

Fatigue and Physical Activity in Older Patients With Cancer: A Six-Month Follow-Up Study

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Cancer is predominantly a disease affecting older patients. Forty-two percent of new cancer cases in Canada occur among patients aged 70 years or older; 27% occur in Canadian patients aged 60–69 years (Canadian Cancer Society/National Cancer Institute of Canada, 2008). Cancer-related fatigue (CRF) is a highly prevalent and distressing symptom that is associated with decreases in physical activity, functional status, and quality of life regardless of diagnosis, treatment, or prognosis (Dagnelie et al., 2007; de Jong, Candel, Schouten, Abu-Saad, & Courtens, 2006; Glaus, 1993; Loge, Abrahamsen, Ekeberg, & Kaasa, 2000; Mock et al., 1997; Nail & Jones, 1995; Stone, Richards, A'Hern, & Hardy, 2001). Physical activity has strong supporting evidence as a nonpharmacologic intervention for CRF (Dimeo, 2001; Galvao & Newton, 2005; Knols, Aaronson, Uebelhart, Fransen, & Aufdemkampe, 2005; Mitchell, Beck, Hood, Moore, & Tanner, 2007; National Comprehensive Cancer Network [NCCN], 2003; Penedo, Schneiderman, Dahn, & Gonzalez, 2004); however, the relationship between physical activity and CRF in older patients has not been reported in the literature.

NCCN (2003) defines CRF as “a persistent, subjective sense of tiredness related to cancer or cancer treatment that interferes with usual functioning” (p. 310). CRF is associated with all cancer treatment modalities (Irvine, Vincent, Bubela, Thompson, & Graydon, 1991; Irvine, Vincent, Graydon, Bubela, & Thompson, 1994; Jacobsen & Stein, 1999; Lawrence, Kupelnick, Miller, Devine, & Lau, 2004) and affects 70%–100% of patients receiving cancer treatment (Ahlberg, Ekman, Gaston-Johansson, & Mock, 2003). CRF often is not addressed because healthcare practitioners may not be aware of practice guidelines (Mock, 2001; Mock, McCorkle, & Krumm, 2003) and patients may not report their fatigue (Donovan & Ward, 2005; Stasi, Abriani, Beccaglia, Terzoli, & Amadori, 2003). Untreated CRF may result in a decrease or discontinuation of physical, recreational, and social activities; delays in treatment; dose limitation; discontinuation of therapy; or withdrawal from clinical

Purpose/Objectives: To determine the relationship between fatigue and physical activity in older patients with cancer.

Design: Targeted analysis using data from a prospective longitudinal study.

Setting: A cancer care facility in southeastern Ontario, Canada.

Sample: 440 patients, aged 65 years and older, seeking consultation for cancer treatment at a regional cancer clinic for lymphoma or leukemia or lung, breast, genitourinary, head or neck, gastrointestinal, or skin cancers.

Methods: Self-report questionnaires were mailed to consenting participants and completed at baseline and three and six months after consultation for cancer treatment.

Main Research Variables: Participants rated fatigue and physical activity and reported comorbidities and personal demographic characteristics. Clinical measures of disease and treatment factors were obtained through chart abstraction.

Findings: Fatigue was the most prevalent symptom reported. Higher fatigue was associated with lower physical activity levels. Physical activity level significantly predicted fatigue level, regardless of age.

Conclusions: Physical activity level is a modifiable factor significantly predicting cancer-related fatigue at three and six months following consultation for cancer treatment. The results suggest that physical activity may reduce fatigue in older patients with cancer.

Implications for Nursing: Physical activity interventions should be developed and tested in older patients with cancer.

cal trials (Camarillo, 1991; Ferrell, Grant, Dean, Funk, & Ly, 1996; Nail & Jones, 1995; Skalla & Rieger, 1995; Visovsky & Schneider, 2003; Whedon, Stearns, & Mills, 1995). Factors contributing to CRF in older patients include immobility, deconditioning, sleep disorders, poor nutrition, drugs affecting the central nervous system, organ system decline, and the presence of pain or other symptoms (Curtis, Krech, & Walsh, 1991; Duthie, 2004; Given, Given, Azzouz, Kozachik, & Stommel, 2001; Portenoy & Itri, 1999).

