

Award Number: DAMD17-01-1-0628

TITLE: The Effect of a Home-Based Walking Intervention on Quality of Life, Body Composition, and Estrogen Metabolism in Postmenopausal Breast Cancer Survivors

PRINCIPAL INVESTIGATOR: Sara Wilcox, Ph.D.

CONTRACTING ORGANIZATION: University of South Carolina
Columbia, SC 29208

REPORT DATE: September 2006

TYPE OF REPORT: Final Addendum

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE (DD-MM-YYYY) 01-09-2005		2. REPORT TYPE Final Addendum		3. DATES COVERED (From - To) 1 Sep 2005 – 31 Aug 2006	
4. TITLE AND SUBTITLE The Effect of a Home-Based Walking Intervention on Quality of Life, Body Composition, and Estrogen Metabolism in Postmenopausal Breast Cancer Survivors				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER DAMD17-01-1-0628	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Sara Wilcox, Ph.D. E-mail: SWILCOX@SC.EDU				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of South Carolina Columbia, SC 29208				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Increased incidence of and survival from breast cancer have resulted in growth of the number of women who have survived this disease and are faced with the subsequent consequences of their diagnosis and treatment. Physical activity (PA) is a modifiable health behavior that has the potential to address both the emotional and physical needs of women with early stage breast cancer. However, for PA to be seen as a viable treatment option, and for a change in routine care to occur, its effectiveness must be determined. Thus, the objectives of this pilot study were to: 1) quantify the effect of a 12-week home-based walking intervention on quality of life, body composition, and estrogen metabolism in survivors of breast cancer, and 2) develop and test the feasibility of PA intervention materials for future studies in this population. A total of 33 participants were enrolled and 21 of these were randomized to the walking program. No participants met inclusion criteria for the estrogen metabolism sub-study. Completion of counseling calls and adherence to the walking prescription were high among the walking group. Medium to large increases in PA as well as medium improvements in many domains of health-related quality of life were found among walking but not control participants. Home-based walking programs appear to be a feasible and promising form of intervention for breast cancer survivors.					
15. SUBJECT TERMS Exercise, physical activity, quality of life, body weight, breast cancer					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRMC
U	U	U	UU	8	19b. TELEPHONE NUMBER (include area code)

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Introduction

Increased incidence of and survival from breast cancer have resulted in growth of the number of women who have survived this disease and are faced with the subsequent consequences. Diagnosis and treatment of breast cancer are associated with several adverse physical and psychosocial outcomes (e.g., weight gain, reduced physical activity levels, loss of lean body mass, depression, lowered self-esteem). Some of these adverse effects are attenuated after adjuvant treatment ends. However, psychological distress and weight gain may persist, resulting in reduced quality of life and increased risk of recurrence. Physical activity participation may attenuate the adverse effects outlined above and improve hormonal factors that influence breast cancer recurrence. Given these benefits, it is remarkable that physical activity programs have not been adapted for breast cancer survivors until very recently. In order for physical activity to be seen as a viable treatment option, and for a change in routine care to occur, its effectiveness must be determined. Accordingly, the objectives of this pilot study were to; 1) quantify the effect of a 12-week home-based walking intervention on quality of life, body composition, and estrogen metabolism in survivors of breast cancer, and 2) develop and test the feasibility of physical activity intervention materials for future studies in this population. We hypothesized that women randomized to the walking intervention will report higher levels of quality of life, experience less weight gain, and have more favorable estrogen metabolite profiles.

Body

DESIGN. We proposed to recruit 50 postmenopausal women recently diagnosed with breast cancer from the South Carolina Cancer Center (Columbia, SC), with 30 women to be randomized to a 12-week walking intervention and 20 women to a control group. Women from the control group were offered a walking program following the randomized experiment to allow them benefit from the intervention and improve compliance during the trial. All women were screened for contraindications to the moderate-intensity walking program (i.e., anemia, immune suppression, extreme fatigue, bone pain, and symptoms of cardiovascular disease and orthopedic problems) and excluded as necessary. The intervention occurred after treatment was completed.

