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The purposes of this quasi-experimental pilot study were to determine adherence to a 12-week group-based moderate-intensity walking program for sedentary adult outpatients with serious and persistent mental illness and to examine change from baseline to after the walking program in health status (mental and physical health, mood, and psychosocial functioning) and exercise motivation (exercise outcomes expectancies, exercise decisional balance). The 15 volunteers in this study were aged 21 to 65 years and enrolled in psychosocial rehabilitation; they participated in a 12-week walking program meeting three times per week for 1 hr, supplemented with four health information workshops delivered at the beginning of the study. Participants received individual exercise prescriptions determined by preprogram fitness testing and used heart rate monitors during walking sessions. Thirteen participants (87%) completed the study and attended 76% of the walking sessions. Overall, they walked at lower intensity than prescribed, with pulses within target heart rate ranges 35% of the time during Weeks 1 through 4, 26% of the time during Weeks 5 through 8, and 22% of the time during Weeks 9 through 12. However, mood improved (Profile of Mood States, $t = -2.51$, *two-tailed,* $df = 12$, $p = .02$*), as did psychosocial functioning (Multnomah Community Ability Scale, two-tailed,* $df = 12$, $t = 2.49$, $p = .02$*). The findings indicate a walking group may be feasible for rehabilitation programs. In addition to the known cardiovascular risk-reduction benefits of regular walking, walking may improve mood and psychosocial functioning in adults with serious and persistent mental illness.*

Key words: *exercise; monitoring, ambulatory; walking; psychiatric patients*

Serious and persistent mental illness (SPMI) affects millions of American adults and is a leading cause of disability (National Institute of Mental Health, 2001). Estimates vary, but in a given year, schizophrenia affects 2.2 million people, bipolar disorder 2.3 million, and major depressive disorder 9.9 million, with many having more than 1 mental disorder (National Institute of Mental Health, 2001). Beside the suffering of mental illness, having an SPMI is often associated with additional health disparities, including high risk for premature disability and death due to cardiovascular disease. People with SPMI have higher lifetime rates than the general population for hypertension

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(34.1% vs. 28.7%), diabetes (14.9% vs. 6.4%), and heart problems (15.6% vs. 11.5%; Dixon, Postrado, Delahanty, Fischer, & Lehman, 1999; National Center for Health Statistics, 2004). They are also as obese or more obese than the general population (Allison, Fontaine, et al., 1999; Davidson et al., 2001). In part, this obesity may be related to the weight gain associated with commonly used psychiatric medications, mainly some of the second-generation, or "atypical," antipsychotics (Green, Patel, Goisman, Allison, & Blackburn, 2000; Wirshing et al., 1999). For example, patients on the atypical antipsychotic olanzapine gain an average of 9 pounds after 10 weeks and 26 pounds after a year (Allison, Mentore, et al., 1999). Although these medications are efficacious, their use can further increase health risks for diabetes, hypertension, and hypercholesterolemia (Green et al., 2000; Henderson et al., 2000; Koro et al., 2002a, 2002b; Meyer, 2001). Antipsychotic medications, particularly atypicals, are now considered to pose health problems so significant that the American Diabetes Association recently convened a consensus conference. They recommended nutrition and physical activity counseling for all overweight or obese patients on antipsychotic drugs, especially if they are being placed on an antipsychotic associated with weight gain (American Diabetes Association et al., 2004).

Despite these recommendations, people with SPMI generally are physically inactive (Brown, Birtwistle, Roe, & Thompson, 1999; Davidson et al., 2001; Elmslie, Mann, Silverstone, Williams, & Romans, 2001). This lack of physical activity contributes to obesity and increases risk for cardiovascular disease (U.S. Department of Health and Human Services, 2000). Being physically active and exercising are among the most strongly supported behaviors shown to prevent or reduce the impact of cardiovascular disease and promote health. Although the precise dose-response relationships are not yet known (Blair, Cheng, & Holder, 2001), observational studies demonstrate a consistent inverse, curvilinear gradient for activity and cardiovascular risk, with the steepest reduction in risk accruing to individuals moving from sedentary to some activity (Blair et al., 2001).

