

# Strength, Physical Activity, and Age Predict Fatigue in Older Breast Cancer Survivors

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**Purpose/Objectives:** To determine whether clinical characteristics, physical fitness, or physical activity predict fatigue in older, long-term breast cancer survivors.

**Design:** Cross sectional.

**Setting:** National Cancer Institute–designated cancer center in Portland, OR.

**Sample:** 47 women ( $\bar{X}$  age = 69 years) who were at least one year beyond treatment completion, including surgery, radiation, chemotherapy, or hormone therapy, for early-stage breast cancer.

**Methods:** Participants completed one two-hour testing session to determine fatigue ratings, clinical information, submaximal aerobic fitness, lower-extremity muscle strength, body composition, and physical activity levels.

**Main Research Variables:** Self-reported fatigue assessed by the Schwartz Cancer Fatigue Scale, cancer and treatment history obtained by self-report, submaximal aerobic fitness assessed by 12-minute walk distance, lower-extremity muscle strength assessed by number of chair stands completed in 30 seconds, body composition assessed as percentage of body fat, and physical activity levels assessed by self-reported hours per week.

**Findings:** Fatigue was significantly correlated with all independent variables, with the exception of aerobic fitness. Fatigue was higher with lower age, greater percentage of body fat, fewer years after diagnosis, more adjuvant treatments, poorer lower-extremity muscle strength, and less physical activity. In regression analyses, lower-extremity muscular strength, physical activity levels, and age each were significant independent predictors of fatigue. Lower-extremity muscle strength, physical activity, and age all were inversely related to fatigue and accounted for 15%, 7%, and 15% of the variance in fatigue scores, respectively.

**Conclusions:** In this sample of older breast cancer survivors, fatigue was linked to physical activity and muscle strength; women with better lower-extremity muscle strength, higher physical activity levels, and advanced age reported less fatigue.

**Implications for Nursing:** A physical activity program aimed at improving lower body strength could mitigate persistent fatigue in older, long-term breast cancer survivors.

## Key Points . . .

- ▶ The prevalence of and contributors to persistent fatigue symptoms in older breast cancer survivors are understudied.
- ▶ A low level of fatigue may persist among older breast cancer survivors.
- ▶ Fatigue appears to be related to physical inactivity and lower-extremity muscle weakness, yet whether fatigue affects activity and strength or whether inactivity and weakness contribute to fatigue remains unclear.
- ▶ Physical activity holds promise as a remedy to the persistent fatigue experienced by older breast cancer survivors.

Broeckel et al.); however, these studies were in breast cancer survivors across a wide age range.

Women older than age 60 constitute the largest group of U.S. breast cancer survivors (American Cancer Society, 2008), yet the prevalence of fatigue in older breast cancer survivors has not yet been well described. To date, two studies have assessed symptoms in older breast cancer survivors specifically by comparing breast cancer survivors to age-matched peers with no history of cancer. Results of these studies conflict, with one study reporting no difference in symptoms between groups (Heidrich, Egan, Hengudomsub, & Randolph, 2006) and the other reporting that older breast cancer survivors had more days affected by fatigue than a comparison group (Robb et al., 2007). As the proportion of older adults in the United States rises dramatically in the coming decades, understanding the long-term health impact of cancer treatment in the older cancer survivor will be increasingly important.

Fatigue is the most common symptom reported by cancer survivors and can persist after treatment completion (Jacobsen & Stein, 1999; Smets, Garssen, Schuster-Uitterhoeve, & de Haes, 1993). Breast cancer survivors report a higher prevalence of fatigue than their peers with no cancer history (Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998; Jacobsen et al., 1999; Servaes, Verhagen, & Bleijenberg, 2002b; Stone, Richards, A'Hern, & Hardy, 2000), which persist well after the immediate period following treatment. Estimates of fatigue from a limited number of studies report that about 33% of women 5–15 years after diagnosis still list fatigue as a bothersome symptom (Bower et al., 2006;

