illness have been reported in the literature. The research studies use both quantitative and qualitative methods to describe this relationship and yield similar conclusions but cannot be assumed to establish causality. Farnam, Zipple, et al. (1999) were among the first to describe the health status of individuals with SPMI. Using mailed questionnaires, they found that these individuals did receive yearly medical checkups, but were below average for physical activity when compared to the general population. Additionally the individuals with SMI had increased risk factors such as smoking, poor diet, alcohol consumption, and drug use. Noting risk factors for multiple chronic illnesses within this population, Shen, Sambamoorthi, and Rust (2008) examined data from the national Medical Expenditure Panel Survey (MEPS) for adults living with chronic illnesses such as obesity and mental illness. They found that 25% of adults with obesity and physical illness also had a mental illness. The total expenditures for obese adults with physical illness and mental illness were $9897annually compared to expenditures of $6584 for those with only physical illness.

Jones et al. (2004) studied the occurrence of chronic physical health problems in individuals with serious mental illness. Looking at Medicaid claims, they found that 74% in this population had at least one chronic physical problem and 50% of this population had at two chronic physical problems. Chronic pulmonary illnesses were noted as the most prevalent and the most comorbid. Using regression analysis, the researchers found that age, obesity, and substance abuse disorders were all risk factors in increasing chronic physical health problems in this population.

To assess the physical activity levels of individuals with SPMI, Daumit and Goldberg et al. (2005) examined the frequency of self reported physical activity in this population. They matched by age, gender, and race to data obtained from the National Health and Nutrition Examination Survey (NHANES II). They found a higher prevalence of obesity (46%; $p< 0.001$), less physically activity (49%; $p< 0.001$) in individuals with serious mental illness compared to the general population. Walking was the most common form of physical activity with 29% of this population reporting that it was their only form of physical activity in the past month.

The Health Promoting Lifestyle Profile (HPLP), the instrument used in the present study, was used by Holmberg and Kane (1999) along with the Denyes Self-Care Practices Instrument (DSCPI), Health Risk Appraisal (HRA), and Multidimensional Health Locus of Control Scale Form B (MHLC-B). They found that individuals with SPMI scored lower on all four of these scales and were less likely to perform self-care activities when compared to individuals without psychiatric disorders. Lack of self care, chronic illnesses such as obesity, and mental illness can all lead to poor quality of life.

Kolotkin and Corey-Lisle et al. (2008) looked at the impact of obesity on the quality of life in individuals with SPMI using the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) a 31-item self-report measure consisting of five subscales: physical function, self-esteem, sexual life, public distress, and work. Data indicated that obese participants reported more impairment and lower IWQOL-Lite scores than nonobese participants ($p<0.001$).

Pre-Post Research

Additional research studies investigate the effects of various interventions to lessen obesity in individuals with SPMI. Using a pre-post design these studies also assessed self-reports of health behaviors. Centorrino et al. (2006) looked at the effects of a weight loss study in individuals with SPMI. Twenty participants with schizophrenia or schizoaffective disorder who reported a weight gain of >4.5 kg and an increase in BMI of >5% since starting antipsychotic treatment were recruited for an intensive 24 week weight loss study. Participants were educated on diet, exercise, and counseling in weekly sessions which incorporated meal planning, and individualized fitness plans. While participants did not record self-reports of healthy behaviors, the participants were measured with a pre-test then monthly using the Quality-of-Life Questionnaire (QLS), Clinical Global Impressions (CGI), and Brief Psychiatric Rating scales (BPRS). Adverse effects of medications were measured using the Self-Report SF-36 Health Survey. Baseline followed by monthly tests of the QLS revealed no significant differences from baseline to end of the 24 weeks, while BPRS and CGI improved slightly within the first 6 months and remained stable. There were only minimal changes in ratings of neurological or other adverse effects. Data were analyzed using paired t-tests and average weight decreased by 6.0 kg (5.7%), and BMI decreased to 34.5 (by 5.7%). Blood pressures decreased from 130/83 to 116/74 (11% improvement), pulses fell slightly. Even under less intensive management for another 24 weeks, subjects regained only minimal weight (0.43 kg).