INTERVENTION. Participants randomized to the intervention completed a 12-week home-based walking program using the Stanford model developed and refined by King and colleagues.¹ Supervised home-based programs are preferred by most adults² and have been shown to be safe even in older ages and the obese. To maximize safety, participants were instructed to gradually increase their walking duration and intensity. By the eighth week of the intervention, the goal was to walk for 30-40 minutes, 5 times per week, at a moderate intensity level (i.e., 3-4 mph). Women in the intervention had an initial in-person counseling session with a health educator that emphasized physical activity safety (i.e., perceived exertion, warm-up, and cool-down). They also received 5 brief telephone calls by a health educator to monitor participant safety and enhance adherence during the 12-week intervention. Adherence was monitored with self-report logs and pedometers. Dr. Sara Wilcox, a psychologist and Associate Professor in Exercise Science at USC, oversaw the intervention

MEASURES. Quality of life was measured with the Medical Outcomes Study SF-36^{3,4} that evaluates eight domains of life quality (e.g., physical, social, bodily pain, mental health) and with the International Breast Cancer Quality of Life Scale.^{5,6} Changes in body mass and composition were quantified with anthropometric measures and bioelectrical impedance. We proposed to measure estrogen metabolite levels among half of the overall sample (n=25), or in the number that qualify for this sub-study, from spot urine samples in triplicate using the Estramet 2/16 kit (Immuna Care Corp, Bethlehem, PA). Changes in physical activity were assessed by questionnaire and an accelerometer^{7,8}. Outcomes are measured at baseline, 6-, and 12-weeks. Availability of these data

allowed for examination of the effect of the intervention in returning women toward pre-diagnosis levels of physical and psychosocial health.

RESULTS. A total of 33 women enrolled and were randomized in the study (21 to the walking group and 12 to the control group). Due to a number of factors, including a substantial delay in recruitment due to challenges in institutional agreements regarding coverage of potential medical expenses incurred by women as a consequence of their participation in this research, we were not able to reach our study goal of 50 women. Furthermore, no women qualified for the estrogen metabolism sub-study (largely due to medications they were taking that were exclusion criteria). A decision was made to place our recruitment efforts on enrolling women into the study, regardless of their eligibility for the sub-study, so that a greater number of women who could benefit and contribute to our understanding in this area could participate. Only two women withdrew from the study: one moved from the area and the second indicated she was too busy to participate. Both of these women were in the intervention group.

Table 1 presents the characteristics of study participants at baseline.

Table 1
Characteristics of study participants at baseline

Variable	Walking Group (n = 21)	Control Group (n = 12)	Total Sample (N = 33)
Age, years \pm SD	56.7 \pm 5.6	54.9 \pm 6.5	56.0 \pm 6.0
Education, years \pm SD	15.8 \pm 2.4	16.1 \pm 2.4	15.9 \pm 2.4
Marital status			
% (n) Married or partnered	80.0 (16)	83.3 (10)	81.2 (24)
% (n) Widowed	5.0 (1)	0	3.1 (1)
% (n) Divorced	10.0 (2)	8.3 (1)	9.4 (3)
% (n) Separated	0	8.3 (1)	3.1 (1)
% (n) Single, never married	5.0 (0)	0	3.1 (1)
Race			
% (n) White	90.0 (18)	50.0 (6)	75.0 (24)
% (n) Black or African American	10.0 (2)	41.7 (5)	21.9 (7)
% (n) Other	0	8.3 (1)	3.1 (1)
% (n) treated with radiation	90.0 (18)	58.3 (7)	78.1 (25)
% (n) treated with chemotherapy	79.0 (14)	66.7 (8)	74.2 (23)
% who exercised before diagnosis	79.0 (15)	50.0 (6)	67.7 (21)

Note: Numbers do not always sum to 33 due to missing data.

Despite not being able to enroll 50 women, we believe our major research questions were answered. This study was designed to be a pilot study to quantify effect sizes of the effect of walking on quality of life, physical activity, body composition, and depending on inclusion criteria, estrogen metabolism. Second, this study was designed to assess the degree to which the physical activity intervention materials were feasible in this population and could be used in future studies.

Regarding the first study aim, **Table 2** shows the pretest and posttest scores for intervention and control women for physical activity, quality of life, and body composition. Effect sizes are also shown for each randomization group (i.e., effect size from pretest to posttest) and for the comparison of the two randomization groups. Four participants were still enrolled in the study at the time this report was submitted, so their post-test scores were not yet available (these participants will all be completed by October 2006). Thus, Table 2 is based on 26 participants (33 minus 2 who withdrew minus 1 who did not return for her 12-week assessment minus 4 participants who have not yet completed measurements).

