Predictors of Long-term Exercise Adherence in a Community-Based Sample of Older Women

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Abstract

Background: Few studies have examined long-term exercise adherence in older women. The purpose of this study was to assess predictors of adherence to an intervention involving walking and balance exercises.

Methods: This was a randomized controlled trial with 2-year follow-up. Sedentary women ($n = 137$) aged ≥ 70 randomized to the exercise intervention were evaluated in their homes. The exercise prescription included walking 30 minutes per day 5 days per week and completing 11 balance exercises twice per week. The main outcome measure was exercise adherence of the intervention group only.

Results: The average number of minutes walked per week was 95.2 (SD 68.8); 17% walked the recommended 150 minutes or greater. The average number of times the balance exercises were done was 1.5 (SD 1.6) per week. Results of regression analysis for walking adherence showed clinical variables accounted for the greatest variance (17%) of all the blocks, and cognitive variables were second highest (12%). The final model explained 19% of the variance in predicting adherence to walking. Results of regression analysis for adherence to balance exercises showed health-related quality of life (HRQOL) variables accounted for the greatest variance (14%), followed by cognitive variables (12%). The final model explained 24% of the variance in predicting adherence to balance exercises.

Conclusions: Adherence to exercise was below recommended goals, although this study demonstrated that sedentary women can adopt and continue regular exercise long term. Predictors of adherence varied with different forms of exercise. Individually tailored exercise interventions may be most amenable to older women.

Introduction

HEALTHY PEOPLE 2010 cites physical activity as a leading health indicator; recommendations are for adults to engage in moderate physical activity 30 minutes per day on most days.^{1,2} Similar recommendations have been made for older adults.³ Numerous physical and health benefits have been identified with increased physical activity.^{1,4-7} Results of the 2001 Behavioral Risk Factor Surveillance System (BRFSS) survey showed that those who attained the recommended levels of physical activity had significantly better health-related quality of life (HRQOL) as well.⁸

Recommendations are that physical activity interventions target older adults⁵ and women in particular because of the benefits of exercise for osteoporosis⁹ and women's lower level of physical activity than men; however, just 27% of women > age 65 meet the activity goals.⁷ Effective inter-

ventions aimed specifically at promoting exercise in sedentary, older adults are needed, particularly to address age-related obstacles to exercising, such as comorbid conditions. Changing one's lifestyle to include regular exercise is difficult for persons of all ages, and adherence to exercise programs is low, with estimates suggesting that as many as 50% drop out in the first 3–6 months.¹⁰ For older adults, adherence rates may be even lower. Physical activity interventions aimed at older adults appear to lead to increases in exercise adherence in the short term, but long-term results have not been shown.^{11,12} In addition, most exercise interventions have demonstrated declining levels of adherence in later stages of follow-up compared with immediately after exercise has begun.¹²⁻¹⁹ Although definitions of adherence have varied throughout exercise studies,²⁰ they generally include the number of exercise sessions that participants engaged in or number of minutes of exercise

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completed as a proportion of the number prescribed or recommended.

Walking and other moderate forms of exercise are often preferred and result in better adherence to exercise prescriptions.²¹ This highlights the importance of identifying those who are most likely to adhere to an exercise prescription over time. Some research has approached the assessment of adherence by asking exercise participants to describe reasons why they do not adhere to exercise regimens, such as enjoyment or interest in exercise.^{22–24} Measurement of other predictors is warranted, however, as individuals may not self-identify important variables that clinicians can use to target programmatic efforts.

Most research addressing predictors of adherence has assessed cognitive factors, such as exercise self-efficacy.^{13,16,17,19,22,23,25–34} Equally important are physiological and demographic predictors that affect adherence.³⁵ Research is limited regarding the effect HRQOL factors have in predicting exercise adherence. Social factors, such as social support, have been assessed as well,³⁶ but what evidence exists is mixed.^{13,28–31,37–39} Few studies have examined predictors of adherence in older adults from multiple domains, such as demographic, physiological, cognitive, and social.^{27,37}

The purpose of this study was to assess predictors of long-term adherence by women to an exercise intervention involving walking and balance exercises over 2 years. Adoption and maintenance of exercise are independent acts likely to have different determinants¹⁰; therefore, only the determinants of long-term adherence were addressed in the present analysis. This was part of a multifactorial intervention aimed at reducing falls in sedentary women >age 70 who were at risk for falling.

