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Attrition and Adherence of Young Women to Aerobic Exercise: Lessons from the WISER study

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Abstract

The purpose of this report is to identify factors associated with attrition and adherence of young women to a 16-week randomized aerobic exercise intervention on biomarkers associated with breast cancer risk. The exercise group was prescribed a progressive weight-bearing aerobic exercise program consisting of 30 minute workouts, 5 times/wk for 16 weeks. Adherence was calculated as the average minutes of exercise per week during participation in the study. Of the total of 212 women randomized into the exercise intervention 46 dropped out, of which 82.5% dropped out during the earlier stages of exercise suggesting that reasons for withdrawal may have been related to difficulties with initiating physical activity. Time commitment or lack of time was the primary reason for withdrawal. Drop outs reported lower physical activity at baseline than study completers ($p=.0007$). Although 78% of the 212 randomized participants completed the exercise intervention, only 4.7% of the participants exercised for at least 150 min/wk during the entire study period. Significant predictors of adherence were self-reported physical activity at baseline and depression scores. We conclude that predictors of adherence to exercise in our population of young women are similar to those reported for older adults. We also found that young women are more likely to exercise at moderate to vigorous intensity for 90 to 120 minutes rather than 150 minutes per week, even when participating in a highly structured exercise intervention.

Keywords

physical activity; randomized controlled trial; adherence; women

Introduction

Despite increasing evidence linking physical activity with health benefits, data indicate that the population prevalence of physical inactivity has increased over the last decade. In 2009, data from the Behavioral Risk Factor Surveillance System indicated that 38.7% and 45.3% of adults aged 18-24 and 25-34, respectively, did not meet current recommendations [1]. In addition, women are less likely than men to engage in any regular physical activity (27.3%

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vs 34.4%, respectively) [2]. The purpose of this report is to identify the factors associated with attrition and adherence of young women to the Women in Steady Exercise Research (WISER) study in order to improve retention and adherence of young women to future exercise trials.

Methods

The WISER study was a randomized, controlled trial designed to examine the effects of a 16-week aerobic exercise intervention on biomarkers associated with risk of breast cancer in sedentary young women. Details about recruitment, design and methods of the WISER trial have been previously described [3]. Table 1 shows the inclusion criteria for the study. Written informed consent was obtained from all participants prior to beginning study activities. The WISER trial was approved by the University of Minnesota Human Subjects Review Committee.

Participants randomized into the exercise group were instructed to engage in weight-bearing aerobic exercise for 30 min, 5 times/wk over four menstrual cycles (average of 16 weeks). Participants were asked to wear a Polar Heart Rate monitor during each session (Polar Electro Inc., Lake Success, NY) and keep an exercise log to record the date, type of equipment used, average heart rate, duration of workout and stretching. Exercise intensity was set at 65-70% of age predicted max HR for the first four weeks of exercise, 70-75% for weeks 5-8, 75-80% for weeks 9-12, and 80-85% for the final stage, which ranged from two to six weeks depending on each participant's menstrual cycle length. A certified personal trainer worked with participants to provide ongoing support and to monitor adherence to the protocol.

Adherence was calculated by taking the average minutes of exercise per week for each of the four stages of exercise intensity. A multiple regression model for overall adherence was constructed including several baseline variables as potential predictors of adherence to the exercise intervention to include: BMI, body fat percent, age, caloric intake, baseline fitness, self-reported physical activity, season of study entry, work status (full time vs part time employment including studying), education (less than college degree vs college degree or higher), income (<10,000/yr, 10,000-30,000/yr, or >30,000/yr), depression score (assessed by the Center for Epidemiological Studies Depression scale [4]), stress score (assessed by the Perceived Stress Scale [5]), barriers to exercise score (adapted from [6-7]), and self-efficacy score [8]. Given that 29 participants had missing data, missing values were imputed using a multiple imputation approach. All statistical analyses were performed using SAS software version 9.2 (SAS Institute Inc, Cary, NC).

Results and Discussion

There were a total of 212 women randomized into the exercise intervention out of which 46 dropped out. Among these dropouts, 43.5% left the study before completing one week of exercise, 39% during stages 1 or 2 and 17.5% during stages 3 or 4. This suggests that reasons for withdrawal may have been related to difficulties with initiating physical activity. Table 2 shows the frequency of study withdrawal by reason for both the exercise and control groups. Our qualitative analysis of the reasons for study withdrawal indicated that time commitment or lack of time was the primary reason, followed by health issues, and new life events (i.e., moving away and pregnancy). Other studies also show lack of time as the most prevalent self-reported reason for dropping out of exercise interventions [9].

