Article

Physical Activity and Self-Rated Health Status Among Older Adult Cancer Survivors: Does Intensity of Activity Play a Role?

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Purpose/Objectives: To examine the association between routine physical activity and self-rated health status in older adults with cancer.

Design: Cross-sectional.

Setting: Community-dwelling older adult survivors who completed a screening tool and subsequent detailed interview from the 2004 wave of the National Long-Term Care Survey, a nationally representative study of Medicare beneficiaries aged 65 years or older.

Sample: 251 older adult cancer survivors who regularly engaged in routine physical activity.

Methods: Participants were asked about chronic health conditions, depression, activities of daily living, participation in physical activities, self-rated health status, and sociodemographic characteristics. A weighted ordered probit model was used to estimate variables that predict self-reported health status.

Main Research Variables: Self-rated health status and participation in physical activity.

Findings: Age and higher education level were found to be significant correlates of health status ($p < 0.05$) in the first model. Although education was not significant in subsequent models, age, functional disability, and depression all were identified as significant correlates of health status ($p < 0.01$). In the final model, in which moderate and vigorous activity participation were entered, older adult survivors who engaged in vigorous physical activity showed higher levels of health status than those who engaged in light physical activity ($p < 0.05$), but number of chronic health conditions was not significantly associated with health status.

Conclusions: The association between vigorous activity and health status points to the primacy of physical activity within a post-cancer treatment health regimen.

Implications for Nursing: Health programs and policies need to address physical activity to improve the overall well-being of older adult cancer survivors.

Key Words: physical activity; cancer survivor; older adult; self-rated health; intensity

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Although the aim of treatments for cancer is to prolong life, they often can lead to diminished quality of life in multiple domains. Cancer treatments are linked to decreased levels of physical and mental health. In particular, the side effects caused by cancer treatments include fatigue, weight changes, muscle loss or weakness, depression, anxiety, and decreased general well-being (Brunet & Sabiston, 2011). All of these side effects can lower a survivor's level of physical activity, a particular concern among older adult survivors who face the highest cancer burden for most types of cancer (Maramaldi & Lee, 2006; Parry, Kent, Mariotto, Alfano, & Rowland, 2011) and who have more chronic health conditions and poorer physical health than older adults without cancer (Holmes et al., 2014; Smith et al., 2008). For this population, regular exercise has been significantly related to improved physical fitness, reduced risk of cardiovascular disease, and higher quality of life (McTiernan, 2004; Mosher et al., 2009; Winters-Stone, Bennett, Nail, & Schwartz, 2008). To better understand how exercise contributes to these positive outcomes, the researchers investigated the link between intensity of routine physical activity and self-rated health status among a sample of older adults.

Research has shown physical activity to be an essential factor for minimizing negative cancer-related symptoms, such as fatigue, decreased physical functioning, depression, and additional comorbidities among survivors (Courneya & Karvinen, 2007). Recreational physical activity has been significantly related to lower risk of death from all causes in breast cancer survivors and male survivors with varying cancer diagnoses (excluding those with nonmelanoma skin cancer) (Lahart, Metsios, Nevill, & Carmichael, 2015; Lee, Wolin, Freeman, Sattelmair, & Sesso, 2014). Across

different types of cancers, the importance of physical activity for positive physical functioning has repeatedly been noted. For example, Mosher et al. (2009) found a positive association between regular exercise habits and increased physical quality of life among older adult long-term survivors of prostate, colorectal, and breast cancers. Courneya et al. (2003) examined the efficacy of a post-treatment, home-based exercise regimen for improving overall quality of life, including physical functioning, among colorectal cancer survivors and found that those in the regular exercise group showed significant increases in physical functioning (e.g., increased muscle mass, increased strength, increased flexibility) compared to the control group. Clark et al. (2008) found that lung cancer survivors who undertook regular physical activity reported better physical functioning than those with sedentary lifestyles; likewise, Demark-Wahnefried, Morey, Sloane, Snyder, and Cohen (2009) found that a regular exercise regimen was associated with better physical functioning among survivors of breast and prostate cancers.

Studies have explored the multifactorial influences of physical activity on survivors' health outcomes. For example, Milne, Gordon, Guilfoyle, Wallman, and Courneya (2007) examined how urban or rural contexts affect quality of life for survivors; regardless of setting, they found that physical activity was correlated with improved quality of life. Although engaging in more physical activity is associated with greater reductions in mortality rates, even the recommended amount of weekly physical activity has been linked to significantly lower mortality rates (Lee et al., 2014).