Physical activity has been defined as “bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level” (U.S. Department of Health and Human Services, 1996, p. 20). The terms *physical activity* and *exercise* often are used synonymously in the literature; however, exercise can be viewed as a subcategory of physical activity and defined as “physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is the objective” (Caspersen, Powell, & Christenson, 1985, p. 128). Randomized clinical trials conducted on patients with cancer aged 21–65 years have demonstrated that physical activity decreases CRF during and after cancer treatment (Burnham & Wilcox, 2002; Dimeo, Stieglitz, Novelli-Fischer, Fetscher, & Keul, 1999; Mock et al., 1997; Oldervoll, Kaasa, Knobel, & Loge, 2003; Schwartz, 2000). Older patients have not been adequately represented in clinical trials as a result of physician and patient bias and exclusion because of age, comorbidities, or perceived lack of compliance (Hutchins, Unger, Crowley, Coltman, & Albain, 1999; Mitka, 2003). CRF knowledge is based predominantly on studies conducted in younger patients. Interventions have not been tested in older patients and, to date, the interventions developed for younger patients are used for all age groups. Whether treatments effective for younger patients will also be effective in older patients is unknown.

The objective of this study was to determine the relationship between fatigue and physical activity in older patients with cancer. The following research questions were addressed.

- Is there a relationship between physical activity levels at study enrollment (referral to cancer center for cancer consultation and treatment) and fatigue at three and six months after enrollment?
- Is there a relationship between physical activity at three months and fatigue levels at three and six months after study enrollment?

Methods

Design, Setting, and Sample

This study used data collected for a prospective, longitudinal study entitled Health and Well Being in Older Persons With Cancer, conducted by a team of investigators led by Joan Tranmer, RN, PhD. The primary study was a quantitative, descriptive, exploratory 12-month follow-up with a cohort of older patients with cancer (≥ 65 years) focused on functional well-being during and following cancer treatment. The current study used data from baseline, three-month, and six-month surveys only and was completed prior to the completion of the longer primary study. The current study is a targeted analysis that focuses on CRF and explores, in depth, its relation-

ship with physical activity levels. The study received approval from the ethics board at Queen’s University in Kingston, Canada. The ethics board at the University of Ottawa also approved the secondary analysis. Informed consent was obtained from all study participants.

Data collection took place at the Cancer Centre of Southeastern Ontario in Canada. Patients were considered for inclusion in the study if they were aged 65 or older, attended consultation at the cancer center for treatment of lymphoma or leukemia or lung, breast, genitourinary, head or neck, gastrointestinal, or skin cancers. Patients were excluded if they were referred to palliative care.

All patients meeting the inclusion criteria were approached. Consenting participants received a mailed questionnaire package at baseline, three months, and six months. A trained research assistant collected appropriate clinical information through chart review. Recruitment took place from October 2003–April 2005.

Instruments

Fatigue: Self-reported fatigue scores were collected with the **Memorial Symptom Assessment Scale (MSAS)**, a multidimensional, reliable, and valid instrument for assessment of cancer symptoms (Portenoy et al., 1994). Fatigue (lack of energy) was a single item in the 32-item scale. Single-item measures are frequently used to measure symptoms such as fatigue in patients with cancer (Jean-Pierre et al., 2007; Sidani, 2003). Internal consistency (Cronbach alpha) for the MSAS scales ranged from 0.58–0.88 (Portenoy et al.). Scores are highly correlated with clinical status and quality-of-life measures. Participants rated how often they experienced the fatigue symptoms (rarely, occasionally, frequently, or almost constantly), how severe the fatigue symptoms usually were (slight, moderate, severe, or very severe), and how much the fatigue distressed or bothered them (not at all, a little bit, somewhat, quite a bit, or very much). Fatigue symptom scores were calculated as the mean of the frequency, severity, and distress scores (Tranmer et al., 2003).