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Fatigue in breast cancer survivors commonly is linked to other symptoms, including menopausal symptoms (Broeckel et al., 1998; Glaus et al., 2006; Tchen et al., 2003), sleep disturbances (Broeckel et al.; Jacobsen et al., 1999; Servaes et al., 2002a), and pain (Blesch et al., 1991; Stone et al., 2000); however, the link between fatigue and treatment type is less clear (Bower et al., 2006; Haghghat, Akbari, Holakoeul, Rahimi, & Montazeri, 2003; Mast, 1998). Behavioral factors, such as physical activity, have been associated with cancer-related fatigue, with inactive survivors reporting more fatigue than their active peers (Berger & Higginbotham, 2000; Servaes et al., 2002a). The role of physical activity and physical fitness in symptom management is of particular interest because intervention studies in younger breast cancer survivors suggest that exercise reduces fatigue (Schmitz et al., 2005). No study to date has aimed specifically to evaluate the contributions of physical activity and physical fitness to fatigue in cancer survivors of any age nor has any study specifically described the determinants of fatigue in older breast cancer survivors. The purpose of this study was to establish the relationship between clinical characteristics, physical fitness, and physical activity with fatigue in older, long-term breast cancer survivors and to assess which of these attributes were significant determinants of fatigue in this population.

## Methods

### Sample and Setting

Women were recruited for the present study through the Oregon State Cancer Registry, oncologist referral, breast cancer support groups, community events, posted advertisements, and word of mouth. Eligible women for the study had a diagnosis of early-stage breast cancer (0–IIIa), were age 60 or older at diagnosis, and were at least one year past completion of primary treatment for breast cancer (surgery, radiation, or chemotherapy). Stage 0 was included because the study focuses on the effects of treatment; therefore, women with stage 0 who underwent treatment were eligible. “Older breast cancer survivors” was defined as women age 60 and older. Sixty is the age of eligibility defined by the Older Americans Act (1965) and women older than age 60 have been included in previous studies focused on older cancer survivors (Deimling, Bowman, Sterns, Wagner, & Kahana, 2006; Deimling, Sterns, Bowman, & Kahana, 2005, 2007; Deimling, Wagner, et al., 2006; Keating, Norredam, Landrum, Huskamp, & Meara, 2005), including breast cancer (Demark-Wahnefried et al., 2004; Dorval, Maunsell, Deschenes, & Brisson, 1998; Ganz, Greendale, Kahn, O’Leary, & Desmond, 1999; Sparks & Mittapalli, 2004). Women were excluded from participation in the study if they were currently receiving radiation therapy or chemotherapy for cancer or had a physical limitation that prevented participation in performance tests. All measurements were conducted at Oregon Health Sciences University (OHSU) School of Nursing. The study protocol and informed consent were approved by the OHSU institutional review board.

### Procedures

Interested participants were contacted by telephone or in person and were screened for eligibility. Eligible women were then scheduled for their initial testing appointment, including consent. After written, informed consent was obtained,

participants underwent initial testing in the following order: questionnaires, body composition testing (DXA), chair stand, 12-minute walk.

### Measures

Demographic and clinical characteristics, including stage, date of diagnosis, and type and dates of breast cancer treatment, were obtained by self-report. Medical records were not obtained for women who could not recall information regarding their clinical history; therefore, these items were coded as “do not know.”

Fatigue was measured by two methods; first, by asking the participant if she experienced fatigue in the past seven days. Participants then completed a more in-depth assessment of fatigue using the **Schwartz Cancer Fatigue (SCF)** scale, a 6-item scale that specifically assesses the level of subjective fatigue a person currently is experiencing. Internal consistency reliability of the scale has been demonstrated in studies of cancer survivors (Schwartz, 1998). The summed score ranges from 6–30, with higher scores indicating more fatigue.

Habitual physical activity was measured by the **Community Health Activity Model Program for Seniors (CHAMPS)** questionnaire for older adults. The CHAMPS questionnaire was designed to assess activity in older adults. Intraclass correlations for six-month test stability were acceptable ( $r = 0.58$ – $0.67$ ) in previous studies and the instrument had acceptable correlation with actual measures of activity or fitness ( $r = 0.17$ – $0.30$ ; Stewart et al., 2001). The CHAMPS survey captures physical activities as frequency and hours per week; the researchers choose the latter for analysis because it is most comparable to current public health recommendations for physical activity participation.