Rabin, Pinto, Trunzo, Frierson, and Bucknam (2006) found that previously sedentary survivors who participated in a 12-week physical activity intervention showed similar improvement in physical functioning as those who independently undertook regular exercise. Examining the specific physical impact of exercise on older adult breast cancer survivors, Winters-Stone et al. (2008) reported that greater physical activity was positively associated with physical fitness, such as improved muscle strength in the lower extremities and overall less fatigue. Also using an older adult survivor sample, McTiernan (2004) found a negative correlation between regular physical activity and risk of cardiovascular disease, as well as a positive correlation between physical activity and muscle mass, strength, and flexibility. Even light-intensity exercise can produce positive outcomes. Among breast, prostate, and colorectal cancer survivors aged 65 years and older, increasing the levels of light-intensity activities was significantly associated with better physical function, attenuating the rate of functional decline in this vulnerable population (Blair et al., 2014).

Several studies have examined the relationship between physical activity and mental health for survivors, with many finding that physical activity is associated with decreased depressive symptoms (Ganz & Bower, 2007; Yeter et al., 2006). Courneya et al. (2003) studied quality-of-life issues for colorectal cancer survivors and reported that an exercise intervention correlated with a greater decrease in depression symptoms among participants in the experimental group in comparison to the control group. Using a sample of women with ovarian cancer, Beesley et al. (2011) found that low physical activity appeared to correspond with poorer psychosocial functioning. In addition, high levels of physical activity were associated with significantly lower mean depression scores as compared to low or medium activity levels (Beesley et al., 2011), implying that physical activity could have an influential role on depression symptoms. Similarly, Penttinen et al. (2011) investigated the relationship between physical activity and quality of life, including the presence of depression or fatigue; they found that physical performance and activity level were the only factors that positively correlated with quality of life.

The aforementioned studies suggest that physical exercise should be an important component of rehabilitation efforts for survivors who are able to engage in such activities. By promoting exercise in this population, survivors will have a greater chance of having an improved quality of life, less fatigue, enhanced strength and physical functioning, and improved mood. However, of these studies, extremely little research has been done among older adult cancer survivors. Studies that specifically pertain to this population have suggested that trends mirror those found in the broader population of survivors, including the associations between physical activity and improved quality of life (Mosher et al., 2009); physical fitness and lower fatigue (Winters-Stone et al., 2008); and strength, flexibility, and lower risk of cardiovascular disease (McTiernan, 2004). However, older adult survivors appear to be less likely to commit to and maintain regular exercise routines (Courneya & Karvinen, 2007). Most existing intervention studies rarely include older adult survivors, which limits information on how the physical activities of older adult survivors are linked to their health status. In addition, little is known about how everyday routine physical activities of older adult survivors are linked to their health. Therefore, the researchers in the current study attempted to close the knowledge gap by investigating the relationship among older adult survivors using population-based cross-sectional data. To the researchers' knowledge, no studies have examined the relationship between intensity of physical activity and physical health among older adult survivors.

Given the rapidly aging U.S. population and older adults having the highest incidence rates of most

cancers (Maramaldi & Lee, 2006; Parry et al., 2011), the number of older adult survivors is significantly increasing in this population. Therefore, the researchers aimed to investigate the relationship between the intensity of physical activity (light, moderate, or vigorous) and health, using secondary data that describe Medicare beneficiaries' participation in routine physical activity and the self-reported physical health of older adult survivor participants. The following research question guided the current study: What is the relationship between older adults' physical activity intensity levels and their own perceived health status?

Methods

Data and Study Sample

The data employed in the current study were drawn from the 2004 wave of the National Long Term Care Survey (NLTCS). The NLTCS is a longitudinal, nationally representative study of older Americans (aged 65 years or older) that has been administered periodically by the U.S. Census Bureau since 1982, with 2004 being the most recent wave. The NLTCS data have been sampled from the Medicare enrollment database using a stratified, two-stage clustered design (U.S. Census Bureau, 2006). The NLTCS has been designed for a panel study and cross-sectional study. Each wave of the survey is comprised of a subsample taken from previous survey cycles and combined with a new sample drawn from the Medicare database. Therefore, the 2004 NLTCS data include longitudinal and cross-sectional cohorts, being representative of Medicare enrollees as of April 1, 2004. The current study uses a cross-sectional design and examines only the 2004 wave of NLTCS.