Materials and Methods

Design and sample

This was a secondary analysis of data collected during a randomized controlled trial (RCT) with two arms: a multifactorial fall prevention program and a health education program (control). The methods used in this study have been described elsewhere.^{40,41} Only data on the participants randomized to the fall prevention program are included in this analysis because that group received exercise adoption instruction. Participants were recruited through letters mailed to a population-based sample of female Medicare enrollees. Participants were required to meet the following criteria: reside outside a nursing home, be mentally intact (Mini-Mental State Examination [MMSE]⁴² scores >23), be able to walk 30 feet without stopping with or without an assistive device, demonstrate evidence of postural instability on balance testing, have at least one additional fall risk factor, and be available for follow-up, in-home appointments. In addition, participants had to be sedentary, that is, not currently involved in regular exercise (>20 minutes three times per week). Predictors were measured at baseline prior to the intervention, with exercise adherence measured from the end of the intervention through 2 years of follow-up. Participants received \$25 at each follow-up period for a total honorarium of \$100. The study protocol was approved by the university's Institutional Review Board prior to implementation.

Baseline characteristics were obtained on all participants prior to randomization. Participants were then stratified by

age group and randomized using a permuted block design with varying block sizes of four and six. The fall prevention program consisted of exercise instruction, fall prevention education, and tailored risk reduction counseling.

Procedures

The 12-week intervention consisted of home visits by a baccalaureate-prepared registered nurse at weeks 1, 3, 5, 7, 9, and 11, alternating with weekly telephone calls from the nurse. Tapered computerized telephone follow-up occurred for an additional 16 weeks. These calls involved assessment and feedback on exercise adherence, assessment of exercise barriers if adherence was <80% with advice given on how to overcome a specific barrier, and reinforcement and role modeling regarding the benefits of exercise through the use of case examples. If relapse had occurred, strategies to overcome it were discussed.

Participants in the fall prevention group were given an exercise prescription of walking and balance exercises, based on their tolerance to the exercises, with the goal that by the end of the 12-week period, they would be walking 30 minutes per day 5 days per week and completing 11 balance exercises for 12 repetitions twice per week. Participants were also requested to keep a daily exercise log that included space to record minutes walked and whether they completed all, some, or none of the balance exercises. This continuous self-monitoring of exercise is recommended over other measures of self-report.²⁰ Electronic methods may be most desirable, but they were not economically feasible over the 2-year period in which exercise behavior was assessed. Weights were provided for some balance exercises, although few women used these in their exercising. The benefits of exercise were reinforced on a weekly basis by research nurses during the intervention based on the individual's perceptions, along with strategies to overcome exercise barriers. Counseling was provided on relapse prevention techniques. Modifications were made to the balance exercises for some participants based on their physical limitations and ability to perform certain exercises.

Measures

Participants completed daily exercise logs beginning at completion of the intervention through the 2-year follow-up period. Exercise logs were mailed monthly to the research office. If a log was not received within 10 days, the participant was contacted by telephone to obtain this information and to request the return of the log. Exercise adherence to the walking program was measured by adding the number of minutes walked at the end of the 12-week intervention and 2 years postintervention follow-up and dividing by the number of weeks to create a variable of average minutes walked per week. To measure adherence to the balance program, the number of days participants said they did all or some of the balance exercises was computed and divided by the number of weeks to create a variable of average number of times the balance exercises were done per week. There were few instances of missing data; however, when walking or exercise times were missing for a time interval, it was assumed that no exercise was done.

Predictors of exercise adherence included socio-demographic, clinical, postural competence, cognitive, and

HRQOL variables (Table 1). All scale measures were chosen because they had strong evidence of validity; the reliability of these scales in this sample was sufficient for group comparisons.

Data analysis

Descriptive statistics were used to summarize baseline characteristics and exercise adherence. Based on the assumption that predictors of walking for exercise would differ from predictors of performing balance exercises, two depen-

dent variables were used. Walking adherence was defined as average minutes walked per week. Balance exercise adherence was defined as whether balance exercises were completed one or more times per week on average compared to less than one time per week as a categorical variable. Therefore, linear regression was used for determining predictors of walking adherence, and logistic regression was used for balance adherence. Walking times were not normally distributed (this could be tested using the Kolmogorov-Smirnov (K-S) test), so a square root transformation was used to increase the symmetry of the distribution. Data were analyzed using both

