Midlife Women's Adherence to Home-Based Walking During Maintenance

JoEllen Wilbur ▼ Annemarie Vassalo ▼ Peggy Chandler ▼ Judith McDevitt ▼ Arlene Michaels Miller

- ***Background:*** Despite the many known benefits of physical activity, some women (27%) report no leisure-time physical activity in the prior month. Of those women who began an exercise program, the dropout rate was as high as 50% in the first 3–6 months. The challenge for researchers and clinicians is to identify those factors that influence not only adoption, but also maintenance, of physical activity.
- ***Objective:*** The purpose of this study was (a) to describe midlife women's maintenance of walking following the intervention phase of a 24-week, home-based walking program, and (b) to identify the effects of background characteristics, self-efficacy for overcoming barriers to exercise, and adherence to walking during the intervention phase on retention and adherence to walking.
- ***Methods:*** There were Black and White women participants (N = 90) aged 40–65 years who completed a 24-week, home-based walking program. Self-efficacy for overcoming barriers to exercise, maximal aerobic fitness, and percentage of body fat were measured at baseline, 24 weeks, and 48 weeks. Adherence was measured with heart-rate monitors and an exercise log.
- ***Results:*** Retention was 80% during maintenance. On average, the women who reported walking during maintenance adhered to 64% of the expected walks during that phase. Examination of the total number of walks and the number and sequence of weeks without a walk revealed dynamic patterns. The multiple regression model explained 40% of the variance in adherence during the maintenance phase.
- ***Discussion:*** These results suggest that both self-efficacy for overcoming barriers and adherence during the intervention phase play a role in women's walking adherence. The findings reflect dynamic patterns of adopting and maintaining new behavior.

- ***Key Words:*** adherence · exercise · maintenance · midlife · walking

The benefits of vigorous or even moderate physical activity in lowering all-cause mortality in women have been well documented (Gregg et al., 2003; Kushi et al., 1997; Rockhill et al., 2001). However, according to the 2002 Behavioral Risk Factor Surveillance System survey, 27.3% of women had not participated in any physical activities in the previous month (Centers for Disease Control and Prevention, 2002). The incidence of no physical activity was higher for Blacks (30.7%) than for Whites (21.1%) and higher for persons with annual incomes less than $15,000 (39.5%) than for those earning $50,000 or more (13.3%). Additionally, about half of the individuals who begin a group-based exercise program drop out within 3–6 months of initiation (Dishman, 1990). In a home-based exercise program, however, it can be expected that adherence will be as high as 75% of the planned number of activity sessions in the first 6 months (King, Haskell, Taylor, Kraemer, & DeBusk, 1991). Unfortunately, many beneficial effects of regular physical activity fade within 2 weeks if physical activity is not maintained and the effects will disappear within 2–8 months without a return to regular exercise (U.S. Department of Health and Human Services [USDHHS], 1996). Therefore, the challenge is not only to identify those factors that are influential in initiating physical activity in previously inactive women, but once physical activity is initiated, to identify factors that influence maintenance.

Establishing a definition and criterion for successful maintenance is difficult. As Prochaska, DiClemente, and

JoEllen Wilbur, PhD, RN, FAAN, *is Professor;* ***Peggy Chandler, PhD,*** *is Research Assistant Professor;* ***Judith McDevitt, PhD, RN,*** *is Clinical Assistant Professor; and* ***Arlene Michaels Miller, PhD, RN,*** *is Associate Professor, Department of Public Health, Mental Health and Administrative Nursing, College of Nursing, University of Illinois at Chicago.*

Annemarie Vassalo, MS, MPH, RN, *is Research Nurse Specialist, MedStar Research Institute, National Institutes of Health/NINDS Contractor, Bethesda, MD.*

Norcross (1992) have stressed, change is a dynamic process. Most people who take action to modify their behavior slip backward occasionally before they are successful. The stage of maintenance is not achieved until persons have engaged in a desirable behavior for 6 months. The current goal for a desirable level of physical activity is meeting the American College of Sports Medicine (ACSM) recommendation of vigorous physical activity 3 or more times per week for 20 min per session or engaging in regular (preferably daily) moderate physical activity at least 30 min per day (ACSM, 2000; Pate et al., 1995). For intervention studies, *maintenance* is typically defined as continued physical activity for at least 6 months after the completion of an intervention (Marcus et al., 2000). Even if participants successfully achieve physical activity at the desirable level identified by the ACSM by the end of an intervention, it is imperative to identify the dynamic patterns of adherence during maintenance in order to determine the effects of the intervention over time (USDHHS, 1996).