The researchers used a noninstitutionalized community sample that completed a screener interview and community-detailed interview. Of 5,201 older adults who completed a community-detailed interview, 357 self-reported to be survivors and endorsed a response at any level of physical activity. The NLTCS data did not contain any details about the older adults' cancer (e.g., cancer site, current stage, treatments, duration, date of diagnosis).

Because the researchers' main study purpose was to examine the link between different levels of activity and self-reported health status of older adult survivors, they excluded older adult survivors who were not able to engage in any level of activity (i.e., sedentary; n = 68). As in the 2004 NLTCS, physical activity was measured by asking the respondents whether they participated in varying levels of activities. The sedentary respondents may have chosen not to engage in physical activities or may not have been able to engage in any of the different levels of activity. The researchers' analysis also revealed that most of them reported higher levels of functional limitations. For example, 50 of the sedentary participants had limitations in five to six activities of daily living (ADLs) (n = 35) or three to four ADLs (n = 15), and 5 participants did not have any functional limitations (n = 2) or had limitations in only instrumental ADLs (IADLs) (n = 3). Therefore, the researchers excluded this group because they may not have been able to participate in activities, and the association between the intensity of activity and self-reported health status may have been inflated if they had been included in this group.

The researchers in the current study also excluded survivors for whom data were missing for key study variables (n = 38). Therefore, the current study sample was comprised of 251 community-dwelling survivors from 2004 NLTCS data. The researchers examined these older adults' self-reported engagement in routine activities, ranging from light to vigorous activities.

Measures

Health status: The dependent outcome variable was self-reported health status, measured on a four-point ordinal scale (1 = poor, 2 = fair, 3 = good, and 4 = excellent). This was a subjective measure of one's general physical health.

Physical activity: This independent variable was measured according to participants' responses to three questions on the Phaffenbarger Physical Activity Questionnaire (Paffenbarger, Wing, & Hyde, 1978). Degree of intensity was delineated as light activity (e.g., office work, walking inside), moderate activity (e.g., light sports, walking outside, dancing), or vigorous activity (e.g., strenuous sports, jogging, digging in the garden). In the NLTCS, respondents were asked to report, on a typical day, how much time they spent on each of the three levels of activities. Because the distribution of each activity time variable was highly skewed (e.g., vigorous activity participation; skewness = 3.4, kurtosis = 13.9), the researchers measured one physical activity participation variable by tabulating three dummy-coded activity participation variables. This indicates the intensity of physical activity, including light activity only, moderate only or with light activity, and vigorous only or with other activity. The light activity only group was used as the reference category in multivariate analysis. This questionnaire has been used in oncology populations to investigate the relationship between physical activity and survival after cancer diagnosis in men (Lee et al., 2014).

Depression: Depression, representing respondents' mental health, was a control assessed according to whether they had felt sad, "blue," or depressed during the previous two weeks because they had experienced

three symptoms: trouble sleeping, loss of appetite, and disinterest in regular activities. Because each symptom was reported as a binary response (yes = 1), internal consistency among three dichotomous variables was estimated by Kuder-Richardson Formula 20 (reliability coefficient = 0.68). Depression was measured as a dummy-coded variable, indicating that respondents were depressed if any symptom was reported.

Physical health conditions: This control was measured in two ways: level of functional disability and number of chronic health conditions. After combining responses assessing six ADLs and nine IADLs, functional disability was measured according to a five-point scale developed by Manton, Corder, & Stallard (1993) (1 = no limitation, 2 = IADL limitations only, 3 = one or two ADL limitations, 4 = three or four ADL limitations, and 5 = five or six ADL limitations). The number of chronic health conditions was summed according to each individual's self-report of health conditions, selected from 29 possible options; a score of 10 was applied any time 10 or more conditions were claimed, yielding a possible range of 0–10.

Demographic variables: Demographic variables used as controls in the analysis were age, gender (1 = male), marital status (1 = married or partnered), and level of education. Education was measured as a five-point scale (1 = less than 12 years, 2 = high school diploma or GED, 3 = associate degree or some college, 4 = bachelor's degree, and 5 = graduate degree).