TABLE 1. VARIABLES INCLUDED FOR ANALYSIS

Variable	Measure
Sociodemographic	
Age	Date of birth to enrollment date, age in years
Education, <high school	Self-report, categorical
Race, white	Self-report, categorical
Income, <\$20,000	Self-report, categorical
Marital status	Self-report, categorical
Clinical	
Body mass index (BMI)	Self-report height and weight, measured as weight in kilograms divided by height in squared meters
Probable depression	Geriatric Depression Scale (short form), which includes 15 dichotomous items related to mood; probable depression $>5^{43}$
Past history of exercise	Self-report
Number of chronic conditions	Self-report (checklist of 15 possible chronic conditions)
Cardiovascular disease	Self-report
Osteoarthritis	Self-report
ABC	The Activity-Specific Balance Confidence Scale (ABC) includes 16 questions asking respondents to rate the degree of confidence they have in not losing their balance or becoming unsteady while performing various activities of daily living ⁴⁴
Number of medications	Observed by research nurse
Smoking status	Self-report, current or former
Urinary incontinence	Self-report, weekly
Postural competence	
Berg Balance Test score	Berg Balance Test ^{45,46} uses categorical rating scale to assess balance during performance of 14 activities
8-foot timed walk	Time to walk 8 feet (in seconds)
Timed chair	Complete 5 elevations to measure muscle endurance in seconds ⁴⁷
Hip strength	Hip flexion isometric strength was measured using the MICROFET-2, a hand-held dynamometer (Hoggan Health Industries, Inc., Draper, UT).
Cognitive	
Mental status	Mini-Mental State Examination (MMSE), a 30-item, interviewer-administered instrument ⁴² ; MMSE <27
Self-efficacy	Exercise Self-Efficacy Scale ⁴⁸
Processes of change—experiential	Exercise Processes of Change Questionnaire ⁴⁹
Processes of change—behavioral	Exercise Processes of Change Questionnaire ⁴⁹
Decisional balance pro score	Exercise Decisional Balance Scale ⁵⁰
Decisional balance con score	Exercise Decisional Balance Scale ⁵⁰
Health-related quality of life	
Physical functioning	SF-36 ⁵¹
Role—physical	SF-36 ⁵¹
Bodily pain	SF-36 ⁵¹
General health	SF-36 ⁵¹
Vitality	SF-36 ⁵¹
Social functioning	SF-36 ⁵¹
Role—emotional	SF-36 ⁵¹
Mental health	SF-36 ⁵¹
Cantril ladder	Cantril Self-Anchoring Scale ⁵² instructed participants to identify considering health ranging from 1 = worst possible to 10 = best possible
How rate overall health?	SF-36 ⁵¹ —Response options: poor, fair, good, very good, or excellent

the original and transformed data. The analyses followed the intent-to-treat paradigm, with all participants randomized to fall prevention included in the analyses regardless of the extent of their adherence to the intervention or intervening events, such as severe injurious falls, which precluded continuation of exercise (see Discussion).

Hierarchical regression was used to select the most important predictors of exercise adherence within the five domains specified by our theoretical framework. Independent variables were analyzed using regression by blocks consisting of sociodemographic, clinical, postural competence, cognitive, and HRQOL variables. Bivariate analyses were run first, retaining those covariates where $p < 0.20$. Within each block, if the correlation between two retained variables exceeded 0.70, only one variable was selected for future regression models to avoid multicollinearity. The choice of which variable to retain was based on theory, selection of the variable likely to have the least measurement error, or, lacking these other criteria, the strongest association. Each of the variables that met these criteria was used in a multivariate regression analysis including only the variables for that block for each outcome. Final models were created by aggregating all variables with $p < 0.10$ across blocks. Analyses were conducted using SPSS version 13.0 (Chicago, IL).

Results

Demographic characteristics of the 137 participants are shown in Table 2. The majority of the sample was white, with high school or greater education and middle income. Six women withdrew prior to completion of the intervention, so exercise adherence data were available on 131 women. Three additional women withdrew during the course of the study, and there was one death unrelated to exercise. The mean length of follow-up was 24.1 months (SD 3.0); the median was

TABLE 2. PARTICIPANT CHARACTERISTICS (N = 137)