On average, moderate exercise lowers systolic and diastolic blood pressure by 7.4 and 5.8 mm Hg, respectively (Fagard, 2001). Also, moderate to vigorous exercise raises high-density lipoprotein (HDL) cholesterol 4.6% and decreases low-density lipoprotein (LDL) cholesterol and triglycerides by 3.7% and 5.0%, respectively (Leon & Sanchez, 2001). Moderate-intensity exercise can prevent type 2 diabetes, with diet and exercise together yielding a 58% reduction in incidence over 2.8 to 3.2 years (Knowler et al., 2002; Tuomilehto et al., 2001) and exercise alone a 46% reduction over 6 years (Pan et al., 1997). In people with type 2 diabetes, moderate-intensity exercise improves carbohydrate metabolism, insulin sensitivity, and glycemic control (Thompson et al., 2001).

Physical activity may also benefit mental health in people with SPMI. During acute psychosis, patients suffer with hopelessness, helplessness, and a fragile sense of well-being (Lysaker, Clements, Wright, Evans, & Marks, 2001). These depressive syndromes persist in the years following an acute psychotic episode, affecting 30% to 60% of patients (Menzies, 2000). Exercise may reduce symptoms of depression resulting from mental illness (Craft & Landers, 1998) and has been consistently associated with positive mood by increasing feelings of vigor and reducing tension, fatigue, and confusion (Biddle, 2000). However, still needed are well-controlled trials, a physiological explanation for the observed effects, and evidence of a dose-response curve (Dunn, Trivedi, & O'Neal, 2001).

There is almost no systematic research on the outcomes of exercise in psychotic disorders (Meyer & Broocks, 2000). Plante (1996) found seven studies, all of which were case reports or small group studies. Findings suggested that exercise had little effect on thought disorders per se, but it did improve mood. A 1999 review of exercise interventions in patients with schizophrenia identified eight preexperimental, three quasi-experimental, and only one experimental study

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(Faulkner & Biddle, 1999). The analysis concluded that exercise might be useful for negative symptoms (lack of energy, withdrawal) and may help to relieve comorbid depression and/or anxiety and that adherence to exercise was no better or worse than it is in the general population (Faulkner & Biddle, 1999).

The purpose of this pilot study was to determine adherence to a group-based, moderate-intensity walking program to improve cardiovascular fitness in adults with SPMI who were enrolled in a psychosocial rehabilitation program. Additional aims were to examine outcomes of the program, including changes in health status (mental and physical health, mood, and psychosocial functioning) and exercise motivation (exercise outcomes expectancies, exercise decisional balance).

Methods

Sample and Setting

The study was conducted at a program site of a leading psychosocial rehabilitation agency in metropolitan Chicago. The participants were 15 outpatients affiliated with the site who agreed to participate in a moderate-intensity 12-week group-based walking program meeting three times a week. Eligibility criteria for the study were psychiatrically stable men and women between the ages of 20 and 65 who were sedentary in their leisure time. Psychiatric stability was defined as having been enrolled in psychosocial rehabilitation for at least 3 months, and sedentary was defined as not participating in physical conditioning or moderate- to high-intensity leisure-time physical activities for 20 min or more per session two or more times per week during the preceding 6 months. Exclusion criteria were major signs or symptoms suggesting pulmonary or cardiovascular disease; self-reported or past history of a myocardial infarction, stroke, or type 1 diabetes; blood pressure ≥160/100 mm Hg; use of beta-blockers, diltiazem, or verapamil (because these directly affect heart rate response to exercise); abnormal electrocardiogram (ECG) contraindicating participation in a moderate-intensity walking program; or other disability preventing participation in a moderate-intensity walking program.

Participants were recruited primarily via oral presentations at group meetings at the program site. Additional strategies included word of mouth, a letter to agency psychiatrists announcing the study, and flyers posted at the site and sent to group homes affiliated with the site. Of 24 individuals indicating interest in participating in the study, 16 were eligible after further screening and 15 enrolled. Use of beta-blocker antihypertensive medication was the most common reason for ineligibility. The participants ranged in age from 21 to 65 years (mean = 41.1, *SD* = 12.1), and 53% were female. By ethnicity, 60% were African American, 27% were White, and 13% were Hispanic. Psychiatric diagnoses included schizophrenia or schizoaffective disorder (66.6%), bipolar illness (26.7%), and major depression (6.7%). All were under psychiatric care, typically seeing their psychiatrist monthly for follow-up and medication management, and all were receiving one or more psychotropic medications, including atypical antipsychotics such as risperidone and olanzapine (73.3%), first-generation antipsychotics such as haloperidol (26.6%), medications for bipolar mania such as lithium and divalproex sodium (60%), and antidepressants such as bupropion and fluoxetine (19%).