Procedures

The NLTCS has been funded by the U.S. Department of Health and Human Services, National Institutes of Health, and National Institute on Aging. Data and supplemental technical reports were obtained from the Inter-University Consortium for Political and Social Research and Duke University's Center for Demographic Studies. The researchers used the NLTCS to conduct secondary data analysis.

Data Analysis

NLTCS data were obtained using a complex survey design; therefore, parameters and standard errors should be correctly estimated by incorporating the sample weight and design effect in the analytic models. Although a weighted statistic corrects point estimates, the use of weights and clustering often leads to an increase in standard errors (Lee & Forthofer, 2006). To compute correct variance and standard errors, the researchers applied a balanced repeated replication (BRR) method and conducted subpopulation analyses. The BRR is a pseudoreplication procedure to estimate the sampling variance with a paired selection design in which two primary sampling units (PSUs) are sampled from each stratum (Lee & Forthofer, 2006). Ash (2005) created 108 pseudo strata to pair PSUs (i.e., two PSUs per each strata from the original 173 NLTCS strata). BRR creates many half samples by choosing one PSU from each stratum and balances half-sample replicates using an orthogonal Hadamard matrix (Lee & Forthofer, 2006). Using Stata®, version 13.0, replicate weights were generated in conjunction with primary sampling units,

Table 1. Sample Characteristics (N = 251)

Characteristic	$\bar{X}$	SE	n	%
Age (years)	76.8	0.5		
65–74			94	37
75–84			93	37
85–101			64	25
Gender				
Male			149	59
Female			102	41
Marital status				
Married or partnered			146	58
Unmarried			105	42
Education	2.4[a]	0.1[a]		
Less than 12 years			65	26
High school or GED			78	31
Some college			68	27
Bachelor's degree			23	9
Graduate degree			17	7
Race				
Caucasian			240	96
Other			11	4
Employment				
No			233	93
Yes			18	7
Functional disability	2.3	0.8		
No limitations			91	36
IADL limitations only			36	14
1–2 ADL limitations			73	29
3–4 ADL limitations			41	16
5–6 ADL limitations			10	4
Number of chronic diseases	4.5	0.2		
0–3			103	41
4–6			80	32
7 or more			68	27
Frequency of chronic disease				
Arthritis			172	69
Hypertension			142	57
Chronic pain			99	39
Trouble sleeping			87	35
Circulation			78	31
Any heart problem in the past 12 years			68	27
Numbness			63	25
Obesity			60	24
Diabetes			55	22

[a] Measured on a five-point scale (1 = less than 12th grade, 2 = high school diploma or GED, 3 = associate degree or some college, 4 = bachelor's degree, 5 = graduate degree)

ADL—activity of daily living; IADL—instrumental activity of daily living; SE—standard error

Note. Only 20 or more proportions of chronic conditions were listed. All numbers were unweighted; all statistics, including percentage, mean, and SE were weighted.

Note. Because of rounding, percentages may not total 100.

stratification, and cross-sectional sample weights were included in the 2004 survey data set.

Descriptive statistics were used to summarize sociodemographic and medical characteristics of the study sample (see Table 1). Weighted means and distributions of study variables are presented separately by levels of physical activity participation in Table 2. Bivariate correlations among variables are presented in Table 3. Finally, a series of weighted ordered probit analyses were performed to examine the unique contribution of physical activity to the self-reported health status of the older adult survivors. A four-step model was employed to predict the self-reported health status of the respondents. In step one, sociodemographic covariates were entered. In step two, two variables indicating physical health conditions—functional disability and number of chronic health conditions—were entered into the step one equation. The third model added depression into the second model. In the final step, physical activity variables were added to the third model. The researchers used Stata, version 13.0, for all statistical analyses.

Results

Sample Demographics

The current study sample tended to report better physical functioning and was not representative of all survivors in the 2004 NLTCS data because the researchers excluded respondents who reported being sedentary.