Physical activity: Physical activity level was measured with the **Physical Activity Scale for the Elderly (PASE)** (Washburn, Smith, Jette, & Janney, 1993), which asks questions about leisure time activity (including exercise), household activity, and work-related activity and was specifically designed to assess activities engaged in by older patients. Because older patients may be less likely to participate in formal exercise (U.S. Department of Health and Human Services, 1996), it was important to use an assessment tool that incorporated all of the subcategories of physical activity, including exercise. Twelve PASE component scores (walking outside the home, light sport or recreational activities, moderate sport or recreational activities, strenuous sport or recreational activities, muscle strength or endurance exercises, light housework, heavy housework or chores, home repairs, lawn work or yard care, outdoor gardening, caring for another person, and

working for pay or as a volunteer) were calculated by multiplying activity weights by activity frequencies. The sum of the component scores equaled the total activity score. Higher scores are indicative of higher physical activity levels. In a sample of community-dwelling older patients, PASE scores ranged from 54–372, with a mean score of 158 (SD = 65) (Harada, Chiu, King, & Stewart, 2001). The PASE correlates well with other performance-based and self-report measures (Harada et al.; Washburn & Ficker, 1999; Washburn, McAuley, Katula, Mihalko, & Boileau, 1999) and has adequate internal consistency (Cronbach alpha = 0.69) and test-retest reliability ($r = 0.60$) (Washburn et al., 1993). Cronbach alpha for the study was 0.81.

Cancer-related factors, demographics, and comorbidities: Factors likely to affect CRF include cancer site, stage, and treatment (Hotopf, 2004); demographics (de Jong, Courtens, Abu-Saad, & Schouten, 2002); lifestyle (Bultmann et al., 2002); and comorbidities (Bower et al., 2000). Clinical measures of disease (cancer site), severity (cancer stage), and treatment (modality) factors were obtained through chart abstraction. Personal demographic characteristics (age, sex, marital status, education, income, and living arrangement) were obtained through self-report at baseline. Measures of comorbidity were obtained by self-report at baseline through completion of the **Functional Comorbidity Index (FCI)**, which contains 18 common diagnoses associated with poorer physical function (Groll, Heyland, Caeser, & Wright, 2006; Groll, To, Bombardier, & Wright, 2005). The FCI score consists of the total number of comorbidities identified.

Data Analysis

All data were entered into a Microsoft® Access® database and verified by a second person. Data were analyzed with SPSS® 12.0. Standard univariate measures, such as means, standard deviations, medians, and frequencies, were calculated to describe patient characteristics and outcome scores. When the assumptions of correlation and multiple regression analysis were tested, several continuous variables did not meet the assumption of normality. A natural log transformation of those variables was performed and the analysis was run with the transformed and untransformed data. Results were unchanged; therefore, the results using the untransformed data are presented. Pearson correlations were calculated between fatigue and physical activity at baseline, three months, and six months. Multivariate linear regression analysis was performed to control for demographic characteristics, disease site, stage, and treatment modality.

For regression analysis, the sample size should be at least 5–10 times the number of variables entered into the analysis (Norman & Streiner, 2000). This condition was met with the sample of 328 subjects completing the six-month questionnaire.

Results

Sample Characteristics

A total of 440 patients consented to participate and completed the baseline questionnaire. Of the 440, 328 (75%) completed the six-month questionnaire and 112 (25%) did not. Of the 112, 76 (68%) withdrew, 28 (25%) died, and 8 (7%) were lost to follow-up (see Figure 1).

The mean age of the participants was 72.6 years (range = 65–90 years), and 56% were men (see Table 1).