Measures

Cardiovascular risk. The American College of Sports Medicine (ACSM) risk-stratification criteria were used to assess cardiovascular risk (ACSM, 2000, Table 2-1, p. 24), with risk factor thresholds for hypercholesterolemia and impaired fasting glucose updated to current cutoffs (American Diabetes Association, 2003; National Cholesterol Education Program, 2001). Family history of early cardiovascular disease, that is, myocardial infarction, coronary revascularization, or sudden death in a first-degree relative (male younger than 55 years or female younger than 65 years); smoking status; and previous medical history of hypertension and diabetes were assessed in the health history. Physiologic measures included blood pressure; fasting total, HDL, and LDL cholesterol and triglycerides; and a comprehensive metabolic profile for fasting glucose as well as electrolytes and liver and kidney functions. Height in inches and weight in pounds were used to calculate body mass index (BMI), which was further classified into normal weight, overweight, and obese categories established by the National Heart, Lung and Blood Institute (1998). For fitness testing results, the heart rate at exhaustion (rate of perceived exertion [RPE]) was compared to 85% of maximum predicted heart rate (220 – age), the goal required to reliably estimate VO_{2max} (ACSM, 2000). Level of fitness, rated as poor, fair, or good, was determined by time on treadmill to reach exhaustion following the modified Bruce protocol (ACSM, 2000).

Adherence. Adherence was measured both by percentage of participants completing the program and by percentage attendance for the 30 walking sessions held during the program. Adherence to the exercise prescription was measured by the Polar Vantage SL heart rate monitor worn during walking sessions (Wilbur, Chandler, & Miller, 2001). A heart rate monitor consists of a chest belt that senses the heart's electrical signals and transmits information to the wrist monitor, which resembles a sports wristwatch. The heart rate is displayed on the face of the wrist monitor, and the average heart rate for each minute is stored as individual files for each walking session. Adherence to the exercise prescription was calculated as percentage of time during each walk that participants attained heart rates within the target heart rate range for the duration prescribed. Percentages were then aggregated by the three target heart rate ranges specified in the walking prescriptions: Weeks 1 to 4, 5 to 8, and 9 to 12.

Health status. The 12-item Short-Form Health Survey measures health-related quality of life by assessing general health, physical and social functioning, role limitations caused by physical or emotional problems, mental health, vitality, and bodily pain in populations including those with SPMI (Salyers, Bosworth, Swanson, Lamb-Pagone, & Osher, 2000). The 30-item Profile of Mood States (POMS) Brief measures affective mood state fluctuations in a variety of populations including psychiatric outpatients, where it is used to measure mood change outcomes of treatment (McNair, Lorr, & Droppleman, 1971). The Multnomah Community Ability Scale is a 17-item case manager rating of psychosocial functioning and disability for people with SPMI living in the community and was a quality measure used in the participating agency twice a year (Barker, Barron, McFarland, & Bigelow, 1994).

Exercise motivation. The Outcomes Expectancies for Exercise Scale is a 9-item scale measuring expected benefits from physical activity (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). The scale is summed and averaged, with 1 indicating low expectations and 5 high expectations (Marcus & Forsyth, 2003). The Decisional Balance Scale is a 16-item scale measuring benefits of and barriers to physical activity (Marcus, Rakowski, & Rossi, 1992). Subtracting the averaged barriers from the averaged benefits scores the scale. A positive score means more benefits than barriers are perceived (Marcus & Forsyth, 2003).

Procedure and Intervention

After institutional review board approval and informed consent, participants were screened for the eligibility criteria via a brief questionnaire. This was followed by additional screening: (a) health history, physical examination, and resting ECG; (b) fasting laboratory testing, including complete blood count, comprehensive metabolic and lipid profiles, and urinalysis; (c) review and clearance for fitness testing by the study cardiologist; (d) aerobic fitness testing at the university Human Performance Laboratory using the modified Bruce protocol; and (e) review and clearance for participation in moderate-intensity walking by the study cardiologist.