Physical Activity Participation

Bivariate analyses of physical activity participation with other variables were conducted. All analysis of variance and two-way tabulate analysis took the weighted statistic and variance estimation to adjust for standard errors with the complex survey design. Although the mean age of those who participated in vigorous activity was younger than the moderate or light activity groups, the difference was relatively small. However, a gender disparity was noted because, although 149 participants (58%) were male, 55 (74%) of those who reported a vigorous activity level were male ($p < 0.01$). Marital status revealed a similar distribution; 146 participants (60%) were married or partnered, and

Table 2. Physical Activity Participation by Demographic Characteristic

Characteristic	Light Activity Only (N = 71) $\bar{X}$	Light Activity Only (N = 71) SE	Moderate Only or With Light Activity (N = 106) $\bar{X}$	Moderate Only or With Light Activity (N = 106) SE	Vigorous Only or With Other Activity (N = 74) $\bar{X}$	Vigorous Only or With Other Activity (N = 74) SE	Total (N = 251) $\bar{X}$	Total (N = 251) SE	F	df	p
Age (years)	78	0.9	77.3	0.8	75	0.7	76.8	0.5	3.31	2, 110	< 0.05
Education[a]	2.3	0.1	2.2	0.1	2.8	0.1	2.4	0.1	5.59	2, 110	< 0.01
Functional disability[b]	3.1	0.1	2.2	0.1	1.6	0.1	2.3	0.1	36.98	2, 110	< 0.001
Health status[c]	2.2	0.8	2.6	0.8	2.9	0.8	2.6	0.9	11.07	2, 110	< 0.001
Number of chronic diseases	5.5	0.3	4.6	0.3	3.4	0.3	4.5	0.2	15.69	2, 110	< 0.001

Characteristic	Light Activity Only (N = 71) n	Light Activity Only (N = 71) %	Moderate Only or With Light Activity (N = 106) n	Moderate Only or With Light Activity (N = 106) %	Vigorous Only or With Other Activities (N = 74) n	Vigorous Only or With Other Activities (N = 74) %	Total (N = 251) n	Total (N = 251) %	Adjusted Wald F	df	p
Gender									5.6	2, 110	< 0.01
Male	36	51	58	55	55	74	149	59			
Female	35	49	48	45	19	26	102	41			
Marital status									4.92	2, 110	< 0.01
Married or partnered	33	46	59	56	54	73	146	58			
Unmarried	38	54	47	44	20	27	105	42			
Depression									2.53	2, 110	NS
No	50	70	88	83	58	78	196	78			
Yes	21	30	18	17	16	22	55	22			

[a] Measured on a five-point scale (1 = less than 12th grade, 2 = high school diploma or GED, 3 = associate degree or some college, 4 = bachelor's degree, 5 = graduate degree)

[b] Measured on a five-point scale (1 = no limitation, 2 = instrumental ADL limitations only, 3 = one or two ADL limitations, 4 = three or four ADL limitations, 5 = five or six ADL limitations)

[c] Measured on a four-point ordinal scale (1 = poor, 2 = fair, 3 = good, 4 = excellent)

ADL—activity of daily living; df—degrees of freedom; NS—not significant; SE—standard error

Note. All numbers were unweighted; all statistics, including percentage, mean, and SE, were weighted.

Table 3. Bivariate Correlations Among Variables (N = 251)

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	–	–	–	–	–	–	–	–	–	–
2. Male	–0.01	–	–	–	–	–	–	–	–	–
3. Married or partnered	–0.26***	0.35***	–	–	–	–	–	–	–	–
4. Education	–0.05	0.06	–0.03	–	–	–	–	–	–	–
5. Functional disability	0.37***	–0.14*	–0.28***	–0.17**	–	–	–	–	–	–
6. Number of chronic diseases	–0.03	–0.07	–0.1	–0.19**	–0.4***	–	–	–	–	–
7. Depression	–0.08	–0.05	–	0.03	0.07	0.26***	–	–	–	–
8. Moderate only or with light PA	0.04	–0.08	–0.04	–0.13*	–0.05	0.08	–0.1	–	–	–
9. Vigorous only or with other PA	–0.2**	0.2**	0.19**	0.24***	–0.36***	–0.26***	–	–0.55***	–	–
10. Health status	0.18**	0.04	–0.03	0.17**	–0.25***	–0.37***	–0.22***	–0.01	0.22***	–

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

PA—physical activity

Note. All numbers were unweighted; all bivariate correlations were weighted.

54 participants in the vigorous activity group (73%) had a spouse or partner ($p < 0.01$). In addition, a difference in education level was noted. The average level of education was almost identical in the light and moderate activity groups, with most having completed high school, whereas the vigorous activity group had, on average, pursued higher education.