The research examining the maintenance of physical activity beyond the intervention phase is limited to mixed gender samples of Whites. In addition, it is difficult to compare across studies because of differing measures of adherence. On the basis of exercise-log data at the end of 1 year, midlife adults had higher adherence to both a home-based, high- and moderate-intensity exercise program than to a high-intensity, group-based program (78.7%, 75.1%, and 52.6%, respectively; King et al., 1995). Conversely, Cox, Burke, Gorely, Beilin, and Puddey (2003) found that midlife women who participated in a center-based exercise program had higher energy expenditure based on a 7-day recall 1 year later than women in a home-based exercise program. Only Bock, Marcus, Pinto, and Forsyth (2001) identified dynamic patterns of physical activity maintenance. In this study, over half of a sample of women participating in an intervention that compared two print-based intervention formats had a stable (but underactive) pattern of physical activity at 12 months (they did not achieve ACSM criteria at either 6 or 12 months). The validity of the patterns identified is compromised, however, by the use of a self-report recall measure of the number of minutes exercised in the prior week. According to Dishman (1994), self-report measures are the least accurate for persons who are sporadically active. Although exercise logs are also a self-report measure, they are filled out prospectively, providing multiple data points. They may be more useful in studying the dynamic nature of adherence.

Self-efficacy is pivotal in research on determinants of physical activity in previously inactive adults (McAuley & Blissmer, 2000). Specifically, exercise self-efficacy (the confidence in one's ability to be physically active under a number of specific circumstances) was a significant predictor of adoption and overall exercise levels in previously sedentary adult women enrolled in a 24-week, low-impact aerobic exercise class (McAuley & Jacobson, 1991). As reported earlier, adherence to a 24-week, home-based walking program was higher among those with a higher level of exercise self-efficacy at baseline (Wilbur, Miller, Chandler, & McDevitt, 2003). Although exercise self-efficacy at the end of an intervention has been examined less frequently, study results of healthy adults showed that it was predictive of individuals who maintain high levels of physical activity through follow-up (Bock et al., 2001); baseline self-efficacy was not predictive (Oman & King, 1998). Previous exercise behavior was a strong source of self-efficacy information often overlooked as a determinant of subsequent behavior (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). In earlier reports, recent experience with exercise was the strongest predictor of subsequent participation in the maintenance phase of a group-based exercise in both middle-age and older men and women (McAuley, 1992; McAuley et al., 2003).

The study had two purposes:

1. to describe walking maintenance patterns for midlife Black and White women during 24 weeks after a walking intervention and
2. to identify how demographic characteristics (age, race, education, marital status, professional status), self-efficacy for overcoming barriers to exercise, and adherence to walking during the intervention phase affect retention and adherence to walking during a maintenance phase (weeks 24 through 48 after orientation).

Methods

Participants

Sedentary, healthy, employed, midlife Black and White women (45–65 years of age) residing in metropolitan Chicago were recruited to participate in a home-based walking intervention through oral and poster presentations at work sites and community churches, e-mail notices, flyers, newspaper notices, and an evening television news report. *Sedentary* was defined as not having exercised more than 20 min twice a week in the preceding 6 months. *Healthy* was defined as no more than one major coronary risk factor (in addition to age and sedentary lifestyle) and no major signs or symptoms of cardiopulmonary or metabolic disease. The exclusion criteria, which included use of psychotropic drugs, hormone replacement therapy, and a history of bilateral oophorectomy, were designed to control for influences other than walking on physical and psychological symptoms not reported here. Women with a body mass index (weight in kilograms/height in square meter) more than 40 were excluded because of the technical restrictions on the measure of dual-photon x-ray absorptiometry (Wilbur, Miller, & Chandler, 2001). The women were initially screened for eligibility with a telephone questionnaire. Additional screening consisted of a health assessment with a nurse practitioner, a complete blood cell count and lipoprotein profile, calculation of percentage of body fat, and a maximal aerobic fitness test at the university Human Performance Laboratory.

Intervention and Procedure

The intervention was a home-based, moderately intense walking program (Wilbur et al., 2003). Each woman received an individually tailored exercise prescription that

included walking at a prescribed frequency, intensity, and duration. Participants walked 4 times per week within their target heart-rate range, which had been determined by a maximal aerobic fitness test. Participants gradually progressed to walking from 20 to 30 min in the target heart-rate range in addition to a 5-min warm-up and stretch and a 5-min cooldown and stretch. The number of walks was measured by both a self-report exercise log and a Polar Heart Rate Monitor during the 24-week intervention phase.