Characteristic	n (%) or Mean (SD)	Median, range
Age	78.5 (5.3)	77.9, 70.5–96.1
Race, white	133 (97.1)	
Marital status, married	51 (37.2)	
Education, $\leq$ high school	52 (38.0)	
Income, $\leq$ \$20,000	46 (33.6)	
Mini-Mental State Examination <27	14 (10.2)	
Number of chronic conditions	2.6 (1.6)	2.0, 0–8
Probable depression by Geriatric Depression Scale (>5)	10 (7.3)	
Self-rated health, fair or poor	9 (6.6)	
Cantril Quality of Life Ladder score	7.6 (1.4)	8.0, 4–10
SF-36 domains		
Physical functioning	61.2 (23.2)	65.0, 10–100
Role—physical	61.2 (40.0)	75.0, 0–100
Bodily pain	62.8 (20.7)	62.0, 22–100
General health	70.5 (15.0)	72.0, 25–100
Vitality	59.9 (17.3)	60.0, 10–100
Social functioning	85.7 (20.4)	100.0, 12.5–100
Role—emotional	76.6 (33.9)	100.0, 0–100
Mental health	80.9 (13.5)	84.0, 20–100

24.5 months, with a range of 1.0–26.7 months. Of the 127 women who participated until the 2-year follow-up period was complete, about two thirds (66%) were walking on a regular basis (20 minutes three times per week or more) in the final month, and 40% continued to do the balance exercises on a regular basis (at least two times per week) in the final month. A total of 29% of participants ($n = 37$) were neither walking nor doing the balance exercises on a regular basis by the end of the study, leaving 71% who were doing one or the other (or both) regularly.

The average number of minutes walked per week over the course of the 2 years was 95.2 (SD 68.8). Just over half of the women (51%) walked ≥ 90 minutes per week (30 minutes three times per week), but only 17% walked the recommended 150 minutes per week or greater over the 2 years. The average number of times the balance exercises were done was 1.5 (SD 1.6) times per week. Just 28% of the sample did them twice or more per week as prescribed over the 2 years.

Results of the regression analyses conducted by blocks for walking adherence are shown in Table 3. Sociodemographic variables were not significant. Clinical variables accounted for

TABLE 3. RESULTS OF REGRESSION ANALYSES BY BLOCK PREDICTING WALKING ADHERENCE IN COMMUNITY-DWELLING OLDER WOMEN: RESULTS OF REGRESSION ANALYSES BY BLOCK (N = 137)

Independent variables measured at baseline	β	p value	Adjusted R^2
Clinical characteristics			
Body mass index (BMI)	−0.22	0.029	
Probable depression	−0.18	0.070	
Past history of exercise	−0.05	0.597	
Number of chronic conditions	−0.32	0.028	
Osteoarthritis	0.17	0.114	
Activities-Specific Balance Confidence scale	0.04	0.746	
Number of medications	−0.09	0.448	
Weekly urinary incontinence	0.06	0.610	0.169
Postural competence			
Berg Balance Test score	0.13	0.298	
8-foot timed walk (in seconds)	−0.02	0.887	
Timed chair (in seconds)	0.03	0.795	
Hip strength	0.20	0.051	0.052
Cognitive			
Mini-Mental State Examination <27	−0.20	0.023	
Self-efficacy	0.22	0.015	
Processes of change—behavioral	0.20	0.033	
Decisional balance con score	−0.19	0.036	0.122
Health-related quality of life			
Physical functioning	0.31	0.009	
Role—physical	−0.12	0.315	
Bodily pain	0.01	0.996	
General health	−0.10	0.369	
Vitality	0.07	0.548	
Social functioning	0.12	0.338	
Role—emotional	0.11	0.323	
Mental health	−0.09	0.467	
Cantril ladder	0.11	0.340	0.082

TABLE 4. FINAL MODEL: PREDICTING WALKING ADHERENCE IN COMMUNITY-DWELLING OLDER WOMEN

Independent variable	β	p value	Adjusted R^2
Body mass index (BMI)	-0.06	0.529	0.190
Probable depression	-0.17	0.050	
Number of chronic conditions	-0.22	0.019	
Hip strength	0.10	0.321	
Mini-Mental State Examination <27	-0.14	0.093	
Self-efficacy	0.14	0.111	
Processes of change—behavioral	0.20	0.027	
Decisional balance con score	-0.09	0.336	
Physical functioning	0.03	0.796	

the most variance (17%). The model for cognitive variables was second highest (12%). Those variables with p values <0.10 within the blocks were retained for the final model to predict walking adherence (Table 4); this model explained 19% of the variance. Increased numbers of chronic conditions and probable depression led to decreased adherence, whereas higher use of behavioral processes of change led to increased adherence.

Although the variable of average minutes walked per week was slightly skewed because of outliers who walked more than the recommended amount, the data were reasonably symmetrical. In an attempt to normalize the data, however the outcome was transformed via log, natural log, and square root of minutes walked; only the square root of minutes walked became more symmetrical. Regression analyses were reanalyzed with this dependent variable, resulting in a similar final model with the exception of behavioral processes of change and decisional balance con scores being eliminated because of nonsignificance. This final model resulted in only probable depression being significant ($p = 0.033$, $R^2 = 0.228$).