The intervention consisted of the study orientation and structured group sessions meeting three times a week for 12 weeks. The study orientation was an individual appointment to receive the exercise prescription and instructions, problem solve, and set goals. The exercise prescription was individualized for each participant by the exercise physiologists performing the preprogram aerobic fitness testing and standardized to mode (walking), frequency (two to three times per week), intensity (60%-79% of each participant's predicted maximal heart rate), and duration (progressing from 10 to 30 min of continuous walking; ACSM, 2000). The prescriptions included an initial conditioning stage with gradually increasing duration, frequency, and intensity and provided both target heart rates and RPE (Borg, 1998) as a guide for intensity. Instructions included walking and stretching techniques, self-monitoring using a heart rate monitor and log, and coaching in how to use heart rate and RPE to gauge exercise intensity. Problem solving addressed ways to overcome barriers anticipated by the participant. Goal setting included stretching after walking, using the exercise prescription as a weekly guide, and planning for session attendance.

The structured group sessions and all walks were led by a psychosocial case manager cross-trained to support, educate, and motivate new exercisers as they became more physically active, with assistance by a member of the research staff. During Weeks 1 to 4, the emphasis was on conditioning and weekly workshops. Two sessions each week focused on conditioning activities, with warm-up, 10 to 15 min of walking, and cool down and stretching. The third session was a workshop that included group discussion, worksheets, problem solving, and goal setting to increase exercise motivation and knowledge and help overcome barriers, develop adherence, and prevent relapses.

After completion of the initial conditioning phase (Weeks 1 to 4), the emphasis was on increasing aerobic fitness and reinforcing learning, with the group walking three times a week and increasing intensity and duration in accordance with their personal prescriptions. By Week 12, they were walking for 25 to 30 min each time. All walking sessions also included warm up, cool down, stretching, and, as appropriate, 10 to 15 min for problem solving, sharing successes, and providing support for one another.

Data Analysis

Data analysis included descriptive statistics for cardiovascular risk factors, fitness testing results, and adherence to walking. To analyze the heart rate monitor data, the data were sampled by trimming recordings to control for inconsistencies when participants turned off their heart rate monitors. For each minute-by-minute recording of a walk, data for Minutes 1 to 10, 1 to 15, 1 to 20, or 1 to 25 were analyzed, with duration depending on walking prescription; any remaining minutes after Minute 25 were discarded. The number of minutes within, below, or above the target heart rate range was then counted for each walk, and percentages were calculated for each of the durations specified in the exercise prescription (10, 15, 20, and 25 min). Percentages were weighted by the number of walks and averaged for each of the three target heart rate ranges in the exercise prescription. To estimate overall adherence to intensity across participants, percentages for each of the target heart rate ranges for each participant were averaged. To analyze changes in mental and physical health status, exercise outcomes expectancies, exercise decisional balance, mood, and level of psychosocial functioning, pre- and post-means, change scores, and paired *t* tests were performed, setting significance at $p = .05$.

Results

The participants had high risk for cardiovascular disease (Table 1), including smoking (40%), hypercholesterolemia (67%), hyperglycemia (47%), and obesity (87%). All completed fitness testing done as part of preprogram screening to rule out ischemic heart disease, walking a mean of 10.87 min on the treadmill per the modified Bruce protocol before exhaustion (range, 7-13 min; $SD = 1.8$ min). The mean heart rate attained was 84% of predicted maximum (range, 62%-100%; $SD = 9\%$); the main reason for not attaining 85% of predicted maximum was leg pain and cramping. One subject had an abnormal fitness test due to left ventricular hypertrophy from prior uncontrolled hypertension but was subsequently cleared to participate after a stress echocardiogram. All but 1 tested at the poor or fair level of fitness, indicating sedentary lifestyle or low participation in physical activity.