During the intervention phase, an assigned research-team member met with each woman every 2 weeks to deliver the intervention using sources of self-efficacy beliefs to enhance confidence for exercise, including mastery of exercise, verbal persuasion, and physiological arousal (Bandura, 1997). Mastery of exercise was addressed by reviewing exercise logs and heart-rate monitor data and providing emotional support and reinforcement in the form of feedback on the woman's progress. Verbal persuasion was provided by offering praise and encouragement, and by working with the woman to identify potential barriers and to develop plans for overcoming obstacles. Physiological arousal included transferring each woman's heart-rate monitor data to a notebook computer and showing her graphs of the intensity of her exercise. Also, a 2-week symptom questionnaire was administered so that each woman could monitor her physiological responses to exercise.

At the completion of the intervention phase, the women returned to the data-collection site to complete a questionnaire and physiological measures, including a maximal aerobic fitness test and calculation of percentage of body fat. They were given results of all physiological measures taken at baseline and at completion of the intervention. They were given also a new target heart-rate range on the basis of changes in their performance on the maximal aerobic fitness test, taught to take their pulse to monitor exercise intensity, and instructed to continue recording their walks in the exercise logs.

During the 24-week maintenance phase, a staff researcher called the participants monthly to remind them to mail or fax their exercise-log sheets. The women returned to the data-collection site at the end of the 24-week maintenance phase (48 weeks, or 12 months, after orientation) for administration of the final questionnaire, maximal aerobic fitness test, and calculation of body fat. After completion of each of the three data collections, each woman received compensation for her time and travel.

Measures

Adherence to Walking Adherence during the intervention phase (Wilbur, Chandler, & Miller, 2001) was measured with a Polar Vantage XL heart-rate monitor and a self-report exercise log. Adherence to walking during the maintenance phase was measured by the self-report exercise log. The women recorded the date, time of completion of the warm-up/stretch and cooldown/stretch, and the number of minutes they walked for each session. The women were given credit during maintenance if they reported aerobic exercise other than walking. Adherence to the prescribed frequency was calculated for both the intervention phase and the maintenance phase as a percentage of the expected 96 walks (four walks per week for each 24-week period). The number of minutes walking for each session was not used because the majority of women completed the prescribed duration of 30 min per session. The correlation between the number of walks on the log and on the heart-rate monitor during the intervention phase was .96 (Wilbur, Chandler, et al., 2001).

Six dynamic, comprehensive, and mutually exclusive adherence patterns were identified over the intervention phase (Wilbur, Chandler, et al., 2001). These six mutually exclusive patterns were based on the total number of walks reported via both exercise logs and heart-rate monitors, and the number and sequence of weeks reported without any walks. For the present analysis, the original six patterns were modified and reduced to five patterns that described adherence in both the intervention and maintenance phases. A sixth pattern only for the maintenance phase was included.

1. *Consistent adherence pattern* completed 80% or more of the prescribed number of walks during the intervention or maintenance and had no lapses (lapse = 1 week with no walks).
2. *Occasional lapse adherence pattern* completed 80% or more of the expected number of walks and lapsed 1–4 weeks (during the intervention phase or maintenance) but had no relapse (relapse = 3 consecutive weeks with no walks).
3. *Low-adherence pattern* completed less than 80% of the prescribed walks, lapsed 0–4 weeks, but had no relapses during the intervention or maintenance phase.
4. *Recyclers* had a relapse but then returned to walking.
5. *Relapsers* had a relapse and did not walk again during the last 3 weeks of either the intervention or maintenance phase.
6. *Drop* did not complete the maintenance phase.