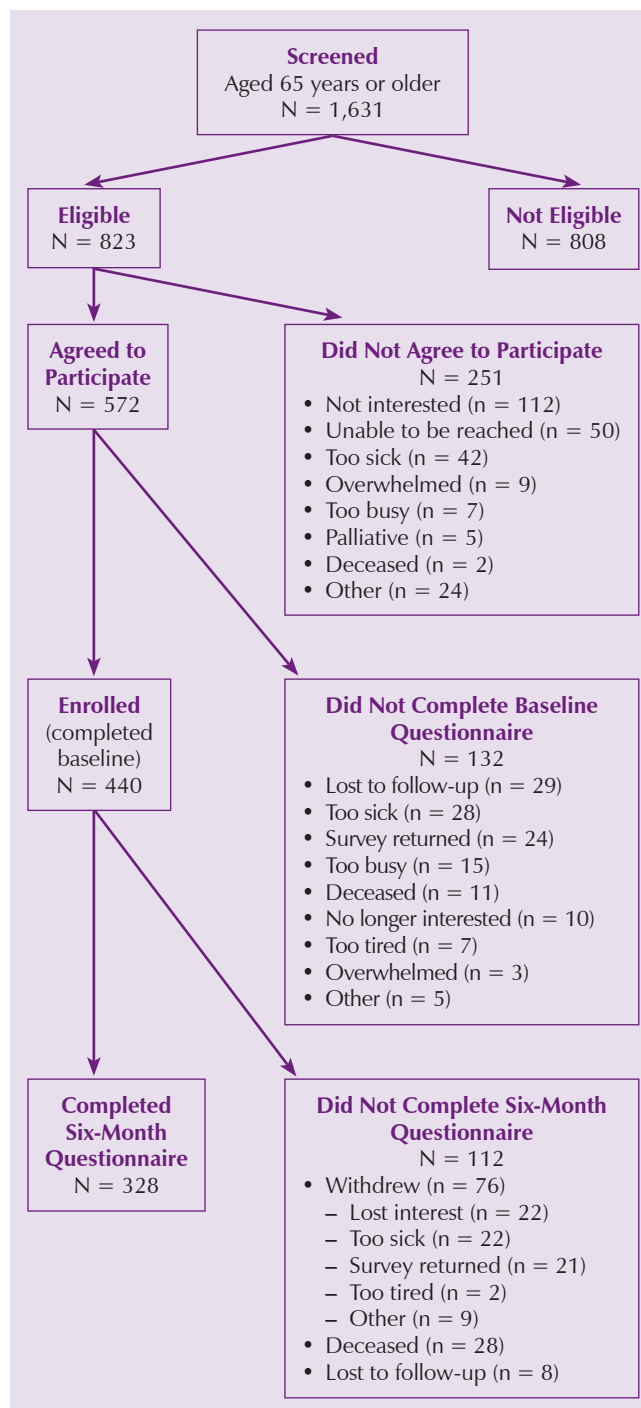


Figure 1. Study Participant Flow Chart

Participants self-reported an average of 2.9 comorbidities (range = 1–12). Most subjects were treated for early-stage cancer of the breast, prostate, colon or rectum, or lung. Subjects were treated with radiotherapy (62%), surgery (55%), chemotherapy (34%), or hormones (21%). Some patients received more than one treatment.

Prevalence and Scores

Fatigue (lack of energy) was the most prevalent symptom reported at baseline (69%), three months (71%), and six months (68%). Related symptoms of difficulty sleeping and feeling drowsy were among the top four symptoms reported at each time point (see Table 2). Outcome scores and ranges are reported in Table 3. Mean fatigue scores (compiled through MSAS) decreased from 1.31 (SD = 1.13) at baseline to 1.13 (SD = 1.14) at three months and 0.96 (SD = 1.12) at six months. Changes in fatigue scores were statistically significant between baseline and three months, between baseline and six months, and between three months and six months ($p < 0.01$). As a result of skewed distributions, medians also were calculated. The decrease in the median scores was even greater, from 1.33 at baseline to 0.25 at six months. Higher scores on the MSAS are indicative of increased frequency, intensity, or distress of fatigue.

Physical activity scores (compiled through PASE) increased from 93.3 (SD = 66.2) at baseline to 110.3 (SD = 72.3) at three months and 119.7 (SD = 70.6) at six months. Again, median scores showed a greater change from 78.93 at baseline to 111.36 at six months. Changes in physical activity scores were statistically significant between baseline and three months and between baseline and six months ($p < 0.01$). Higher physical activity scores on the PASE are indicative of increased frequency or intensity of physical activity.

Correlational Analysis

Fatigue and physical activity were negatively correlated at all time periods (see Table 4). Baseline fatigue levels were positively correlated with fatigue levels at three months and six months, and baseline physical activity levels were positively correlated with physical activity levels at three months and six months. All correlations were statistically significant ($p < 0.001$).

Predictors of Fatigue at Three and Six Months

The dependent variables for the regression analysis were fatigue outcome scores at three and six months after study enrollment. Physical activity scores at baseline and three months were entered as independent variables into two separate stepwise regression models along with the measured demographic variables, cancer site, stage and treatment modality, and self-reported functional comorbidity.