Thirteen subjects (87%) completed the study. One subject withdrew for full-time employment after completing orientation but before the walking group began. Another participant who was severely obese walked only once before withdrawing. The average attendance for the walking sessions was 76% of the 30 walking sessions held during the 12 weeks of the program (range, 60%-100%; $SD = 13\%$). Many (60%) of the absences occurred because of conflicts with other scheduled activities such as medical or welfare ap-

Table 1. Cardiovascular Risk Factors Among a Sample of Adult Outpatients in Psychiatric Rehabilitation Participating in a Moderate-Intensity Walking Program ($N = 15$)

Risk Factor[a]	*n*	%
Positive risk factors		
Family history, early cardiovascular disease	2	13
Smoking	6	40
Diagnosed hypertension	2	13
Hypercholesterolemia	10[b]	67
Triglycerides >150	2	20
High-density lipoprotein (HDL) <40	5	50
Low-density lipoprotein >130	4	40
Hyperglycemia	7	47
Impaired fasting glucose	4	57
Diagnosed type 2 diabetes	3	43
Body mass index		
Normal weight (18.5-24.9)	1	7
Overweight (25-29.90)	1	7
Obese	13	87
Obesity class 1 (30.0-34.9)	3	23
Obesity class 2 (35.0-39.9)	4	31
Extreme obesity (≥40)	6	46
Negative risk factor		
High serum HDL (>60)	1	7

a. From the American College of Sports Medicine (2000), with updated reference ranges for cholesterol from the National Cholesterol Education Program (2001) and for hyperglycemia from the American Diabetes Association et al. (2004); impaired fasting glucose is now defined as >100 mg/dL.

b. Half of these (5 subjects) were on medication for hypercholesterolemia; the other 5 were not. Some subjects had more than one lipid abnormality.

pointments, job interviews, or the agency's 2-day summer camp.

The heart rate monitor data are summarized in Table 2. On average, participants walked within their target heart rate ranges 35% of the time during Weeks 1 to 4, 26% of the time during Weeks 5 to 8, and 22% of the time during Weeks 9 to 12. Thus, although participants did attend the walking sessions and received coaching by program staff, they did not attain or maintain the recommended intensity for the prescribed time when they walked even though they used heart rate monitors to help them attain this intensity.

Table 3 shows changes from baseline to after the group-based, moderate-intensity walking program in mental and physical health status, exercise outcomes expectancies, exercise decisional balance, mood, and level of psychosocial functioning. There was no change in health as measured by the SF-12 Health Survey (physical health $t = -0.055$, two-tailed, $df = 12$, nonsignificant [NS]; mental health $t = -0.035$, two-tailed, $df = 12$, NS). Compared to norms for the general U.S. population, the SF-12 scores were between the 25th and 50th percentile (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). Expectations as to the benefits of exercise were high both at baseline (mean = 4.47 ± 0.39) and after the program (mean = 4.64 ± 0.41) and did not change significantly. On decisional balance for exercise, perceived benefits outweighed barriers at both baseline and after the program and did not change significantly. Mood improved by the end of the study ($t = -2.51$, two-tailed, $df = 12$, $p = .02$). Among the POMS subscales, vigor-activity increased ($p = .05$). Psychosocial functioning also improved as measured by the Multnomah Community Ability Scale ($t = 2.49$, two-tailed, $df = 12$, $p = .02$), with the most improvement in subscale scores measuring medication compliance ($p = .027$) and response to stress and anxiety ($p = .056$).

Discussion

With the exception of hypertension, the sample in this pilot study had much higher levels of cardiovascular risk than the general population (see Table 1). Whereas 30.9% of U.S. adults are obese (National Center for Health Statistics, 2004), 87% of the participants were obese, and almost half of these were extremely obese, with a BMI ≥ 40. Consistent with this obesity, almost half had hyperglycemia, and two thirds had lipid abnormalities. The high rate of smoking, 40% (vs. 23% in the general population), reflects the increased prevalence of smoking among people with SPMI (Brown et al., 1999; National Center for Health Statistics, 2004). The low level of fitness is consistent with sedentary lifestyle. Scores on the SF-12 measure of self-perceived health, comparing to the 25th to 50th percentile of the general population, indicate that the participants considered their health to be below average.

However, the study also demonstrates that outpatients enrolled in psychiatric rehabilitation will volunteer for a 12-week exercise program and adhere to walking two to three times a week. Retention in the

Table 2. Adherence to Moderate-Intensity Walking in Adult Outpatients in Psychiatric Rehabilitation Using Heart Rate Monitors to Walk at Prescribed Intensity (*N* = 13)

	Percent of Time Walking in Prescribed HRR		
Pulse	**Range 1 (Weeks 1-4)**	**Range 2 (Weeks 5-8)**	**Range 3 (Weeks 9-12)**
1-10 beats above HRR	18.14	15.81	4.64
Within HRR	35.09	26.09	21.71
1-10 beats below HRR	20.49	23.03	18.33
>10 beats below HRR or missing	26.29	35.07	55.32

NOTE: HRR = heart rate range.