Two physiological measurements provided indirect measures of adherence including maximal aerobic fitness and percentage of body fat. Aerobic fitness was determined through a symptom-limited, incremental exercise test by using a treadmill and the modified Bruce-test protocol designed for use with participants of low fitness (American Heart Association Committee on Exercise, 1972; Pollock et al., 1982). The test began at Step I, 1.7 mph, 0% grade, and was followed by Step II, 1.7 mph, 5% grade. In each following stage, the grade increased 2%, and the speed increased either 0.8 or 0.9 mph until the participant was exhausted. The duration of each progressive stage was 3 min. Oxygen consumption and carbon dioxide production were measured from exhaled gases on a breath-by-breath basis using the 2900 Sensor Medic metabolic cart (ACSM, 2000). Heart rate was measured with a 12-lead electrocardiogram at rest and continuously during the test. Blood pressure was monitored by cuff sphygmomanometer at 3-min intervals. Percentage of body fat was calculated using the equation by Jackson, Pollock, and Ward (1980). Harpenden calipers (British Indicators Limited, England) were used to measure skinfold thickness in millimeters to the

nearest 0.1 mm at the triceps, suprailiac, abdomen, and thigh. Three measures were taken at each site on the right side of the body, averaged, and used to calculate percentage of body fat.

Retention in the Study Retention differs from adherence in that it refers to the number of participants in the study at baseline, at 24 weeks (end of the intervention phase), and at 48 weeks (end of the maintenance phase).

Self-Efficacy The 14-item McAuley Self-efficacy for Exercise Scale (McAuley & Jacobson, 1991) was used to measure exercise self-efficacy. The participant indicated confidence in her ability to continue walking in the face of barriers using a range from 10 (*not confident*) to 100 (*completely confident*). The items were summed and divided by the total number of items. Examples of barriers to exercise items included "weather very bad" or "felt pain or discomfort when exercising." Three additional items identified from the literature as exercise barriers specifically for women were added to the original measure. The additional items were "family relationships and responsibilities," "lack of encouragement from family," and "personal safety." The resulting scale was composed of 17 barriers to exercise. The Cronbach alpha for the scale was .92.

Analyses

First, differences between the women who completed the maintenance phase and the women who did not were examined using chi-square (for categorical variables) test and two-sample *t* (for numeric variables) test. Differences between the two groups in demographics (i.e., age, race, education, marital status, professional status), adherence to walking, and baseline to 24-week changes in self-efficacy (change in exercise self-efficacy score) and physiological measures (percent changes in maximal aerobic fitness and percent body fat) were examined. All tests used an alpha level of .05.

Second, the effects of adherence to walking during the intervention phase, exercise self-efficacy, physiological measures, and background characteristics on adherence to walking during the maintenance phase were evaluated using multiple regression analyses. Finally, differences among patterns of adherence during the intervention phase and patterns of adherence during the maintenance phase were examined.

Results

Of the 173 women who met the screening criteria, 102 women were randomly assigned to a 24-week walking intervention phase, to be followed by an additional 24-week maintenance phase. Of the 102 women, 90 returned for their 24-week (6-month) measures for a retention rate of 88% in the intervention phase; their data are presented in this study. The women ranged in age from 45 to 63 years (M = 49.93, SD = ±4.84). The sample was 30% Black and 70% White; 53% of participants were married, and the majority of women (66%) had 1–3 children. A majority of participants reported having a college degree (68%), whereas 63% held professional positions.

Of the 90 women who completed the intervention phase, 72 also completed the maintenance phase for a retention rate of 80%. The reasons women dropped out during the maintenance phase (n = 18) included medical problems (8), no time (5), family problems (3), relocation (1), and no reason provided (1). The final contact with the women dropping out was made by a staff researcher who contacted 7 of the women in the first 2 months and the remaining 11 women in the last month of the maintenance phase. During the final contact, all of the women reported that they had not exercised following the completion of the intervention phase.

Examination of the exercise-log data for the women who did complete the maintenance phase indicated that they adhered to 64.6% (SD = 0.286, range = 6%–100%) of the expected frequency of 96 walks (4 times a week for 24 weeks) during the maintenance phase. The average duration per walk was 39.30 (SD = 9.24) min, which was longer than the prescribed duration of 30 min per session. The average number of minutes women spent walking ranged from 20 to 56.9.

A chi-square test showed that the women who did not complete the maintenance phase differed from the women who completed maintenance by race, but not by marital status, professional status, or education (Table 1). Retention was higher for White women than for Black women, 86% and 67%, respectively.

A two-sample *t* test showed significant differences in percentage of adherence during the intervention, exercise self-efficacy at the end of the intervention, and change in exercise self-efficacy and body fat from baseline to the end of the intervention between the women who completed maintenance and those who did not (Table 2). The women who completed the maintenance phase had greater adherence (81% vs. 47%) during the intervention and higher scores on exercise self-efficacy (71% vs. 54% confidence) to overcome barriers at the end of the intervention than the women who did not complete maintenance phase. In addition, the change in exercise self-efficacy from baseline to 24 weeks was greater than the change in those women who did not complete the maintenance phase. The women who completed maintenance had a greater loss in percentage of body fat from baseline to the end of the intervention phase than the women who did not participate in walking. Women who completed maintenance had a greater increase in maximal aerobic fitness from baseline to the end of the intervention phase than the women who did not participate in walking (p = .056).