Body composition was described as percentage of body fat using measures of lean and muscle mass. Bone-free lean mass (kg) and fat mass (kg) were determined from whole body scans using dual energy x-ray absorptiometry (DXA; Hologic QDR Discovery Wi). All scans were conducted on the same densitometer. In-house coefficients of variation determined from a subsample of younger women were less than 1.5% for lean and fat mass (Winters & Snow, 2000).

Lower-extremity muscle strength was assessed by a timed **chair-stand test**. Participants were instructed to rise from a seated position as many times as possible in 30 seconds. The timed chair-stand test has been shown to be a valid and reliable measure of lower-extremity muscle strength in older adults (Jones, Rikli, Beam, 1999).

Submaximal aerobic fitness was measured by the **12-minute walk (12MW) test** performed on a motor-driven treadmill (LifeFitness, Inc). Participants were given a one to two minute warm-up period at a slow pace (1–2 mph), then the speed of the treadmill was increased to a test pace self-selected by the participant (0% grade). Participants were instructed to select a speed they felt was challenging, yet could maintain for 12 minutes. During the test, participants were allowed to increase or decrease the speed of the treadmill depending on perceived fatigue level. No verbal encouragement was given during the test. The distance traveled was recorded at the end of the test period and the treadmill was slowed to the warm-up pace for the next three to five minutes or for an extended period until the participant felt recovered and ready to exit the treadmill. Self-paced 12MW tests conducted on treadmills have established validity and reliability as a test of submaximal aerobic

fitness (Bernstein et al., 1994; Kosak & Smith, 2005; Larson et al., 1996) and produce comparable results as 12MW corridor protocols (Beaumont, Cockcroft, & Guz, 1985). The 12MW test has been used to measure changes in aerobic fitness after exercise training in clinical populations, including breast cancer survivors (Mutrie et al., 2007; Schwartz, Mori, Gao, Nail, & King, 2001).

## Statistical Analysis

Means and standard deviations were used to describe the group. Pearson-product moment correlation coefficients were used to determine relationships between the dependent measure, fatigue, and the following independent variables: age, years since diagnosis, number of types of adjuvant treatments (chemotherapy, radiation therapy, or current hormone therapy), body composition, lower-extremity strength, submaximal aerobic fitness, and time spent in physical activity. Similar analyses were used to examine relationships between independent variables to check for multicollinearity and shared variance between measures. Stepwise regression analysis was used to determine the independent variables that contributed significantly to variance in fatigue. The significance criterion of the critical F value for entry into the regression equation was set at  $p < 0.05$ . All analyses were performed using SPSS® version 13.0.

## Results

Ninety-eight women expressed interest in the study, 11 were deemed ineligible, and 28 opted not to participate. Sixty women were eligible and volunteered to participate in the study, and fatigue data were available on 48 women. All women completed DXA testing and were able to complete at least one chair stand. Three women voluntarily stopped their 12MW test during the warm-up period and were given a score of zero for the test. One woman's data were excluded because her physical activity data, reported as 46 hours per week, was four standard deviations above the mean and, therefore, the validity was questionable. Therefore, the final sample size for all analyses was 47. Women in the study were at least high school educated, nearly all Caucasian, mostly married, retired, and all from the Portland metropolitan area. On average, women in the study were at least five years beyond diagnosis, although the range among participants varied greatly. Most women had stage I–II disease and had more than one type of adjuvant treatment after surgery. Almost 58% of women had received radiation treatment and 37% had received chemotherapy, with more than half currently on adjuvant hormonal therapy with either a selective estrogen receptor modulator (SERM) or an aromatase inhibitor (AI). More than 58% of the participants in this group reported the presence of fatigue, but fatigue was not severe for most (see Table 1 and Figure 1). Women had an average percentage of body fat for their ages, average lower-extremity muscle strength, and low submaximal aerobic fitness compared to age-matched reference groups of community-dwelling older adults (Rikli & Jones, 2001).