On average, the participants assessed their health status as "fair to good" ($\bar{X} = 2.6$, SE = 0.6). For the relationship between physical activity and health status, participants who engaged in vigorous activity reported better overall health than their less active counterparts. On average, the more active older adults reported few limitations in terms of IADLs or ADLs, whereas those who participated only in light activity reported limitations in one or two ADLs ($p < 0.001$). A difference was noted in the number of health conditions as well. Study participants who engaged in vigorous activity had an average of three chronic health conditions, and the moderate and light activity groups had, on average, five chronic health conditions ($p < 0.001$). Participants in the vigorous activity group self-assessed their health status to be better than their age peers compared to the light and moderate activity groups. About 55 participants (22%) reported experiencing depressive symptoms in the previous two weeks. The moderate activity group had a lower depression incidence in the previous two weeks (n = 18, 16%) than the other two activity levels, but the difference was not statistically significant.

Bivariate Correlations Among Variables

Self-reported health status among the survivors in the sample was positively associated with participating in vigorous activity ($r = 0.22$, $p < 0.001$), educational attainment ($r = 0.17$, $p < 0.01$), and age ($r = 0.18$, $p < 0.01$). In comparison, self-reported health status was negatively associated with other health-related variables: greater numbers of chronic health conditions ($r = –0.37$, $p < 0.001$), higher levels of functional disability ($r = –0.25$, $p < 0.001$), and depression ($r = –0.22$, $p < 0.001$).

The survivors who participated in vigorous activity had lower levels of functional disability ($r = –0.36$, $p < 0.001$), reported fewer chronic health conditions ($r = –0.26$, $p < 0.001$), and were younger ($r = –0.20$, $p < 0.01$) than the light activity group. The vigorous activity group included higher percentages of men ($r = 0.2$, $p < 0.01$), married or partnered individuals ($r = 0.19$, $p < 0.01$), and higher educational attainment ($r = 0.24$, $p < 0.001$) than the light activity group. The moderate activity group had, on average, slightly fewer years of education ($r = –0.13$, $p < 0.05$) than the light activity group.

Ordered Probit Regression Analysis

Table 4 presents the estimated coefficients and marginal effects of self-rated health status of older adult survivors, taking into account demographic, physical, and mental health conditions and intensity of participation in physical activities. The dependent variable (i.e., self-rated health status) was a four-point ordinal scale variable in which each category was ranked and the distances between adjacent categories were unknown. For such ordinal outcomes, ordered regression analysis can be employed with the logit or probit link function. According to the current study objectives, ordered probit analysis was more appropriate than logit analysis because the researchers were interested in testing the relationship between

independent variables and the dependent variable in a series of additive models. Probit analysis identifies statistically significant relationships between independent variables and a dependent variable, like ordinary least squares regression. However, in terms of ordered probit regression analysis, the researchers cannot directly interpret the sign of coefficients or the size of parameters (Greene & Hensher, 2010). To measure the quantitative effect of explanatory variables on self-reported health status, the marginal effects were calculated. The marginal effect indicates the change in the percentage of older adult survivors having a specific self-reported health status value when the independent variable increases by one unit. For binary independent variables, the marginal effects are computed by differences of probabilities and, for continuous independent variables, by means. In all estimations, the marginal effects are only presented for the highest value of the self-reported health status (4 = excellent).

The first weighted ordered probit model revealed that age and education were statistically significant correlates of the health status of the current study sample in the first model. Although education was not significant in subsequent models, age, functional disability, and depression all were identified as significant correlates of health status. In the final model, in which moderate and vigorous activity participation were entered, participants who engaged in vigorous physical activity were more likely to positively assess their own health than older adults engaged in light physical activity; no difference was found between participants who engaged in moderate and light physical activity to assess their health status. The marginal effects indicate that if older adult survivors participated in vigorous physical activity, those individuals would be 15 percentage points more likely to report the highest health status compared to individuals engaged in light physical activity. In addition, the number of chronic illnesses no longer significantly predicted the health status of

Table 4. Weighted Ordered Probit Regression on Self-Rated Health Status (N = 251)