Forty percent of variance was explained when percent adherence to walking during the maintenance phase as the outcome variable was regressed on (a) percent adherence during the intervention phase, (b) self-efficacy for overcoming barriers at the end of the intervention (24 weeks), (c) change scores for self-efficacy and percent change for maximal aerobic fitness and percent body fat from baseline to the end of the intervention, and (d) race as independent variables (Table 3). Both adherence to walking during the intervention phase and self-efficacy at the end of the intervention were significant predictors of adherence to walking during the maintenance phase. Women who had greater adherence to walking during the intervention phase and

TABLE 1. Descriptive Statistics for Background Characteristics by Completion of Maintenance (*N* = 90)

Background Characteristics	Completed Maintenance (*n* = 72)		Did Not Complete Maintenance (*n* = 18)		Statistics
	N	%	*N*	%	
Race					
Black	18	67	9	33	$\chi^2 = 4.29$;
White	54	86	9	14	$p = .04$
Marital status					
Married	39	85	7	15	$\chi^2 = 0.13$; *ns*
Not married	32	80	8	20	
Professional status					
Professional	46	78	13	22	$\chi^2 = 0.44$; *ns*
Nonprofessional	26	84	5	16	
Education					
College graduate	49	83	10	17	$\chi^2 = 0.01$; *ns*
Not college graduate	23	82	5	18	
Age, *M* (*SD*)		50.04 (4.89)	49.5 (4.74)		$t = 0.18$; *ns*

Note. ns = Not significant.

higher exercise self-efficacy scores at the end of the intervention had greater adherence during maintenance.

The women were categorized into adherence patterns on the basis of the number of walks they completed and relapses they had during the maintenance phase (Table 4). There were 18 women (20%) in the consistent adherence pattern, 10 women (11%) in the occasional lapse adherence pattern, and 8 women (8%) in the low-adherence

TABLE 2. Summary Statistics of Adherence to Walking, Self-Efficacy, Maximal Oxygen Uptake, and Percent Body Fat by Completion of Maintenance (*N* = 90)

Variable	Completed Maintenance (*n* = 72)		Did Not Complete Maintenance (*n* = 18)		*t*	*df*	*p*
	M	*SD*	*M*	*SD*			
Adherence (%)							
During intervention	80.95	17.25	47.34	16.19	7.48	88	<.001
Self-efficacy (%)							
Baseline	71.93	17.6	72.46	16.2	–0.11	86	*ns*
End of intervention	71.23	17.4	54.13	17.4	3.24	83	.002
Change	–0.54	19.5	–18.7	15.8	3.17	82	.002
Maximal aerobic fitness (%)							
Baseline	26.26	4.37	26.87	5.39	–0.50	88	*ns*
End of intervention	28.33	4.14	27.14	5.27	1.01	87	*ns*
Percentage Change	8.94	12.75	2.57	9.65	1.93	87	*ns*
Body fat (%)							
Baseline	34.48	5.15	33.00	5.01	1.07	87	*ns*
End of intervention	32.96	5.36	33.99	5.20	–0.72	87	*ns*
Change	–4.15	9.48	1.40	8.92	2.14	86	.035

Note. ns = Not significant.

TABLE 3. Multiple Regression of Adherence During the Maintenance on Adherence During the Intervention Phase, Self-Efficacy, Physiological Measures, and Background Characteristics

Variable	Standardized Coefficients	*t*	*p*
Adherence during the intervention phase	.50	4.71	<.01
Self-efficacy for exercise at end of intervention	.28	2.31	.02
Change in self-efficacy	−.07	–0.60	*ns*
Change in maximal aerobic fitness (%)	−.03	–0.38	*ns*
Change in body fat (%)	−.10	–1.01	*ns*
Age	−.08	–0.85	*ns*
Race	−.07	–0.60	*ns*

$R^2 = 0.40$, $F = 7.13$.