Frequency distributions for outcome measures were normally distributed with the exception of fatigue. Significant correlations existed among the independent variables ( $r = -0.23$ – $-0.68$ ; see Table 2), but none were considered to be multicollinear (defined as  $r > 0.80$ ); therefore, each was included in regression analyses.

Because the fatigue data were not normally distributed, regression analyses were repeated using log-transformed fatigue scores and results were unchanged.

All of the independent variables were modestly, but significantly, associated with fatigue ( $-0.37$ – $0.27$ ), with the exception of submaximal aerobic fitness. Fatigue scores were inversely correlated with age and time since diagnosis and positively associated with the number of types of adjuvant treatments. Higher fatigue scores were significantly associated with higher percentage body fat, lower levels of lower-extremity muscle strength, and less physical activity.

Stepwise regression analyses showed that age, lower-extremity muscle strength, and physical activity all were independent and significant predictors of fatigue, and combined, explained 37% of the variance in fatigue scores (see Table 3). Lower-extremity muscle strength was an independent predictor of fatigue and accounted for 15% of the variance in this measure. Age also accounted for 15% of the variance in fatigue scores, with a lower age predictive of more fatigue. Weekly duration of physical activity explained an additional 7% of the variance in fatigue scores; less physical activity was predictive of more fatigue. No other independent variables contributed to the model.

## Discussion

The results indicate that within this group of older, long-term breast cancer survivors, women of lower age, closer to diagnosis, and who had multiple types of adjuvant treatments

**Table 1. Demographics and Fatigue and Physical Scores**

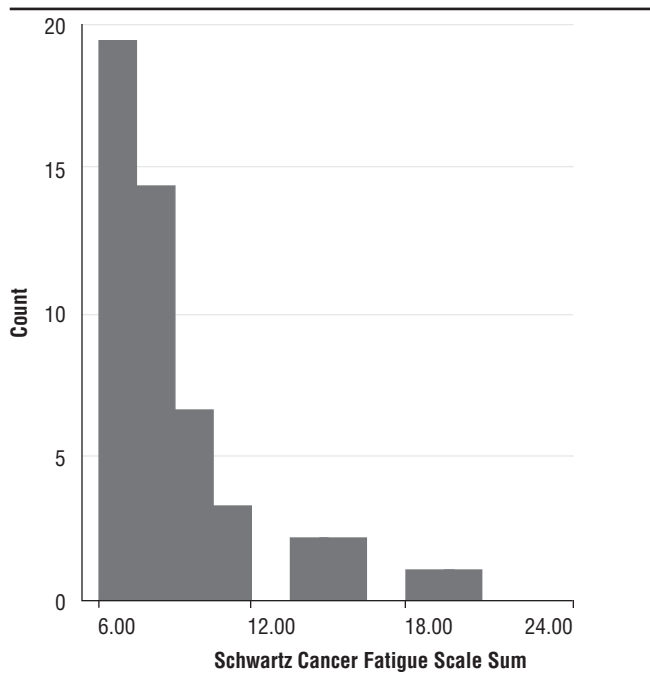
Characteristic	$\bar{X}$	SD	Range
Age (years)	68.0	7.0	60–89
Time since diagnosis (years)	7.5	7.4	1–37
Number of adjuvant treatment types	1.4	0.9	0–3
Fatigue score <sup>a</sup> (6–30)	9.2	3.2	6–20
Body fat (%)	36.4	7.4	17.9–49.9
Chair stands	12.5	3.2	3–18
12-minute walk (minutes)	965.6	321.9	0–1,384
Physical activity (hours per week)	6.5	5.6	0–25

Characteristic	n	%
<b>Caucasian</b>	46	98
<b>Married</b>	24	52
<b>High school education or greater</b>	47	100
<b>Retired</b>	29	62
<b>Stage</b>		
0	1	3
I	17	37
II	11	22
III	3	7
Do not know	15	31
<b>Type of adjuvant treatment received</b>		
Radiation	27	58
Chemotherapy	17	37
Tamoxifen (current)	16	33
Anastrozole (current)	7	15
<b>Experienced recurrence</b>	5	10
<b>Experienced fatigue</b>	27	58