Chen et al. (2009) recruited 33 patients with schizophrenia and antipsychotic-related obesity in a 10-week multimodal weight control program. Participants were given pre-tests based on weight at baseline, then week 4, week 8, week 10 (end of the intervention), and post-test at week

12, week 24, and week 48. In addition to measuring weight, researchers also collected pre and post tests measured blood sugar levels, cholesterol levels, triglyceride levels, quality of life using the World Health Organization-Quality of Life-Brief version (WHO-QOL-BREF) scale, and mental health using the Positive and Negative Symptom scale (PANSS) and the Beck Depression Inventory (BDI). The intervention included nutritional counseling, exercise, and behavioral interventions to help reduce weight in these individuals. Data were analyzed using paired t-tests that indicated those in the intervention had a mean weight loss of 2.7 kg by the end of 12 months and a 1.1 decrease in BMI. Participants also showed significant improvements in WHO-QOL-BREF, PANSS, and BDI scores. The effectiveness of this weight loss intervention lasted up to 12 months in specific participants, indicating that a weight loss program targeted for individuals with SPMI can produce long term health benefits.

Control Group Research

Brown and Chan (2006) performed randomized control study with six weekly 50 minute sessions designed to promote health in individuals with serious mental illness. Subjects initially answered a basic health screening questionnaire, followed by the DINE questionnaire to assess diet and the GODIN questionnaire to measure frequency and intensity of physical activity prior to six weekly sessions of health education. Subjects gave self-reported ratings of their physical health, fitness and mental health on a Likert scale graded from 0 (very poor) to 10 (excellent) at baseline and after completion of the intervention. Researchers discovered that subjects in the intervention did report slight improvements in physical activity, increased fiber intake in their diets, an average weight loss of 0.9 kg, and self-reports indicated improved subjective well being in comparison to the control group.

Skouroliakou et al. (2009) recruited a total of 204 overweight subjects (63 without psychiatric disabilities and 141 individuals with SPMI) to participate in a weight loss study tailored for individuals with SPMI taking olanzapine. All participants with SPMI were recommended for the study by clinical psychologists and had been taking olanzapine for a minimum of one year with an average dosage of 8.96 ±0.2 mg/d, while members from the general population were placed in a matched healthy/control group. During the 3 month nutritional intervention participants were screened to assess lifestyle, eating habits, physical activity, and food preferences. Individual food plans were designed for the participants by a registered dietitian and participants were given weekly food diaries to assess adherence to diet as well as receiving dietary and exercise counseling. Behavioral interventions included teaching basic nutritional principles, healthy recipes, cooking techniques, and grocery shopping skills. Participants were instructed to participate in light to

moderate intensity exercise daily for 30 minutes and to record this activity in their weekly exercise log. Data obtained at baseline and at three months were tested with independent *t* test to compare changes in body weight, fat mass, and waist circumference. The nutritional intervention produced significant decreases in body weight, BMI, fat mass, and waist circumference over the 3 month period with no difference in weight loss between the population with SPMI and individuals in the healthy control. The study shows that personalized nutritional interventions are effective in decreasing body weight, fat mass, and waist circumference in individuals with SPMI over 3 months.

Weber and Wyne (2006) performed a randomized placebo-controlled design to test the effectiveness of a cognitive/behavioral group intervention in 17 individuals with schizophrenia or schizoaffective disorder taking atypical antipsychotics. Weight, BMI, and waist-hip ratio, and blood sugars were measured pre and post intervention. The cognitive/behavioral intervention involved a one hour group session once a week for 16 weeks where participants learned strategies via role play, goal setting, motivational scaling, problem solving, etc. to promote risk reduction for developing diabetes. Participants also kept food and activity diaries. Data were analyzed using paired t-tests. Researchers found that participants in the cognitive/behavioral approach lost an average of 5.4 lbs compared to those in the control group who lost only 1.3 lbs. There was also a 2.9% change in BMI for the treatment group.