Note. ns = Not significant.

pattern. Twelve women (13%) were classified as recyclers and 24 (27%) as relapsers. The drop pattern included the 18 (20%) nonexercising women who did not complete maintenance. Examination of adherence patterns at the end of the intervention phase versus those at the end of the maintenance phase showed that 24% had not changed their walking patterns, 12% of the women had moved to a pattern that suggested an increase in their walking, and over half (63%) had moved to a pattern that involved a decrease in their walking. All of the women in the top two adherence patterns at the end of the intervention phase reported walking during the maintenance phase.

Discussion

Of the 102 women who began the walking intervention, a majority (71%) completed the maintenance phase. This is higher than the 65% retention of men and women participating in an intervention comparing mailed tailored counseling messages versus mailed self-help booklets promoting physical activity (Bock et al., 2001), and the 62% of women participating in either a low-intensity or a high-intensity, home-based exercise program at the end of the maintenance phase (12 months; Cox et al., 2003). Retention at 12 months for this home-based walking program was substantially higher than the 50% retention previously suggested for group-based programs (Dishman, 1990). Retention was lower, however, than the overall 82% retention rate reported for women participating in an intervention comparing high-intensity, group-based; high-intensity, home-based; and lower-intensity, home-based exercise programs conducted in California (King et al., 1991). Although none of the participants in this study mentioned climate as a contributing factor to dropping from the walking program, climate was anecdotally reported to be problematic throughout the winter months. King and colleagues included predominately White men and women, which may have also contributed to higher participation in that study. All of the women in this study were employed as opposed to 64.7% of the women in the earlier study (King et al., 1995), which suggests an additional time burden in this sample.

The retention rate was higher when the time period from the end of the intervention phase to the end of maintenance phase at 1 year was examined. Eighty percent of the women who participated in the active walking intervention continued to walk and complete the maintenance

TABLE 4. Changes in Adherence Patterns From the End of the Intervention Phase to the End of Maintenance Phase for Women (*N* = 90)

	Patterns at the End of Maintenance Phase						
Patterns at the End of Intervention Phase	Consistent *(n)*	Occasional *(n)*	Low *(n)*	Recycler *(n)*	Relapser *(n)*	Drop	Total
Consistent	**11**	2	3	4	6	0	26
Occasional	*3*	**7**	0	2	5	0	17
Low	*3*	*1*	**3**	*4*	12	9	32
Recycler	*1*	*0*	*2*	**1**	*1*	3	8
Relapser	*0*	*0*	*0*	*1*	**0**	6	7
Total	18	10	8	12	24	18	90

Note. Italic values indicate pattern changes that suggest increased walking, underlined values indicate pattern changes that suggest decreased walking, and bold values indicate no change.

phase, similar to 72% reported by Cox et al. (2003) and 80% reported by Bock et al. (2001). As in prior studies (Cox et al., 2003), the most frequent reason for withdrawing from the walking program was medical problems. These problems varied greatly, with only one woman reporting a musculoskeletal problem related to walking. The low incidence of musculoskeletal problems reflects the advantages of a moderate-intensity prescription over a high-intensity prescription. The next most frequent reason for withdrawing was a lack of time (e.g., work schedules, family events, and crises). This is consistent with cross-sectional studies that report the lack of time as a main reason for lack of participation in physical activity (Eyler et al., 2002).

Prior studies document that some participants may be retained but they may walk at suboptimum levels. In this study, mean percentage of frequency of walks during maintenance was less (64%) than that during the intervention phase (80%), but it compares favorably to the findings of Jakicic et al. (1999), who reported a 47.2% adherence to walking 150 min. King et al. (1995), however, using exercise logs and the same definition of *adherence* as used in this study, describes a 75.1% adherence to a home-based, moderate-intensity exercise program after 12 months.

The mean duration of walks (39.3 min) exceeded the expectations of 30 min (Wilbur, Chandler, et al., 2001). It appears that the most challenging aspect of exercise adherence, both during the intervention and in maintenance, is getting started. Once women actually get out and walk, they meet or exceed the prescribed duration.

One of the purposes of this study was to examine the influence of background characteristics and exercise self-efficacy on retention and adherence to walking during maintenance in midlife Black and White women. Like Bock et al. (2001), we found no significant differences between participants and nonparticipants in the maintenance phase on baseline education, age, or body fat. However, we identified that a higher proportion of Black than White women did not participate in or complete the maintenance phase. This disparity warrants further investigation. As reported earlier, a generic videotape and materials that did not include Blacks were used to orient the women to the walking program (Wilbur et al., 2003). The results highlight the importance of developing intervention materials that are culturally sensitive to the targeted population.