N = 47

<sup>a</sup> Measured by the Schwartz Cancer Fatigue scale



N = 47  
 Note.  $\bar{X}$  = 9.2; SD = 3.2; range = 6–20

**Figure 1. Distribution of Fatigue Scores Among Older, Long-Term Breast Cancer Survivors**

experienced greater fatigue. Women with lower-extremity muscle weakness, a greater proportion of body fat, and lower physical activity levels also reported greater fatigue. In regression analysis, age, lower-extremity muscle strength, and physical activity were significant and independent predictors of fatigue scores. Clinical characteristics, body composition, and submaximal aerobic fitness were not significant determinants of fatigue.

Older women constitute the greatest number of breast cancer survivors, and fatigue is the most common symptom in cancer survivors; yet, studies addressing the presence and determinants of fatigue in older, long-term survivors are lacking. The present study is the first to specifically examine fatigue

determinants in older women as well as to examine multiple components of physical fitness in relation to persistent fatigue in breast cancer survivors of any age. Since exercise increasingly is being studied for its ability to mitigate side effects and symptoms that remain after treatment, particularly fatigue, a mechanism for exercise effects on persistent symptoms needs to be identified.

Limitations of the study include a small sample size (N = 47), a limited examination of the effect of treatment characteristics and other symptoms on fatigue, and the cross-sectional design. Because of the small sample size, the number of independent variables included in the regression equation was restricted to reduce the likelihood of type II error. As a result, the influence of individual treatment type or length on fatigue could not be examined. The researchers believed that summarizing treatment in terms of the number of adjuvant treatments received would provide some indication of the potential impact of treatment on fatigue because multiple treatments potentially would have additive or synergistic effects on symptoms. The influence of other symptoms on fatigue scores was not assessed; therefore, the symptoms previously identified as affecting fatigue in breast cancer survivors also could be affecting fatigue among women in the study. Because the study was cross sectional, correlations between independent variables and fatigue cannot suggest cause and effect. Physical fitness and physical activity were found to be predictive of fatigue; in other words, higher fitness, characterized in this case as better muscle strength and body composition and greater physical activity, mitigate fatigue in older breast cancer survivors. However, persistent fatigue may lead to inactivity that in turn contributes to muscle weakness and weight increases. Only randomized, controlled physical activity interventions in cancer survivors that include fatigue as an outcome measure can determine the role of physical fitness and physical activity in management of fatigue during or after treatment.

Fifty-eight percent of older breast cancer survivors reported that they experienced the symptom of fatigue, although for most women, fatigue severity was low. The findings are consistent with other reports that suggest a slightly elevated level of fatigue among a wide age range of breast cancer survivors well after treatment completion compared to cancer-free peers (Bower et al., 2000, 2006; Broeckel et al., 1998).

**Table 2. Pearson-Product Moment Correlation Matrix for Study Variables**

Variable	Fatigue	Age	Years Since Diagnosis	Number of Adjuvant Treatments	Body Fat (%)	12-Mile Walk Distance (Minutes)	Chair Stands	Physical Activity (Hours Per Week)
Fatigue	1.00	–	–	–	–	–	–	–
Age	–0.37*	1.00	–	–	–	–	–	–
Years since diagnosis	–0.25*	0.30	1.00	–	–	–	–	–
Number of adjuvant treatments	0.27*	0.01	–0.34*	1.00	–	–	–	–
Body fat (%)	0.29*	0.20	–0.22	0.16	1.00	–	–	–
12-mile walk distance (minutes)	–0.13	–0.57*	0.18	–0.13	–0.68*	1.00	–	–
Chair stands	–0.27*	–0.39*	0.03	–0.08	–0.52*	0.64*	1.00	–
Physical activity (hours per week)	–0.23*	–0.26*	0.10	–0.11	–0.46*	0.58*	0.41*	1.00