Table 3. Changes in Health Status and Exercise Motivation From Baseline to After a 12-Week Walking Program for Outpatients Enrolled in Psychiatric Rehabilitation (*N* = 13)

Measure	Pre	Post	Change	*t*	*P*
Health status					
Mental health	51.94 ± 8.09	51.84 ± 8.64	–0.10 ± 10.85	–0.035	NS
Physical health	49.67 ± 6.81	49.51 ± 6.10	–0.15 ± 10.36	–0.055	NS
Mood	12.92 ± 14.60	1.38 ± 17.07	–11.53 ± 16.56	–2.51	0.027
Psychosocial functioning	62.15 ± 8.44	66.92 ± 7.51	4.76 ± 6.88	2.49	0.028
Exercise motivation					
Outcomes expectancies	4.47 ± 0.39	4.64 ± 0.41	0.17 ± 0.43	1.42	NS
Decisional balance	1.96 ± 1.17	1.58 ± 1.42	–0.38 ± 1.22	–1.12	NS

NOTE: *df* = 12 for all comparisons.

study was acceptable at 87%, with one of the two withdrawals occurring because of employment, which is of course a primary goal of psychosocial rehabilitation. Attendance at the walking sessions was also acceptable at 76%. The adherence outcomes of the study are higher than the 50% average adherence for structured exercise programs in the general population (Dishman & Buckworth, 1996).

Findings from the heart rate monitor recordings indicate that even though the participants had feedback from their monitors to assist them in attaining and maintaining moderate-intensity effort during the walking sessions, they walked at the recommended intensity less and less of the time as the program progressed. During Weeks 1 to 4, the conditioning phase of the study, participants had the highest adherence to recommended intensity, reaching it 35% of the time. The exercise prescriptions were planned to progress the participants to 70% to 80% of their maximum heart rate range as established in preprogram fitness testing by Weeks 9 to 12 of the study, as recommended by ACSM (2000) guidelines. This is the mid to high range of moderate intensity, a level that turned out to be unattainable for most participants. By the end of the study, they were walking at the recommended intensity only 22% of the time.

There are several possible explanations for this outcome. First, several participants had difficulty understanding how to use their heart rate monitors and needed frequent assistance with putting them on and activating the functions. Given the known cognitive deficits in persons with SPMI, some participants may not have understood the concept of “target heart rate range” or that faster walking would raise their heart rate, even when this was explained and demonstrated. Difficulty learning new skills or incorporating variability into the physical activity of walking (slow for warm up, brisk for exercise) may have affected the results and may have been related to the subjects’ cognitive deficits. By field observations, many participants walked at the same rate throughout each session. The so-called negative symptoms of SPMI (avolition, amotivation) or psychomotor retardation related to medications may have been factors, although participants had very good attendance and did not exhibit sedation, stiffness, or robotic gait that would be indicative of such problems (M. Schneiderhan, personal communication, April 12, 2004).

The exercise prescriptions may have progressed the participants too quickly into moderate-intensity activity. The initial 4-week conditioning stage could have started at a lower percentage of effort, perhaps 50%. The ACSM (2000) guidelines caution that exercise adherence can be affected if expectations are too high.

Stigma may have been another barrier to brisk walking in these participants. Field observations indicated that participants were not comfortable drawing attention to themselves in public, such as could occur if walking were notably brisk. In particular, even when coached to do so, they did not want to swing or pump their arms, which can help walkers to increase intensity without having to jog or run. People with mental illness encounter stigmatizing attitudes and discrimination as part of the experience of having a mental illness. Internalized negative attitudes, or self-stigma, have been shown to affect adaptation and recovery from mental illness (Link, Struening, Neese-Todd, Asmussen, & Phelan, 2001; Perlick et al., 2001) and even to restrict participation in recreation opportunities that others without mental illness commonly enjoy (West, 1984). One way to avoid the hurt of stigma, as played out in gratuitous insults from strangers, is to be unremarkable. The impact of obesity may have played a role as well, with one participant commenting, "When I walk fast, my belly jiggles." Self-consciousness about body image issues and stigma of mental illness may have been a barrier that the program did not help the participants to negotiate successfully. Future programs could be tailored to help participants to examine and dispute these issues, thereby reducing the issues' influence and validating their right to exercise in public and enjoy a healthy lifestyle as others do.