Table 1. Baseline Patient Characteristics

Characteristic	\bar{X}	Range	SD
Age (years)	72.6	65–90	5.6
Body mass index	27	15–43	4.8
Functional comorbidity	2.9	1–12	1.8

Characteristic	n	%
Gender (N = 440)		
Male	248	56
Female	192	44
Marital status (N = 438)		
Married or common law	323	74
Single, widowed, or divorced	115	26
Education (N = 430)		
Public school or high school	308	72
College or university	122	28
Income (\$) (N = 384)		
Less than 20,000	67	17
20,000 or more	317	83
Living arrangement (N = 438)		
Lives alone	87	20
Lives with someone	351	80
Housing arrangement (N = 440)		
Single-dwelling house	350	80
Other	90	20
Cancer site (N = 440)		
Breast	110	25
Prostate	107	24
Colorectal	70	16
Lung	42	10
Other	111	25
Cancer stage (tumor-node-metastases) (N = 440)		
I	106	24
II	175	40
III	91	21
IV	45	10
Not staged or not stageable disease	23	5
Treatment modality (N = 440)		
Radiotherapy	270	62
Surgery	241	55
Chemotherapy	150	34
Hormones	92	21
Observation	19	4
Biotherapy	3	1
Number of treatment modalities (N = 439)		
1	185	42
2	174	39
3	73	17
4	7	2

Baseline physical activity was significantly related to fatigue at three months ($\beta = -0.291$, $p = 0.001$) and six months ($\beta = -0.225$, $p = 0.001$). Chemotherapy and housing arrangement (living in a single-family home versus living in an apartment, retirement home, or other accommodation) also were significantly related to fatigue at three months (see Table 5). Standardized β values reflect the relative importance of each of the independent variables in predicting the dependent variable; therefore, physical activity was the variable in the model

Table 2. Prevalence of the Top 10 Symptoms Reported by a Cohort of Older Patients With Cancer

Symptom	Baseline			Three Months			Six Months		
	Rank	n	%	Rank	n	%	Rank	n	%
Lack of energy	1	302	69	1	258	71	1	220	68
Difficulty sleeping	2	248	56	4	173	47	4	171	53
Worrying	3	238	54	5	152	42	5	146	45
Feeling drowsy	4	235	53	2	211	58	2	181	56
Pain	5	231	53	3	174	48	3	175	54
Dry mouth	6	184	42	6	145	40	7	139	43
Cough	7	183	42	9	132	36	8	130	40
Feeling nervous	8	179	41	10	112	31	9	120	37
Feeling irritable	9	176	41	8	133	36	10	120	37
Difficulty concentrating	10	175	40	7	139	38	6	142	44

most strongly related to fatigue at three months and the only variable related to fatigue at six months.

The adjusted R^2 (the proportion of the variation in the dependent variable explained by the regression model) for the model predicting fatigue at three months was 0.105; 0.048 for the model predicting fatigue at six months. Both models were significant ($p < 0.001$). Therefore, the regression models using baseline physical activity level as an independent variable explained 11% of the variance in fatigue at three months and only 5% of the variance in fatigue at six months. Similarly, physical activity at three months was a significant predictor of fatigue at three months ($\beta = -0.327$, $p = 0.001$) and six months ($\beta = -0.177$, $p = 0.006$). Chemotherapy, functional comorbidity, and housing arrangement (living in a house) also were significant predictors of fatigue at three months; chemotherapy and functional comorbidity significantly predicted fatigue at six months. Again, physical activity was the strongest predictor of fatigue in each model. Physical activity level at three months accounted for 33% of the variance attributed to the model predicting fatigue at three months and 18% of the variance attributed to the model predicting fatigue at six months. Adjusted R^2 for the models were 0.183 and 0.087, respectively ($p < 0.001$). The regression models using physical activity level at

three months as an independent variable explained 18% of the variance in fatigue at three months and 9% of the variance in fatigue at six months.

Discussion

In this study, fatigue was the most prevalent symptom reported by a cohort of older patients with cancer at the time of and up to six months following consultation for treatment at a cancer center. The timeframe is comparable with other studies. Fatigue was the most common symptom reported at baseline and three months in a study by Esbensen, Osterlind, and Hallberg (2006) of older patients with mixed cancer diagnoses. Fatigue remained a primary source of symptom distress in a group of older women throughout six months following breast cancer surgery in a study by Kenefick (2006).