A prospective comparative analysis by Poulin et al. (2007) recruited 110 patients with schizophrenia, schizoaffective, or bipolar disorders in a behavioral weight control program to reduce antipsychotic induced weight gain. The 59 randomly assigned participants completed an 18 month intervention program involving dietary education and physical activity counseling, while 51 participants were assigned to a control group that did not receive the clinical intervention. Body weight, height, waist circumference, BMI, plasma lipid-lipoprotein profiles, and fasting plasma glucose concentrations at were collected at 11 intervals throughout the study. Additionally, serum concentrations of prolactin, thyrotropin-stimulating hormone (TSH), and glycated haemoglobin (HbA1c) were assessed at four times. The Clinical Global Impression scale (CGI), Brief Psychiatric Rating Scale (BPRS), and the Short Form (SF)-36 Health Survey were used were used to assess psychological health of the participants. Data indicated a significant increase in bodyweight (4.1%), BMI (5.5%), and waist circumference (4.2%) in the control group compared to a significant reduction in bodyweight (-3.5%), BMI (-4.4%), and waist circumference (-4.6%) for the experimental group at the end of the study. In addition, LDL cholesterol, triglycerides, total cholesterol, fasting blood glucose, and HbA1c showed significant decreases in the intervention group when compared to baseline. While there were no self-reports of health behaviors, this study

shows that a behavioral weight loss program can be effective for individuals with SPMI over 18 months.

Jay Lee et al. (2008) recruited 232 South Korean psychiatric patients who had a diagnosis of either schizophrenia or schizoaffective disorder and were also taking antipsychotic medications were randomly assigned to a 12-week weight management program. All participants had a body mass index (BMI) 25 kg/m^2 or greater. Researchers measured changes in body weight and BMI over the course of the study to determine the effectiveness of the weight control program. Participants in the intervention showed significant reductions in BMI (0.98 ±1.01 kg/m^2, $p < .001$) and body weight (2.64 ± 2.75 kg, $p < .001$) compared to those in the control. Diet modification and compliance was the strongest indicator of weight loss for individuals with SPMI participating in this study.

Another study focusing on traditional weight loss practices recruited 53 individuals with schizophrenia from a veteran's hospital in Taiwan and randomly assigned them to a study group of 28 or a control group of 25. All participants had BMI greater than 27 and were taking clozapine. The study group was placed on a reduced calorie diet, cutting 200 to 300 calories per day for a period of six months. Participants also participated in regular physical activity burning a total of 600 to 750 kcal per week. Results found that compared to the control group, there was a significant decrease in BMI (5.4% reduction), waist circumference (3.3cm), as well as a decrease in triglyceride levels, Wu et al. (2007).

In addition to utilizing general weight loss practices, other researchers incorporated cognitive and behavioral interventions to help reduce and maintain weight loss in individuals with SPMI. Melamed et al. (2008) randomly assigned 59 individuals diagnosed with schizophrenia or schizoaffective disorder to a behavioral weight reduction intervention and control groups. In addition to behavioral modification, participants were given nutritional information and physical exercise to help reduce their body mass index (BMI). A 2x2 ANOVA was performed to compare the baseline, one, two, and three month BMI measures between the control and experimental groups. Data showed a significant weight reduction in the experimental group from one to three months when compared to the control group. Also, a significant improvement in self-report of quality of life was evident in the experimental group compared to the control group showing that a combination of behavioral and traditional weight loss methods are effective in reducing weight and improving quality of life in this population.

McKibbin et al. (2006) also performed a randomized controlled trial with 64 participants aged 40-81 and diagnosed with schizophrenia or schizoaffective disorder to test a lifestyle

intervention for older schizophrenia patients with type-2 diabetes. Participants were randomly assigned to 24 week diabetes awareness and training (DART) sessions where they had weekly weights, pedometers, healthy food sampling, and other strategies to implement behavioral changes. Physical activity was measured using an accelerometer worn around the waist and by participant self-reports on the Yale Physical Activity Scale (YPAS). Diet was measured using the Block Brief 2000 Revision of the Health Habits and History Questionnaire. Participants in the DART program showed significant reductions in BMI, weight changes (5%), waist circumference, and plasma triglycerides when compared to the control group. Analysis of diet indicated that participations in the intervention reduced their daily fat consumption from 2.8 servings to 1.7 servings, while the control group did not decrease their fat consumption from pre to post intervention. Additionally participants in the intervention reported an increase in total activity summary index as measured by the YPAS while individuals in the control decreased. Not only did this study reduce diabetes risk factors, it also produced healthier lifestyles for individuals with SPMI.