Both higher self-efficacy for exercise and improved self-efficacy at the end of the intervention phase as well as greater adherence to frequency of walking during the intervention phase distinguished women who completed the maintenance phase from those who did not and influenced adherence to frequency of walking during maintenance. These findings are similar to those of other studies showing that individuals who continued to maintain high levels of physical activity through the follow-up period had higher self-efficacy and were less likely to perceive barriers to physical activity at the end of the intervention (Bock et al., 2001; King et al., 1991; McAuley & Jacobson, 1991; Oman & King, 1998). Also, similar to prior research (Oman & King, 1998), this study showed that baseline exercise self-efficacy did not predict exercise adherence during the maintenance phase. Improved self-efficacy from baseline to the end of the intervention phase influenced adherence during the maintenance phase. This suggests that self-efficacy is dynamic. The influence of change in self-efficacy on retention reinforces the importance of targeting interventions toward improving self-efficacy for exercise.

Frequency of walking at the end of the intervention was the strongest predictor of subsequent walking during the maintenance phase. It appears that recent exercise experience or mastery could be a source of self-efficacy information, which influences adherence during maintenance.

The women who completed the maintenance phase had a loss in body fat during the intervention phase whereas the women who did not complete the maintenance phase on average gained body fat during the intervention. It may be important to include a measure of percentage of body fat rather than body weight alone, because body weight may not change with moderate exercise. For example, Dunn and colleagues (1999) found no change in body weight in men and women exercising at 50%–85% intensity 3–5 days a week for 6 months, but found that body fat decreased by 1.85% on average.

Examination of the exercise patterns revealed that 31% of the women followed either a continuous or an occasional lapse pattern through the maintenance phase of the study and a much larger percentage (63%) regressed to a less active pattern. The majority of women who did not walk reported health-related problems. These findings further reinforce the need for additional time and verbal persuasion targeted for women who have been forced to recycle to a less active lifestyle.

The findings of this study indicate that physical activity motivation, or self-efficacy, may be increased through verbal persuasion by staff researchers, by developing awareness of physiological responses to activity, and through the performance accomplishments of increased physical activity. Evidence of this is shown in the women who completed the intervention phase with higher self-efficacy toward overcoming specific barriers to exercise. Through their 24-week experience with the intervention, they had developed effective personal strategies supporting regular physical activity. They continued to use these strategies during maintenance and thus were able to adhere, resulting in ongoing validation of their ability to devise effective strategies. Successful deployment of these strategies resulted in continuing experiences of physiological arousal and ongoing accrual of performance accomplishments. ▼

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Corresponding author: JoEllen Wilbur, PhD, RN, FAAN, Department of Public Health, Mental Health and Administrative Nursing, College of Nursing, University of Illinois at Chicago, Chicago, Illinois 60612 (e-mail: JWilbur@uic.edu).

References

American College of Sports Medicine. (2000). *ACSM's guidelines for exercise testing and prescription* (6th ed.). Philadelphia: Lippincott Williams & Wilkins.

American Heart Association Committee on Exercise. (1972). *Exercise testing and training of apparently healthy individuals: A handbook for physicians*. Dallas, TX: American Heart Association.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Bock, B. C., Marcus, B. H., Pinto, B. M., & Forsyth, L. H. (2001). Maintenance of physical activity following an individualized motivationally tailored intervention. *Annals of Behavioral Medicine, 23*(2), 79-87.

Centers for Disease Control and Prevention. (2002). *Behavioral risk factor surveillance system*. Retrieved December 26, 2003, from http://apps.nccd.cdc.gov/brfss/display.asp?cat=EX&yr=2002&qkey=4347&state=US

Cox, K. L., Burke, V., Gorely, T. J., Beilin, L. J., & Puddey, I. B. (2003). Controlled comparison of retention and adherence in home- vs center-initiated exercise interventions in women ages 40-65 years: The S.W.E.A.T. Study (Sedentary Women Exercise Adherence Trial). *Preventive Medicine, 36*(1), 17-29.

Dishman, R. K. (1990). Determinants of participation in physical activity. In C. Bouchard, T. Shepard, J. Stephens, J. Sutton, & B. McPherson (Eds.), *Exercise, fitness and health* (pp. 75-102). Champaign, IL: Human Kinetics.