Fatigue scores were highest at baseline when many of the patients (mostly with breast and colon cancer) had just completed surgery and were attending consultations at the cancer center for adjuvant treatment. According to Cimprich (1999) and Morrow, Andrews, Hickok, Roscoe, and Matteson (2002), CRF may be present even before treatment begins. Fatigue after surgery improves with time (Tavio, Milan, & Tirelli, 2002). Fatigue scores declined at three months and again at six months after most patients had completed their cancer treatment. The results are consistent with prior studies reporting that fatigue levels are highest during and immediately following cancer treatment (Headley, 1997; Janda et al., 2000; Truong et al., 2006; Wengstrom, Haggmark, Strander, & Forsberg, 2000). Fatigue continued to be the most prevalent symptom at six months, consistent with other research findings that fatigue persists beyond completion of cancer treatment (Andrykowski, Curran, & Lightner, 1998; Bower et al., 2006; Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998; Kenefick, 2006; Loge, Abrahamsen, Ekeberg, & Kaasa, 1999).

Physical activity scores gradually increased over the six-month period. Because many subjects had surgery

Table 3. Fatigue and Physical Activity Scores

Variable	\bar{X}	SD	Median	Range
Fatigue (MSAS)				
Baseline	1.31	1.13	1.33	0–4
Three months	1.13	1.14	1	0–4
Six months	0.96	1.12	0.25	0–4
Physical activity (PASE)				
Baseline	93.3	66.2	78.93	0–335.3
Three months	110.3	72.3	101.15	0–474
Six months	119.7	70.6	111.36	0–401.1

MSAS—Memorial Symptom Assessment Scale; PASE—Physical Activity Scale for the Elderly

prior to their cancer center consultations, their baseline scores may have been low. In a study by Irwin et al. (2003), surgery alone accounted for a 24% decline in physical activity. As time from surgery increases, physical activity scores may increase (Berger, 1998; Courneya & Friedenreich, 1997). Mean physical activity scores in this study were lower than mean PASE scores reported by Harada et al. (2001) in a sample of community-dwelling older adults, suggesting that physical activity levels had not returned to prediagnosis levels at the six-month follow-up.

Higher physical activity levels were associated with lower fatigue levels in older patients during and following cancer treatment. Results from this study are encouraging because they are based on older patients' reported physical activity levels as measured by the PASE, which reflects leisure time activity (including formal exercise), household activity, and work-related activity engaged in by older patients. Increasing physical activity through exercise interventions may have additional benefits in reducing CRF. Studies and reviews of exercise interventions in patients with cancer have consistently reported a negative association between physical activity and fatigue, providing evidence that aerobic and resistance exercises may effectively reduce CRF (Galvao & Newton, 2005; Luctkar-Flude, Groll, Tranmer, & Woodend, 2007; McNeely et al., 2006; Mitchell et al., 2007).

The positive association between comorbidity and fatigue is of particular significance to older patients with cancer because they report more comorbidities than younger patients (Kurtz, Kurtz, Stommel, Given, & Given, 1999; Yancik et al., 2001). In this study, comorbidities and fatigue were associated regardless of age; however, the study was conducted on older patients. A study that included younger patients may have revealed that age was a more important factor. In other studies, comorbidities were associated with higher fatigue levels in women with breast cancer (Bower et al., 2000) and higher symptom severity (Kurtz et al.; Yun, Kim, Lee, Park, & Kim, 2007), and older women in particular were more likely to experience fatigue related to concurrent illness (Mast, 1998).

Baseline comorbidity was a significant predictor of fatigue at three and six months. The evidence suggests that physical activity may be effective in reducing fatigue associated with comorbid conditions such as chronic obstructive pulmonary disease, heart failure, fibromyalgia, and multiple sclerosis (Mostert & Kesselring, 2002; Pedersen & Saltin, 2006). In the current study, treatment with chemotherapy was associated with higher fatigue. Chemotherapy has previously been associated with long-term fatigue (Payne, 2002). The combination of chemotherapy and comorbidities appears to put older women at particular risk for CRF (Mast, 1998).