Cabassa et al. (2010) completed a systematic review of quality of lifestyle interventions for this population. Twenty-three articles were assessed that reported physical and health promotion outcomes of lifestyle interventions utilized in individuals classified with serious mental illness. After rating the studies using the Methodological Quality Rating Scale (MQRS) the researchers noted that the most effective interventions utilized behavioral techniques, such as goal setting, skills training, and motivational counseling to improve diet and physical activity levels. Of the studies included, all used anthropometric assessments, such as BMI or weight loss, to measure health outcomes as opposed to self-reports of health behaviors. Overall, specific lifestyle interventions targeted for individuals with serious mental illness can not only reduce weight and risk factors for diabetes, but enhance physical activity and nutrition, too.

In the larger federally funded grant *A Psychiatric Rehabilation Approach to Weight Loss* (Brown, 2006) a randomized control designed was used to test a psychosocial rehabilitation weight loss program on weight reduction and health promotion behaviors in individuals with serious mental illness (Brown, Goetz, & Hamera, in press). Eighty-nine participants completed the Recovering Energy through Nutrition and Exercise for Weight loss (RENEW) program. RENEW uses evidence based weight loss strategies such as calorie deficits and daily physical activity as well as psychiatric rehabilitation through social support, goal setting, skill transfer training, and strategies to compensate for cognitive impairments in this population.

Participants in this randomized study attended weekly three hour sessions with active instruction and active participation in nutrition and physical activity and were given two meal

replacements per day. Over the next three months participants met monthly for a three hour session on active instruction and participation in nutrition and physical activity and received weekly phone support, but no meal replacements. Participants were also required to complete a 52 item questionnaire assessing self-reports of six health behaviors: health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management at baseline, three months, and six months. The intervention produced an average weight loss of 5 pounds in participants that was maintained at six months, illustrating that individuals with serious mental illness can benefit from diet and exercise programs and sustainably improve their health behaviors (Brown, Goetz, & Hamera, in press).

The present study examines the effects of a psychosocial weight loss intervention by assessing self-reports of healthy behaviors and focuses on the two specific health behaviors-physical activity and nutrition from the HPLPII. When assessing these self-reports at 3 months, 6 months, and 12 months there is expected to be an increase in healthy behaviors that occurs over time in the intervention group compared to the control group.

Methods

This study analyzes data from A Psychiatric Rehabilitation Approach to Weight Loss (Brown, 2006). A repeated measure ANOVA is performed to examine differences between the intervention and the control groups in self-reported nutrition and physical activity from the HPLPII at baseline, 3 months, 6 months, and 12 months.

Sample

The sample included adults age 21 to 65 that have a diagnosis of serious mental illness, a BMI greater than or equal to 25, and a stable weight with no change greater than 10 pounds in the past three months. Participants were recruited from four community support programs, three in the Kansas City area and one in Las Vegas, providing services to individuals with SPMI. The study was approved by the IRBs of the University of Kansas Medical Center and Touro University, Nevada. After complete description of the study to participants, written informed consent was obtained. Individuals were stratified by psychiatric medication risk for weight gain into high (olanzapine, clozapine, lithium), moderate (risperidone, chlorpromazine, quetiapine, valproate) and low/no (molinidone, ziprasidone, fluphenazine, haloperidol, aripiprazole) risk groups using guidelines from a consensus conference on antipsychotic drugs and obesity (American Diabetes Association, 2000) and randomly assigned to the intervention or control group. There were 47 participants randomly assigned to the intervention group and 42 to the control group. There were 35 (39%)

male participants, and the mean age was 44.6 (±10.9). Racial distribution included 60% Caucasian, 34% African American, and 6% other races

Measure

The HPLP, was used to measure health behavior of participants. The HPLP was created in 1987 by three nurses, Walker, Pinder, and Sechrist (Walker et. al, 1987). This scale has been modified over time to measure frequency of self-reported health promoting behaviors. Healthy behaviors as defined by the HPLP scale include: health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management. The scale consists of a 52 item questionnaire relating to specific healthy activities. Responses are rated: never, sometimes, often, or routinely. This study focuses on the physical activity and nutrition subscales as assessed by the HPLPII. The scale has nine items relating to nutrition and eight items relating to physical activity. Five of the nutrition items relate to the food pyramid and specific serving sizes of food. They require participants to rate their adherence to the range of servings in each food group e.g. fruit, vegetable, carbohydrates, dairy, and fats per day. One item requires participants to be able to identify and read nutrition labels. Of the eight items that regard physical activity, three items require participants to report amounts of exercise per week. Two of the items suggest participants use equipment, such as a bicycle, for exercise.