Because this was a pilot study and not a fully-powered study, all results are described relative to effect sizes. Effect sizes of $d = 0.2$ were considered small; $d = 0.5$, medium; and $d = 0.8$, large.

Table 2.

Changes in body composition, physical activity, and quality of life from pre- to post-intervention, by randomization group

	Walking Group					Control Group					Walking vs Control
	Baseline		12-weeks		d	Baseline		12-weeks		d	d
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		
Body Composition											
BMI (kg/m ²)	26.1	3.5	26.3	3.5	0.03	29.2	7.4	29.5	7.0	0.05	0.0
Body mass (kg)	68.2	9.3	68.6	9.3	0.03	82.7	19.7	83.5	18.8	0.05	0.0
Waist Circumference (cm)	84.4	10.1	83.3	10.1	-0.08	92.6	17.3	94.8	17.3	0.17	-0.2
Hip Circumference (cm)	105.4	6.9	105.0	7.1	-0.04	113.3	13.2	113.5	12.0	0.02	-0.1
Body fat (%)	34.0	6.4	33.7	6.1	-0.06	35.1	7.1	34.5	6.3	-0.11	0.0
Physical Activity											
Actigraph (ct/min/d)	264.9	108	323.4	112	0.62	210.2	58.3	219.2	57.7	0.09	0.5
Total Activity (MET-hrs/wk)	24.7	11.9	49.1	19.4	1.74	19.4	16.7	24.2	20.5	0.34	1.4
Walking (MET-hrs/wk)	6.4	6.1	25.8	16.8	3.52	3.7	4.4	5.9	10.0	0.39	3.1
Quality of Life											
SF-36											
General health	66.6	14.2	72.7	13.6	0.32	66.6	22.2	63.9	25.9	-0.16	0.5
Physical function	72.0	13.0	79.7	16.5	0.53	77.0	17.0	76.0	13.7	-0.07	0.6
Mental health	75.6	14.6	84.4	11.2	0.47	68.0	24.1	73.2	24.4	0.28	0.2
Role-emotional	84.4	28.2	85.4	29.7	0.04	80.0	28.1	70.0	36.7	-0.36	0.4
Social function	56.3	40.3	79.7	31.9	0.62	67.5	33.4	70.0	35.0	0.07	0.6
Vitality	85.9	12.0	96.1	7.5	0.54	68.8	23.0	80.0	23.0	0.60	-0.1
Pain	50.6	21.4	65.4	20.9	0.65	53.0	26.2	52.5	24.4	-0.02	0.7
PCS	52.2	7.3	57.2	5.5	0.43	47.3	13.9	48.7	11.4	0.13	0.3
MCS	43.0	6.5	47.1	6.2	0.54	44.9	6.1	44.7	6.7	-0.03	0.6
IBCQOL											
Hot flashes	0.31	0.5	0.19	0.4	-0.28	0.20	0.4	0.30	0.5	0.22	-0.5
Restricted arm use	0.31	0.5	0.44	0.5	0.25	0.50	0.5	0.50	0.5	0.00	0.3
Feeling sick	0.88	0.3	0.94	0.3	0.15	0.60	0.5	0.70	0.5	0.23	-0.1
Social support	0.81	0.4	0.81	0.4	0.00	0.70	0.5	0.80	0.4	0.23	-0.2
Appetite	96.2	2.0	97.3	1.3	0.46	95.9	2.9	95.7	2.2	-0.06	0.5
Coping effort	95.0	2.5	96.0	2.3	0.40	96.1	2.5	96.1	2.5	-0.01	0.4
Current health	95.1	1.6	95.7	1.7	0.28	95.0	2.6	94.7	1.6	-0.17	0.5
Mood	96.3	1.8	97.1	1.7	0.35	95.3	3.2	95.1	2.6	-0.07	0.4
Physical well-being	95.4	2.0	96.5	2.1	0.40	94.8	2.8	94.6	2.6	-0.08	0.5
Tiredness	93.1	1.9	94.1	2.4	0.62	93.0	1.9	93.2	1.9	0.11	0.5
FACT-Fatigue	14.6	8.6	10.3	8.8	-0.51	16.0	8.4	14.3	9.0	-0.20	-0.3

Note: d for walking and control groups refers to the effect size, which is equal to 12-week mean minus baseline mean divided by the pooled (across groups) baseline standard deviation. d for walking vs. control refers to the difference between pre-post differences divided by the pooled (across groups) baseline standard deviation.