Logistic regression by blocks was used to predict adherence to the balance exercises, comparing those who did them on average one or more times per week with those who did not. As above, variables with bivariate associations with p values >0.20 were entered by blocks and are included in Table 5. Because of the high correlation of the experiential and behavioral processes of change, a summary score was created that combined the two so that those who used more of either or both types of processes had higher scores. No socio-demographic or postural competence variables were entered, as none fit the criteria. HRQOL variables accounted for the greatest variance by block (14%), followed by cognitive variables (12%). Those variables with p values <0.10 within the blocks were retained for the final model to predict balance exercises (Table 6); this model explained 24% of the variance. Low cognitive functioning as measured by the MMSE and higher self-rated health led to decreased odds of performing the balance exercises once or more per week, whereas higher self-efficacy resulted in increased odds.

Discussion

This study is one of the first to assess predictors of exercise adherence in older women with a follow-up period as long as 2 years. In this study, two thirds of older women were walking regularly (e.g., 20 minutes at least three times a week), and 40% were doing the balance exercises twice a week at 2 years. A majority (71%) of participants were doing either or both, similar to another study addressing exercise in patients with chronic obstructive pulmonary disease (COPD).⁵³ However, the average over the 2 years was 95 minutes of walking per week compared with a recommendation of 150 minutes per week. These results are similar to results of another study, which found adherence fell far short of the exercise prescription; when 5–7 days per week were prescribed, participants did an average of 30 minutes three times per week.²¹ This is in contrast to another multicomponent intervention aimed at those with osteoarthritis that established a

TABLE 5. PREDICTING BALANCE EXERCISE ADHERENCE IN COMMUNITY-DWELLING OLDER WOMEN: RESULTS OF LOGISTIC REGRESSION ANALYSES BY BLOCK

Independent variable	Odds ratio, 95% CI	p value	Nagelkerke R^2
Clinical characteristics			0.080
Body mass index (BMI)	0.960 (0.897-1.028)	0.242	
Probable depression	0.395 (0.095-1.640) ^a	0.201	
Cardiovascular disease	1.336 (0.549-3.247) ^a	0.523	
Smoker, past or present	0.521 (0.250-1.083) ^a	0.081	
Cognitive			0.117
Mini-Mental State Examination <27	0.274 (0.065-1.152) ^a	0.077	
Self-efficacy	1.033 (1.000-1.068)	0.052	
Processes of change—sum of experiential and behavioral	1.065 (0.997-1.138)	0.060	
Health-related quality of life			0.142
Vitality	1.014 (0.987-1.041)	0.317	
Mental health	1.023 (0.988-1.060)	0.201	
Cantril ladder	1.122 (0.826-1.524)	0.462	
Rate health good, very good, or excellent	0.071 (.008-.639)	0.018	

^aThe reference group for each binary variable was the null condition; for example, the reference group for cardiovascular disease was the group who did not have cardiovascular disease.

TABLE 6. FINAL MODEL: PREDICTING BALANCE EXERCISE ADHERENCE IN COMMUNITY-DWELLING OLDER WOMEN

<i>Independent variable</i>	<i>Odds ratio, 95% CI</i>	<i>p value</i>	<i>Nagelkerke R²</i>
Smoker, past or present	0.467 (0.212-1.033)	0.060	
Mini-Mental State Examination <27	0.078 (0.008-0.727)	0.025	
Self-efficacy	1.038 (1.002-1.075)	0.037	
Processes of change— sum of experiential and behavioral	1.052 (0.983-1.127)	0.144	
Rate health good, very good, or excellent	0.034 (0.002-0.504)	0.014	
			0.240

goal of 90 minutes per week and found that participants exercised, on average, 210 minutes per week over 12 months.⁵⁴ Higher adherence has also been found with 171 minutes walked per week on average in one study that had only 13 participants >age 70¹⁷ and 150 minutes per week in a study that allowed cancer survivors to choose their preferred form of exercise.⁵⁵

In this study, only 17% of participants met the recommendation of 150 minutes or more per week, and 28% met the recommendation of doing the balance exercises $\geq$ twice per week more. Half of participants averaged $\geq$ 90 minutes of walking per week. Although this may be considered a low rate of adherence, women were retained in this study even if they quit exercising because of the primary outcome of falls, which has not been the case in other exercise studies. Lower rates of adherence are also seen with intention-to-treat analysis.¹⁸ This also made for better use of predictors, as there was greater variation than in studies where those who did not exercise at the end were removed from analysis. Given that all women recruited for this study were sedentary at baseline, the fact that 70% were exercising regularly by the end of 2 years may be considered successful.