The HPLPII scale has a high alpha coefficient of 0.919, signifying that items are measuring a similar construct. Additionally a t-retest *r* of 0.854 indicates stability of the scale. Another indication of validity of the HPLPII is the factor analysis of the six subscales: health responsibility, physical activity, nutrition, interpersonal relations, spiritual growth, and stress management. The HPLPII has been used in multiple studies, one example is the *Depression and Health-Promoting Lifestyles of Persons with Mental Illness* by Jensen and Decker et al. (2006). They found a total alpha coefficient of 0.92 and subscale alpha coefficients for stress management= (0.86), interpersonal relationships= (0.87), spiritual growth= (0.91), nutrition= (0.77), physical activity= (0.91), and health responsibility= (0.89).

Intervention

There were three phases to the intervention that included a 12-week intensive phase, 12-week maintenance phase, and a 6-month intermittent phase. During the intensive phase participants attended a three hour weekly session where they learned skills training, goal setting, participated in physical activity, and ate a nutritious lunch. The participants could also attend an optional one hour exercise session once or twice a week. During the intensive phase participants were given two meal replacements for each day of the week while they were learning portion sizes

for weight loss. During the maintenance phase (weeks 13-24), participants were instructed in transferring behavioral changes into habit patterns at the monthly 3-hours sessions. The participants continued to have the opportunity to participate in 1 hour exercise sessions once or twice a week and received weekly phone calls and newsletters in the mail. They also had the opportunity to participate in individualized grocery shopping training. The intermittent intervention occurred during weeks 25-52. Participants did not receive face to face contact but did receive feedback, reminders, and support to continue to adhere to behavioral changes through weekly phone calls and monthly newsletters.

Analysis

Data were collected from 2007 – 2009 and analyzed using SPSS X.0 software. Descriptive statistics were generated to describe the sample. The hypothesis was tested using a repeated measure ANOVA on the HPLPII subscales, nutrition and exercise.

Results

A total of 59 participants completed the study, 27 of which were in the control and 32 in the intervention. The primary psychiatric diagnoses of participants were schizophrenia spectrum disorders (n=31), bipolar disorder (n=14), and major depressive disorders (n=14). Fifty-eight (n=34) of the participants were female and the mean age for participants was 46.02 (± 10.55 SD). Ethnic/racial participants included 25 African Americans, 33 Caucasians, and 1 other group.

A repeated measure ANOVA with analysis of variance was performed to evaluate change over time in self-reports from HPLPII subscales, nutrition and physical activity, between participants in the control and intervention groups. There were 9 questions on nutrition yielding a possible range of scores from 9 to 36. There were 8 questions pertaining to physical activity yielding a possible range of scores from 8 to 32. Table 1 shows the means and standard deviations for individuals in the control and intervention groups for each testing period. The means for the nutrition subscale show small increases in both the intervention and control groups. Means for the physical activity subscale show improvements in physical activity for the intervention group at 3 and 6 months and little changes in the control group.

The time main effect from self-report of nutrition activities X the testing periods (time) were compared between the control and intervention group. Using the multivariate criterion of Wilks's lambda (∧), change in self-reports of nutrition over time between groups was not significant, $\wedge = .94$, $F(3,55) = 1.09$, $p = .363$.

The time X group of self-report of physical activity were tested using the multivariate criterion of Wilks's lambda (Λ). The change in self-reports of physical activity over time was significant, Λ= .83, F(3,55)= 3.83, *p*= .02. Additional analysis was conducted to identify which time periods differed. From baseline to three months self-reports of physical activity were found to be significantly different between the control and intervention groups, Λ= .93, F(1,57)= 4.4, *p*= .04. Similarly baseline to six months self-reports of physical activity between groups were also significant, Λ= .91, F(1,57)= 6.0, *p*= .02. From baseline to 12 months self-reports of physical activity were not significant by group, Λ= 1, F(1,57)= .18, *p*= .68.