\* p < 0.05

Studies that characterize the severity of fatigue report that between 15%–38% of breast cancer survivors still experience “severe” fatigue (Bower et al., 2000, 2006; Servaes et al., 2002a; Stone et al., 2000). Those studies have sampled a wide age range of women, used diverse instruments to assess fatigue, and state varying criteria for categorizing fatigue as severe. In the present study, 4% of older breast cancer survivors reported scores in the upper half of the SCF range, and 20% reported scores above the median value for the group. In the only other study to assess fatigue among older breast cancer survivors, women reported more days affected by fatigue compared to cancer-free peers (Robb et al., 2007). Among the sample of older women in the present study, a lower age was associated with greater fatigue, though age was not associated with time since diagnosis or time since treatment completion. As women age, they may be more likely to attribute symptoms to aging and as being acceptable and are less likely to recognize symptoms distinctly (Heidrich et al., 2006), particularly in the context of how symptoms may interfere with their daily lives. Clearly, more work needs to be done to characterize fatigue levels among older survivors.

Data from the present study suggest that treatment is related to fatigue. Older breast cancer survivors who were closer to diagnosis reported more fatigue than women farther out and these women also were more likely to receive multiple treatments. The findings are similar to Bower et al. (2000) who reported that the relationship between receipt of chemotherapy and fatigue was stronger in women closer to treatment completion than women farther out; however, they differ from other studies in younger breast cancer survivors that report no association between time since diagnosis and fatigue (Berglund, Bolund, Fornander, Rutqvist, & Sjoden, 1991; Servaes et al., 2002a), suggesting that the trajectory of fatigue is complex and may differ in older versus younger women.

The data also show that the number of adjuvant treatment types was associated with fatigue, further confirming the influence of treatment severity on fatigue in older women. Studies examining the relation of number of treatment modalities to fatigue are few and results are mixed. One study reported no influence of the number of treatments on fatigue (Servaes et al., 2002b), and the other reported higher fatigue in breast cancer survivors who received radiation plus chemotherapy versus either treatment alone (Bower et al., 2006). Additive effects of individual treatments with known side effects of fatigue are plausible. Although multimodal treatment may be positively associated with disease outcomes, they also may be associated with greater and more persistent symptoms and side effects (Bower et al., 2006). Although no prospective longitudinal studies comparing the effects of various types of adjuvant therapy on symptoms among older breast cancer survivors are available, recognizing that this population should be monitored for persistent symptoms long after the completion of treatment is important.

Older breast cancer survivors with a higher percentage of body fat reported more fatigue compared to leaner women. In separate correlation analysis using lean mass and fat mass (data not shown), fat mass was significantly and positively associated with fatigue rather than lean mass. Higher adiposity has been associated with greater levels of fatigue in women in prior studies (Lim, Hong, Nelesen, & Dimsdale,

**Table 3. Summary of Stepwise Regression Analyses to Determine Predictors of Fatigue**

Independent Variable	r <sup>2</sup> Change	Beta	t	p
<b>Included variables</b>				
Age	0.150	-0.608	-4.561	< 0.01
Chair stands	0.151	-0.348	-2.572	0.01
Physical activity (hours per week)	0.073	-0.291	-2.234	0.03
<b>Excluded variables</b>				
Time since diagnosis (years)	–	-0.216	-1.832	0.07
Number of adjuvant treatments	–	0.073	0.575	0.57
12-minute walk distance (minutes)	–	-0.152	-0.775	0.44
Body fat (%)	–	0.170	1.213	0.72