Limitations

Given that the study was observational, causality cannot be inferred from the identified associations. Confirmation of the proposed associations in older patients with cancer may provide useful insight and hypothesis generation for the development and testing of physical activity interventions for CRF in this population.

The single study center reduces the generalizability of results. Similarly, the heterogeneous sample in terms of cancer site, stage, treatment modality, and the timing of treatment limits applicability of the findings to specific populations of patients with cancer. Subjects who were late returning their baseline questionnaires may have already begun adjuvant treatment, which may have reduced the magnitude of the change in scores between baseline and three months.

Another potential limitation of this study is participation bias. Patients experiencing the most fatigue may have been less likely to enroll and more likely to withdraw before completing all questionnaires, actually making the findings appear stronger because the bias is in the correct direction. It also has been reported that older patients with cancer are less likely to consent to participate in research studies (Neumark, Stommel, Given, & Given, 2001). Attrition prior to completion of the baseline survey was high (23%). Attrition after completion of the baseline questionnaire was fairly

Table 4. Pearson Correlations Between Fatigue and Physical Activity at Baseline and Three and Six Months^a

Variable	Fatigue		Physical Activity		
	Three Months	Six Months	Baseline	Three Months	Six Months
Fatigue (MSAS)					
Baseline	0.362	0.258	-0.394	-0.314	-0.319
Three months	-	0.536	-0.252	-0.4	-0.367
Six months	-	-	-0.19	-0.228	-0.427
Physical activity (PASE)					
Baseline	-	-	-	0.631	0.483
Three months	-	-	-	-	0.624

^a All correlations are significant at $p < 0.01$ (two-tailed).

MSAS—Memorial Symptom Assessment Scale; PASE—Physical Activity Scale for the Elderly

Table 5. Significant Results of Stepwise Linear Regression Models Related to Research Questions

Variable	Standardized β	p	R ²
Relationship between physical activity at baseline and fatigue (MSAS) at three months			
Physical activity at baseline (PASE)	-0.291	0.001	0.105*
Chemotherapy	0.136	0.017	
Housing arrangement	0.123	0.032	
Relationship between physical activity at baseline and fatigue (MSAS) at six months			
Physical activity at baseline (PASE)	-0.225	0.001	0.048*
Relationship between physical activity at three months and fatigue (MSAS) at three months			
Physical activity at three months (PASE)	-0.327	0.001	0.183*
Housing arrangement	0.153	0.009	
Chemotherapy	0.162	0.006	
Comorbidity (FCI)	0.157	0.009	
Relationship between physical activity at three months and fatigue (MSAS) at six months			
Physical activity at three months (PASE)	-0.177	0.006	0.087*
Comorbidity (FCI)	0.17	0.007	
Chemotherapy	0.145	0.02	

* p = 0.001

FCI—Functional Comorbidity Index; MSAS—Memorial Symptom Assessment Scale; PASE—Physical Activity Scale for the Elderly

high (25%) but comparable with other studies enrolling older patients with cancer. Attrition rates in longitudinal studies have been reported to range from 16%–50% (McMillan & Weitzner, 2003; Moser, Dracup, & Doering, 2000). Nonparticipants were significantly more likely to be older (Pearson chi-square = 8.071, p = 0.004) than participants and were more likely to be deceased within the study timeframe (Pearson chi-square = 19.128, p < 0.001), indicating that their disease was likely more severe at baseline than participants.

Conclusion

Physical activity level is a modifiable factor that significantly predicted CRF in this cohort of older patients at three and six months following consultation for cancer treatment. The results suggest that the inverse

relationship between fatigue and physical activity previously reported in younger patients with cancer also is present in older patients with cancer, suggesting that physical activity interventions for fatigue effective in younger patients also might be effective for older patients.

Implications for Nursing

Additional research with randomized, controlled trials is needed to test physical activity interventions and identify optimal levels and types of physical activity to treat CRF in older patients. Results from this study suggest that older patients with low baseline physical activity levels, comorbidities, or treatment with chemotherapy may be at greater risk for fatigue. Identifying patients at risk for CRF should be a priority so that support can be provided and promising interventions, such as physical

activity, can be implemented. Patients of all ages should be encouraged to participate in regular physical activity during and following cancer treatment in consultation with their oncologists.

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