Discussion

The findings show an increase in physical activity from baseline after 3 months of weekly intervention sessions and at 6 months after monthly intervention sessions but not at 12 months after there had been no face to face interventions for 6 months. Unlike the physical activity subscale of the HPLPII, the nutrition subscale did not show differences between the intervention and control groups at any of the testing times. This implies that participants in the intervention made more changes in physical activity than in their diet.

Before accepting this conclusion, other explanation for the lack of findings with the nutrition subscale of the HPLPII need exploration since approximately equal time was spent on both topics in the 3 hour intervention sessions. One possible explanation is the type of items in the nutrition subscale. Five of the nine items in the nutrition subscale focused on the food pyramid and serving sizes of food. This requires distinguishing between food groups and understanding what are serving sizes for each food group; a fairly complex task. For example "getting 5-11 servings of carbohydrates daily" requires understanding what carbohydrates are and that the number of serving needed depends on basic energy requirements and energy expenditure. In addition since most people eat more than once a day it is more difficult to calculate total daily intake. Items assessing physical activity were not as complex. For example "do stretching exercises at least 3 times per week" only requires the simple task of stretching with a minimal frequency and less cognitive effort on the part of the participant.

Another explanation for the increase in physical activity and lack of improvement in nutrition could have been that the information was learned but was too difficult to implement. Due to increased poverty levels in this population, participants may not have been able to purchase healthy foods, while exercise such as walking, dancing, running is free. Individuals with SPMI may not have access to nutritious foods in the neighborhoods where they live and lack transportation to

go get to larger grocery stores with more selection and lower prices. Also, when eating out, participants may not have been able to obtain nutrition information about their food.

The improvement in self-report of physical activity must be tempered with the possibility that participants may have overestimated their actual activity or wanted to please or look good to the investigators. This reactivity effect occurs when subjects want to meet the perceived expectation of the researchers (Macnee, & McCabe, 2008). In addition, one study that used the UCLA Activity Score (Grimby scale) in which participants rated their levels of physical activity noted that a major disadvantage of the use of self-report scales is that although they give an impression of the level of physical activity, they do not provide details on duration, frequency, and energy expenditure. Therefore, it cannot be determined to what extent participants completed physical activity compared to their self-reports of activity (Wagenmakers et. al, 2011). Furthermore, there is a tendency for people to overestimate time spent exercising. While reported physical activity can be used to make indirect measurements of energy expenditure, multiple validations of physical activity questionnaires indicate that individuals, especially those who are older and overweight, tend to overestimate their amounts of physical activity (Walsh et. al, 2004).

Results of this study were concurrent with such studies as Brown and Chan (2006) that resulted in weight loss as well as increases in physical activity for individuals with SPMI that participated in a weight loss intervention. Results of this study were also congruent with the Melamed et al. (2008) study implementing cognitive behavioral interventions that resulted in sustained weight loss in individuals with SPMI. While Daumit and Goldberg et al. (2005) examined self-reports of physical activity in individuals with SPMI, this study was the first of its kind that recorded participants self-reports of healthy behaviors throughout participation in a weight loss intervention.

Conclusion

Individuals with severe mental illness who participate in a weight loss study reported an increase in physical activity from baseline compared to individuals in the control group at 3 months and 6 months, but not at 12 months. There was no difference in self report of nutrition. Further study is needed to determine if self-report of increased physical activity is confirmed with actual increase in activity.

Table 1 Means (Standard Deviation) for total physical activity and nutrition subscales of HPLPII for intervention and control groups (N=59) at baseline, 3, 6, and 12 months

		Testing Periods		
Subscales	**Baseline**	**3 Months**	**6 Months**	**12 Months**
Nutrition				
possible range: 9 to 36				
Intervention	20.88 (4.34)	24.5 (4.42)	23.31 (5.25)	23.63 (4.56)
Control	20.6 (4.34)	22.9 (5.26)	22.07 (6.23)	21.78 (5.71)
Physical Activity				
Possible range: 8 to 32				
Intervention	16.66 (4.56)	20.47 (4.72)	19.97 (4.71)	18.19 (4.86)
Control	15.3 (5.07)	16.52 (4.96)	15.44 (4.99)	16.26 (5.16)

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