Baseline demographic characteristics and physiologic data are shown in Table 3. Exercisers who dropped out reported lower physical activity at baseline than study completers ($p=$

0007). This finding poses an interesting challenge to researchers conducting exercise interventions as those who are the least active might be the ones who benefit the most from exercise, but also the ones who are most likely to drop out. Figure 1 shows the distribution of self-reported physical activity at baseline in completers and drop outs.

Mean adherence to the exercise intervention was 108.3 minutes per week out of the prescribed 150 min/wk. Study completers had significantly higher average minutes/week than those who dropped out at all stages of exercise (Table 4). Although study completion was high, only 4.7% of the participants exercised for at least 150 min/wk during the entire study. During the first stage of exercise (65-70% max HR), 36.4% of participants adhered to 150 min/wk but at the final stage (80-85% max HR), this number decreased to 11.8%. Research suggests that exercise adherence decreases over time [10-11] and it also decreases as prescribed intensity increases [12]. Thus, the progressive increase in exercise intensity over time in this study was likely the main contributor to the lower adherence at the final stages. However, it should be noted that during stages 3 (70-75% max HR) and 4 (75-80% max HR), participants were exercising at a vigorous intensity and nearly 73% exercised for 90 or more min/wk, which is above the current recommendation of 75 min/wk of vigorous intensity activity. This suggests that, in the short term, the public health recommendations are feasible for young, single, diverse, educated women.

We found that self-reported physical activity and depression scores were significant predictors of adherence measured as mean total minutes of exercise per week. Overall, the variables included in our multiple regression model (Table 5) explained around 14% of the differences in exercise adherence observed among participants. Previous research supports this finding [10, 13].

One limitation of this trial was that we did not assess the stage of change of physical activity based on the transtheoretical model [14], but rather we assessed expected benefits. Several studies have shown that stage of change is an important predictor of adherence to exercise interventions [10-11]. Also, the first six months of an exercise program are considered the initial adoption phase of exercise [15], but our intervention lasted approximately four months, which does not allow us to make any inferences on exercise maintenance. The generalizability of our findings is also limited to our study population, which was highly educated, single and not using hormonal contraceptives. We are also not able to extrapolate a highly structured exercise program used in the WISER trial to a different setting where young women are not held accountable for exercising.

Conclusion

Few studies have investigated factors associated with adherence to exercise interventions in young populations. We conclude that predictors of adherence to exercise in our population of young women are similar to those reported for older adults and that young women are more likely to exercise at moderate to vigorous intensity for 90 to 120 minutes rather than 150 minutes per week. Overall, our findings are consistent with previous research in other populations and suggest that both frequency and intensity of exercise are important factors to consider when prescribing exercise to young women. Some questions remain to be answered: can young women sustain physical activity during periods of time when major transitions such as starting adult employment, getting married and having children are occurring?; can young women meet current physical activity guidelines in the absence of a structured and intensive exercise trial? Future research in this area should be designed to also address these questions.

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Figure 1. Distribution of self-reported physical activity (METs/week) at baseline among completers and drop outs. Completers reported higher physical activity at baseline than drop outs.

Table 1

Inclusion and exclusion criteria for the WISER study.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Sedentary (defined as not currently participating in habitual exercise for two or more times per week) • No use of hormonal contraceptives for the past three months • Age between 18-30 years • BMI between 18.5 and 40 kg/m² • Self-reported menstrual cycle length between 24-35 days • Intact ovaries and uterus • No history of gynecologic problems • Stable weight • Not currently trying to lose weight 	<ul style="list-style-type: none"> • History of cancer over the past five years • Use of hormonal contraceptives for the past three months • Currently pregnant or breastfeeding • Uncontrolled hypertension • Thyroid disease • Alcohol consumption of more than seven servings per week

Table 2Frequency of drop out in the exercise and control groups by reason ($n = 72$).

Reason for Drop	Exercisers N = 46	Controls N = 26
Family problems	3 (6.5%)	1 (3.9%)
Pregnancy	6 (13%)	3 (11.5%)
Time commitment	19 (41.3%)	3 (11.5%)
Health concerns/injury	7 (15.2%)	4 (15.4%)
Started taking hormones	2 (4.3%)	3 (11.5%)
Moved away	6 (13%)	4 (15.4%)
Did not agree with randomization	2 (4.3%)	4 (15.4%)
Stop responding	1 (2.4%)	4 (15.4%)

Table 3Baseline characteristics of participants randomized into the exercise group by drop out status^a.