Body composition showed no or very small changes among women randomized to the walking group and among women randomized to the control group. This finding is not surprising as the intervention was only 12 weeks. Waist and hip circumference showed small decreases over time among women in the walking group and very small increases among women in the control group.

Increases in physical activity were seen for walking but not control participants. Of particular note is the medium to large effect size for the walking group for objectively assessed physical activity and the large effect sizes for the walking group for self-reported total physical activity and walking.

Finally, regarding quality of life, effect sizes for all SF-36 scales except role-emotional were medium in size for the walking group (indicating improved quality of life) but more variable and generally smaller (or even negative) for the control group. For breast cancer specific quality of life (IBCQOL), the walking group showed improvements in all domains except hot flashes (where they actually reported an increase) and social support, which did not change from pretest to posttest. As with the SF-36, effect sizes were more variable for the control group on the IBCQOL scale.

Regarding the second study aim of testing the feasibility of the intervention, we were very successful. As noted, only two women withdrew from the study, and one withdrawal was due to moving to another state. Delivery of the intervention via the telephone was very successful. For all women who remained in the study, all five of their counseling calls were delivered. One participant who withdrew received 3 calls, and the second participant who withdrew received 2 calls. Furthermore, for women randomized to the walking group, adherence to prescribed exercise sessions was very high based on monthly exercise logs. In the event that logs weren't received, we took a conservative estimate of assuming that no exercise sessions were completed. Overall, women on average exceeded the prescribed exercise sessions, and had an average adherence rate of 103.6%. In addition, no adverse events were reported. Therefore, based on the positive increases shown in physical activity, the correspondingly high adherence rates, the high rate of completed telephone counseling sessions, and the low risk, we conclude that this approach is highly feasible for breast cancer survivors

SUMMARY. This pilot study evaluated the effectiveness of a generalizable physical activity intervention for improving quality of life in postmenopausal breast cancer survivors. These data provide the necessary quantitative estimates of outcome effect sizes that will be used for submission of a larger-scale proposal to rigorously test the hypotheses outlined above. This work, which demonstrated that a home-based walking program is a feasible intervention for breast cancer survivors and yielded initial promising findings, has the potential to add an important new treatment option for the growing population of breast cancer survivors.

Key Research Accomplishments

- Participants in this study showed high adherence to the walking prescription
- Telephone counseling calls were delivered as scheduled, indicating this was a feasible approach in which to reach breast cancer survivors
- The study withdrawal rate was low
- Medium to large increases in physical activity were shown among women randomized to the walking group but not the control group
- Medium improvements were shown in most measures of quality of life among women randomized to the walking group but not the control group

Reportable Outcomes (Bibliography)

Manuscripts accepted for publication:

Matthews, C.E., Wilcox, S., Hanby, C.L., Der Ananian, C., Heiney, S.P., Gebretsadik, T., Shintani, A. (in press). Evaluation of a 12-week Home-based Walking Intervention for Breast Cancer Survivors. Supportive Care in Cancer.

Published abstracts for papers presented at conferences:

Matthews, C.E., Wilcox, S., Hanby, C., DerAnanian, C. (2004). A 12-week home based physical activity intervention in early stage breast cancer survivors. [abstract]. Medicine and Science in Sports and Exercise, 36(5), p. S285. Paper presented at the annual meeting of the American College of Sports Medicine.

Hanby, C.L., Matthews, C., Wilcox, S., DerAnanian, C. (2004). Predictors of adherence to a home-based walking intervention in breast cancer survivors. [abstract]. Medicine and Science in Sports and Exercise, 36(5), p. S285. Paper presented at the annual meeting of the American College of Sports Medicine.

Baruth, M., Wilcox, S., Der Ananian, C., Heiney, S.P., Hanby, C.L., Matthews, C.E. (under review). Physical activity correlates in breast cancer survivors. [abstract]. Annals of Behavioral Medicine. Paper submitted for presentation at the annual meeting of the Society of Behavioral Medicine.

Conclusions

Home-based walking programs appear to be a feasible approach to increasing physical activity in breast cancer survivors. Findings from this pilot study suggest that these types of interventions can produce medium to large increases in physical activity and medium sized improvements in quality of life. Furthermore, this intervention delivery appears to be safe with a low risk of adverse events.

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Personnel Receiving pay from this project

Chery Der Ananian
Meghan Baruth (Stritesky)