Dishman, R. K. (1994). The measurement conundrum in exercise adherence research. *Medicine and Science in Sports and Exercise, 26*(11), 1382-1390.

Dunn, A. L., Marcus, B. H., Dkampert, J. B., et al. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: A randomized trial. *JAMA, 281*(4), 327-334.

Eyler, A. E., Wilcox, S., Matson-Koffman, D., Evenson, K. R., Sanderson, B., Thompson, J., et al. (2002). Correlates of physical activity among women from diverse racial/ethnic groups. *Journal of Women's Health & Gender-Based Medicine, 11*(3), 239-253.

Gregg, E. W., Cauley, J. A., Stone, K., Thompson, T. J., Bauer, D. C., Cummings, S. R., et al. (2003). Relationship of changes in physical activity and mortality among older women. *JAMA, 289*(18), 2379-2386.

Jackson, A. S., Pollock, M. L., & Ward, A. (1980). Generalized equations for predicting body density of women. *Medicine and Science in Sports and Exercise, 12*(3), 175-181.

Jakicic, J. M., Winters, C., Lang, W., et al. (1999). Effects of intermittent exercise and use of home exercise equipment on adherence, weight loss, and fitness in overweight women: A randomized trial. *JAMA, 282*(16), 1554-1560.

King, A. C., Haskell, W. L., Taylor, C. B., Kraemer, H. C., & DeBusk, R. F. (1991). Group- vs home-based exercise training in healthy older men and women. A community-based clinical trial. *JAMA, 266*(11), 1535-1542.

King, A. C., Haskell, W. L., Young, D. R., Oka, R. K., Stefanick, M. L., Pate, R. R., et al. (1995). Long-term effects of varying intensities and formats of physical activity on participation rates, fitness, and lipoproteins in men and women aged 50 to 65 years. *Circulation, 91*(10), 2596-2604.

Kushi, L. H., Fee, R. M., Folsom, A. R., Mink, P. J., Anderson, K. E., & Sellers, T. A. (1997). Physical activity and mortality in postmenopausal women. *JAMA, 277*(16), 1287-1292.

Marcus, B. H., Dubbert, P. M., Forsyth, L. H., McKenzie, T. L., Stone, E. J., Dunn, A. L., et al. (2000). Physical activity behavior change: Issues in adoption and maintenance. *Health Psychology, 19*(1, Suppl.), 32-41.

McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioral Medicine, 15*(1), 65-88.

McAuley, E., & Blissmer, B. (2000). Self-efficacy determinants and consequences of physical activity. *Exercise and Sport Sciences Reviews, 28*(2), 85-88.

McAuley, E., & Jacobson, L. (1991). Self-efficacy and exercise participation in sedentary adult females. *American Journal of Health Promotion, 5*(3), 185-191.

McAuley, E., Jerome, G. J., Elavsky, S., Marquez, D. X., & Ramsey, S. N. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine, 37*(2), 110-118.

Oman, R. F., & King, A. C. (1998). Predicting the adoption and maintenance of exercise participation using self-efficacy and previous exercise participation rates. *American Journal of Health Promotion, 12*(3), 154-161.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., et al. (1995). Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA, 273*(5), 402-407.

Pollock, M. L., Foster, C., Schmidt, D., Hellman, C., Linnerud, A. C., & Ward, A. (1982). Comparative analysis of physiologic responses to three different maximal graded exercise test protocols in healthy women. *American Heart Journal, 103*(3), 363-373.

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change. Applications to addictive behaviors. *American Psychologist, 47*(9), 1102-1114.

Rockhill, B., Willett, W. C., Manson, J. E., Leitzmann, M. F., Stampfer, M. J., Hunter, D. J., et al. (2001). Physical activity and mortality: A prospective study among women. *American Journal of Public Health, 91*(4), 578-583.

U.S. Department of Health and Human Services. (1996). *Physical activity and health: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Wilbur, J., Chandler, P., & Miller, A. (2001). Measuring adherence to a women's walking program. *Western Journal of Nursing Research, 23*(1), 8-32.

Wilbur, J., Miller, A., & Chandler, P. (2001). Recruitment and cardiovascular risk characteristics of African American and Caucasian midlife women. *Journal of Cardiovascular Nursing, 15*(3), 88-104.

Wilbur, J., Miller, A., Chandler, P., & McDevitt, J. (2003). Determinants of physical activity and adherence to a 24-week home-based walking program in African American and Caucasian women. *Research in Nursing and Health, 26*(3), 213-224.