Last, the heart monitors themselves may have discouraged rather than encouraged the participants' efforts. For those who understood their function, they could see that they were meeting their recommended intensity level more of the time during the first month but that they were falling further and further behind in doing so as the program progressed. Although they continued to attend, they may have given up attempting to meet the target heart rate ranges because to do so would require a level of effort they believed they could not attain or did not have the confidence to try. Because the purpose of using a feedback device to reach a desired goal is to acknowledge effort (Scheier & Carver, 2003), the heart rate monitors may have been enlarging rather than reducing discrepancy between the goal and the participants' performance. For walking, more effective feedback might recognize effort in a linear way, with continued effort garnering higher "numbers" rather than the "wrong" numbers. Pedometers might be more effective in this regard, in that increased physical activity would be directly reflected by increased step counts (Tudor-Locke, 2002). Because the relationship between activity and cardiovascular risk reduction is a continuous one (Pratt, 1999), with the steepest reduction in risk accruing to individuals moving from sedentary to some activity (Blair et al., 2001), the adoption of consistent walking for exercise for 12 weeks is an accomplishment that, if continued, could reduce cardiovascular risk.

In a 12-week walking program for previously sedentary adults, it is not surprising that there were no changes in physical or mental health as measured by the SF-12. The screening process ensured that only reasonably healthy adults able to exercise were in the sample, so major changes in health status as measured by the SF-12 were not expected. Outcomes expectancies and decisional balance for exercise were positive at the beginning and remained so at the end of the program. This possibly suggests that participants had a positive experience with the walking program. Even if the heart rate monitor feedback was not effective, participants still believed that exercise was beneficial and that the benefits outweighed the barriers. They continued to be motivated to exercise, with expectations and decisional scores not different from those in the general population. The improvement in mood is consistent with other research (Biddle, 2000) and deserves confirmation in a larger sample and further investigation as to its role in facilitation of psychosocial rehabilitation. There is possibly a link between better mood and the improved ability to manage stress and anxiety indicated by subscale results on the Multnomah Community Ability Scale.

Limitations of the study include its one-group, single-treatment design; small sample size; and short, 12-week duration, so findings are necessarily preliminary. Further study should include postintervention exercise testing to measure changes in fitness. The cardiovascular risk, age, psychiatric diagnoses, and fitness level of the sample may differ from that in a representative sample of people with SPMI. Including another arm with no feedback or differing feedback would have provided more information about the efficacy of heart rate monitors in helping participants attain and maintain moderate-intensity walking. Having a comparison group not receiving the intervention would have been useful for interpreting the improvements in mood and psychosocial functioning. Improved mood was discussed in one of the workshops as a benefit of exercise, and caseworkers rating community ability of participants at the end of the study were aware that their clients had participated in the study. The sample size and 12-week duration were chosen based on funding level, not on a power analysis to determine sample size and length of time needed to reliably detect effects of the intervention.

Conclusions and Future Directions

A walking group may be feasible for rehabilitation center programming for outpatients with chronic mental illness, and good adherence is possible. Walking is a health-promotion intervention appropriate for implementation by nurses employed in such settings. In addition to the known cardiovascular risk-reduction benefits of regular walking, walking may also improve mood and psychosocial functioning in individuals with SPMI. Individuals often gain weight on psychotropic medication, so regular walking could help with weight management. Given the higher cardiovascular risks in this population, preparticipation screening is appropriate. As feedback devices for coaching moderate-intensity walking, heart rate monitors may not be efficacious in this population. If exercise prescriptions are used, they should allow ample time for initial conditioning at low to moderate intensity. Tailoring health information and group discussion to address body image and stigma concerns may strengthen the intervention and assist participants in developing their own self-efficacy for regular, moderate exercise.

Because walking can be a mechanism to reduce cardiovascular risk, finding ways to further reduce the impact of identified barriers and increase walking would be valuable modifications for future interventions. In a structured, group-based program, this could include offering choices of walking times. In addition, building in the expectation and coaching participants to walk on their own as well as with the group would help maintain recommended frequency during the program and prepare them for self-initiated, home-based walking when the program ends.

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