Self-reported reasons for adhering to exercise prescriptions have been looked at in other studies^{22–24} and may be quite different from those factors found to be associated with adherence in this report. Many studies on exercise adherence exclude participants with comorbid conditions or focus solely on one specific condition, whereas this study did not; therefore, it may provide a clearer picture of exercise adherence in older women. Chronic conditions are prevalent in older adults, but those with chronic conditions would still likely benefit from exercise.^{4,56} This study may be more reflective of the target population, as participants were not merely agreeing to participate in an exercise study, which may attract a different subset of the population than is necessary to generalize results broadly.

Different predictors were seen for walking adherence and balance adherence. Some differences could have been expected, but one might have assumed at least a few predictors in common. Age and other demographic variables did not predict adherence for either type of exercise, similar to other research.^{22,23,57,58} Significant predictors of walking adherence included absence of depression, fewer chronic conditions, and use of behavioral processes of change. Significant predictors of balance exercise adherence included intact cognitive function as measured by the MMSE, self-efficacy for exercise, and poor or fair health status. This may lead to recommendations to tailor the type of exercise based on these factors; however, more research is warranted in older adults.

Self-efficacy has been the most consistent construct in predicting exercise adherence^{13,17,19,25,31,32} or stage progression in the Transtheoretical Model (TTM).^{26,29} Self-efficacy at baseline was significant in predicting balance adherence but not walking adherence. Other studies have found no association between self-efficacy and exercise adherence.^{27,34} Oman and King¹⁹ found self-efficacy predicted short-term adherence but not long-term adherence. Other analyses of this population revealed self-efficacy measured after the intervention was found to be a better predictor of moving into the action stage of the TTM for exercise adoption than was baseline self-efficacy.⁵⁹ Although stage of change (precontemplation, contemplation, or preparation) had been associated with progressing to action or maintenance in previous research,^{17,55,59–60} this measure was not significant to predict adherence for either form of exercise in this study. This suggests that tactics to promote adoption of exercise behavior may not be sufficient to ensure enduring change from a sedentary lifestyle.

Poorer self-rated health was found to predict adherence to the balance exercises, in contrast with the results of Howze et al.,³⁷ who reported that many in a low adherence group reported their health as fair or poor. Another study reported that adherence was greater in a group adopting yoga who had higher baseline physical functioning and vitality, but walking adherence showed no correlation.⁵⁷ Further work is needed to elucidate the reasons for this discrepancy.

Participants who were at risk for depression were less likely to adhere to their walking prescription, but no difference was seen with respect to balance exercises. Although depression is a well-known predictor of medication nonadherence, few studies have assessed depression as a predictor of exercise adherence in older adults. One study found that those with higher depression were more adherent,²⁷ whereas another found that depression did not predict adherence.⁶⁰ In a study of patients with COPD, those with the lowest level of mental health scores at baseline were most likely to relapse in their exercise prescription.⁵³

Exercise behavior was self-reported by participants and, therefore, may be subject to bias. Exercise logs were completed daily in an attempt to minimize this bias; however, it is not certain that these instructions were followed. Adherence definitions vary throughout the literature, making results of this study difficult to compare with other studies. The measure of adherence used here was compatible with regression analysis to determine predictors. However, patterns of adherence were not addressed, and adherence in this population varied considerably as illnesses occurred or participants took vacations. Therefore, predictors of patterns of adherence were

not considered. Participants of this study were predominantly white, middle-class, educated women. Therefore, results may not be generalizable to minority or lower-income populations. Numerous studies have addressed stressful life events and the impact on exercise adherence,^{23,33,62,63} but these were not measured in this study. It is unknown to what extent this may have played a role, given the age of the population.

Conclusions

Adherence to exercise was below recommended goals. However, this study demonstrated that sedentary women can adopt and continue regular exercise over a 2-year period. Predictors of adherence varied with different forms of exercise. Preference of exercise type may be important to enhance adherence. Preference may be based on enjoyment of a specific form of exercise, as discussed elsewhere,²³ but also on cognitive factors and health status. Individually tailored exercise interventions may be most amenable to sedentary populations of older women.

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