	Exercisers		p
	Completers N = 166	Drop outs N = 46	
Age (years)	25.4 ± 3.3	24.4 ± 3.7	0.08
Weight (kg)	67.6 ± 14.5	67.1 ± 16.5	0.85
BMI (kg/m ²)	24.8 ± 4.6	24.7 ± 5.1	0.96
Body Fat (%)	36.5 ± 8.8	36.6 ± 9.5	0.93
Fitness (METs)	6.92 ± 1.5	6.76 ± 1.3	0.51
Self-reported physical activity (METs/wk)	21.6 ± 16.4	12.7 ± 11.3	0.0007
Total Caloric Intake (kcal/day)	1635 ± 645	1750 ± 891	0.45
Ethnicity			
Hispanic	4.8	8.7	0.31
Non-hispanic	95.2	91.3	
Race			
American Indian/Alaskan	0.6	0	0.65
Asian	12.0	19.6	
Black	8.4	10.9	
White	74.1	63.0	
Other	4.9	6.5	
Education			
Less than college	32.0	52.2	0.03
College degree	34.3	32.6	
Professional/Graduate degree	33.7	15.2	
Marital Status			
Never married	83.1	78.3	0.48
Married/partnered	15.1	21.7	
Divorced	1.8	0	
Work Status			
Part time	18.0	11.9	0.34
Full time	82.0	88.1	

^aValues are expressed as mean ± SD for continuous variables and % frequency for categorical variables.

Table 4

Adherence to exercise intervention in the WISER study (n=212).

Min/Week	Stage 1 (65-70% max HR) [†]	Stage 2 (70-75% max HR)	Stage 3 (75-80% max HR)	Stage 4 (80-85% max HR)	Overall
All [*]	133.7 ± 29.3	119.8 ± 47.5	112.2 ± 53.6	93.7 ± 55.5	108.3 ± 48.0
Completers	139.0 ± 2.1	135.9 ± 2.6	134.2 ± 2.5 ^a	116.9 ± 2.8 ^a	127.4 ± 2.4
Drop outs	106.3 ± 4.8	48.6 ± 5.6 ^b	25.9 ± 4.9 ^b	13.4 ± 5.2 ^b	39.3 ± 4.6
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Participants adhering to:					
≥ 150 min/wk	77 (36.3%)	79 (37.3%)	57 (26.9%)	25 (11.8%)	10 (4.7%)
≥ 120 min/wk	92 (43.4%)	73 (34.4%)	86 (40.5%)	79 (37.3%)	129 (60.9%)
≥ 90 min/wk	19 (9%)	16 (7.6%)	21 (9.9%)	41 (19.3%)	24 (11.3%)
≥ 60 min/wk	0 (0%)	9 (4.2%)	1 (0.5%)	10 (4.7%)	10 (4.7%)
< 60 min/wk	24 (11.3%)	35 (16.5%)	47 (22.2%)	57 (26.9%)	39 (18.4%)

[†] max HR: maximum age predicted heart rate.^{*} Data are expressed as mean ± SD on the row marked with the asterisk, otherwise, data are expressed as mean ± SEM.^a Significantly different than baseline (p<0.03).^b Significantly different than baseline (p<0.0006).

Table 5

Multiple regression model of predictors of adherence to the 16-week exercise intervention (n = 212).

Baseline Predictors	β	SE	P value
BMI	-1.358	1.30	0.29
Body fat (%)	0.262	0.74	0.72
Caloric intake (kcal)	0.004	0.00	0.39
Age (y)	1.415	1.15	0.22
Baseline fitness (METs)	1.387	2.57	0.55
Self-reported PA (METs)	0.641	0.21	0.002
Work status			
Full time	10.448	8.86	0.22
Part time (ref)			
Education			
College or higher	-9.082	8.26	0.28
Less than college (ref)			
Barriers to exercise	0.139	0.32	0.66
Self-efficacy	-0.144	0.34	0.67
Depression	-0.844	0.35	0.02
Stress	0.669	0.48	0.13
Income level			
< \$10,000	16.505	9.31	0.08
\$10,000 \$30,000	0.690	7.61	0.93
> \$30,000 (ref)			
Season			
Fall	-4.005	9.99	0.72
Spring	-0.596	8.73	0.99
Summer	3.026	9.19	0.71
Winter (ref)			