2005), including breast cancer survivors, prior to (Wratten et al., 2004) and during radiation therapy (Geinitz et al., 2001). An underlying inflammatory cascade may underpin the relation between adiposity and fatigue because elevated proinflammatory cytokines are characteristic of obesity (Lim et al.; Panagiotakos, Pitsavos, Yannakoulia, Chrysohoou, & Stefanadis, 2005), occur in response to chemotherapy (Pusztai et al., 2004) or radiation therapy (Girinsky et al., 1994), and have been implicated in fatigue related to cancer treatment (Wood, Nail, Gilster, Winters, & Elsea, 2006). Findings also revealed women with lower, lower-extremity muscle strength reported more fatigue compared to women with higher strength. Similar associations between fatigue and muscle strength have been reported in older women (Bautmans, Gorus, Njemini, & Mets, 2007) and individuals with chronic illness (Hildegunn et al., 2007), including cancer (Jacobsen et al., 1999; Stone et al., 2000). The finding is not surprising because greater muscle strength increases the ability to perform physical work, so fatigue is less likely to result from daily tasks. This may be especially true in older breast cancer survivors who are likely to have lower reserves in strength or energy than younger survivors. No relation was found between aerobic fitness and fatigue in older breast cancer survivors. The finding is consistent with Dimeo et al. (1997), who reported a weak correlation between maximal oxygen uptake and fatigue scores in 89 patients receiving high-dose chemotherapy with peripheral autologous stem cell transplantation. In the present study, more active older women reported less fatigue than inactive older women, suggesting that physical activity may reduce fatigue. Two of three earlier studies reported significant associations between lower physical activity levels and higher fatigue in women undergoing chemotherapy for breast cancer (Berger & Higginbotham, 2000) and in premenopausal-aged breast cancer survivors within six years after treatment completion (Servaes et al., 2002a), although a similar study showed no association (Servaes et al., 2002b).

The finding that muscle weakness and inactivity independently predicted fatigue in older breast cancer survivors in the present study suggests that exercise may be an effective strategy to reduce fatigue in older breast cancer survivors, yet systematic application of exercise interventions in older

breast cancer survivors are lacking. A number of studies have demonstrated that physical activity decreases fatigue and improves physical functioning, health, and quality of life during or immediately after cancer treatment in younger women (Schmitz et al., 2005). The ability of exercise to reduce fatigue specifically in patients with breast cancer undergoing treatment is unclear (Markes, Brockow, & Resch, 2006; McNeely et al., 2006); however, a meta-analysis (McNeely et al.) and trial (Schneider, Hsieh, Sprod, Carter, & Hayward, 2007) show good evidence supporting exercise-induced reductions in fatigue in breast cancer survivors further out from treatment. Even so, few randomized trials have been conducted in cancer survivors more than five years beyond treatment, and none have been conducted specifically in older breast cancer survivors (Schmitz et al.). Because the number of older breast cancer survivors will rise dramatically with the aging population, the ability of exercise to mitigate or reverse persistent side effects and symptoms in older breast cancer survivors must be studied.

## Nursing Implications

Physical activity clearly is important for all older adults and for cancer survivors in particular. Nurses have a unique opportunity to interface with older cancer survivors, for whom physical activity plays an important role in slowing age-related physical and functional declines (American College of Sports Medicine, 1998) and potentially in managing long-term side effects and symptoms that result from treatment (McNeely et al., 2006; Mock, 2004). Nurses need to instruct patients on the importance of exercise, how to begin, and how to progress and help them set reasonable and at-

tainable goals. This could be achieved by referring patients to community physical activity programs or even by providing a simple exercise prescription and follow-up (Stricker, Drake, Hoyer, & Mock, 2004). Data from the present study suggest that exercises that promote muscle strength be included in physical activity programming for older breast cancer survivors experiencing persistent fatigue. Strengthening exercises make sense for the older patient and can be readily prescribed (Schlicht, 2000). For nurses who do not feel competent making these recommendations, at least being able to educate a patient on the short- and long-term benefits of exercise during and following cancer treatment is critical (McNeely et al.; Mock). Exercise studies clearly document the numerous benefits of exercise, and yet this simple, cost-effective intervention has not been consistently integrated into cancer care.

The present study is one of two that focus specifically on treatment-related fatigue in older, long-term breast cancer survivors. Additional descriptive studies are needed to characterize the presence, severity, impact, and determinants of fatigue in older breast cancer survivors and observational studies can better determine what treatment and lifestyle factors contribute to fatigue development and persistence over time. The findings that muscle strength and physical activity predict fatigue in older, long-term breast cancer survivors make a compelling argument that a randomized controlled trial to test the ability of exercise, specifically strength training, to ameliorate persistent fatigue in older breast cancer survivors is needed.

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