	Model 1			Model 2			Model 3			Model 4		
Variable	B	SE	Marginal Effects	B	SE	Marginal Effects	B	SE	Marginal Effects	B	SE	Marginal Effects
Age	0.03	0.01	0.01	0.04	0.01**	0.01	0.04	0.01	0.01	0.04	0.01	0.01
Male	0.02	0.18	–	–0.01	0.19	–	–0.03	0.19	–0.01	–0.08	0.2	–0.02
Married or partnered	0.1	0.18	0.02	–0.12	0.17	–0.02	–0.1	0.17	–0.02	–0.12	0.18	–0.02
Education	0.18	0.07	0.04	0.12	0.08	0.02	0.13	0.08	0.03	0.11	0.07	0.02
Functional disability	–	–	–	–0.25	0.07**	–0.05	–0.25	0.08**	–0.05	–0.19	0.08*	–0.04
Number of chronic diseases	–	–	–	–0.1	0.04	–0.02	–0.08	0.04*	–0.02	–0.07	0.04	–0.01
Depression	–	–	–	–	–	–	–0.04	0.19	–0.07	–0.39	0.18*	–0.07
Moderate with light PA	–	–	–		–	–	–	–	–	0.27	0.21	0.06
Vigorous with other PA (reference: light PA only)	–	–	–	–	–	–	–	–	–	0.65	0.26*	0.15

Variable	Model 1	Model 2	Model 3	Model 4
μ_1	1.35 (0.86)	0.65 (0.92)	0.61 (0.96)	1.2 (0.97)
μ_2	2.39 (0.89)**	1.79 (0.95)	1.76 (0.98)	2.38 (0.98)*
μ_3	3.6 (0.93)***	3.14 (0.98)**	3.13 (1.01)**	3.78 (1.02)***
F	2.85	7.91	7.3	5.87
df	4, 108	6, 106	7, 105	9, 103
p	0.0271	< 0.001	< 0.001	< 0.001

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

B—unstandardized coefficient; df—degrees of freedom; PA—physical activity; SE—standard error

Note. The marginal effects are only presented for the highest value (4 = excellent) in all estimations.

Note. In model 1, sociodemographic covariates were entered. In model 2, physical health conditions (functional disability and number of chronic health conditions) were added to model 1. In model 3, depression was added to model 2. In model 4, physical activity variables were added to model 3.

participants when the level of physical activity was entered in the final model.

Discussion

Maintaining a physically active lifestyle can pose challenges for some survivors because of treatment side effects and diminished strength. However, the health benefits of being physically active have been clearly documented (Brunet & Sabiston, 2011; Clark et al., 2008; Courneya & Karvinen, 2007; Mosher et al., 2009; Rogers, Markwell, Courneya, McAuley, & Verhulst, 2011). The current study examined how physical activity level (light, moderate, and vigorous) is associated with older adult survivors' self-rated health status. Among the 251 respondents who indicated engaging in some form of physical activity, 71 (28%) participated in light activity, 106 (42%) participated in moderate activity, and 74 (29%) participated in vigorous activity. This outcome, although promising, should be interpreted with caution because older adult survivors who reported being inactive (n = 68, 18%) were removed from the analysis. Because of this sampling limitation, the majority of survivors were able to incorporate moderate or vigorous activities into their daily routines.

The main study finding indicates that older adult survivors who engaged in vigorous physical activity reported a higher self-rated health status than survivors who reported only light physical activity. Age, functional disability, and depression were also significant correlates of health status in the final model. These findings corroborate research that demonstrates the positive association between physical activity and quality of life (Mosher et al., 2009; Penttinen et al., 2011) and reduced depressive symptomology (Courneya et al., 2003; Rabin et al., 2006; Yeter et al., 2006). Although level of education was not a significant correlate in the final model, research has shown that a survivor's educational attainment is positively associated with moderate or strenuous physical activity and leisurely walking (Coups et al., 2009). In the final model, in which moderate and vigorous activity participation were entered, the number of chronic illnesses was no longer significantly associated with older adult survivors' self-reported health. Previous studies have demonstrated that older adult survivors have more chronic health conditions and poorer physical health in comparison with older adults without cancer (Holmes et al., 2014; Smith et al., 2008). Using data from the 2009 Behavioral Risk Factor Surveillance System, Holmes et al. (2014) also reported that poor health status was more strongly associated with having two or more chronic health conditions than cancer survivorship among older adults. The researchers' finding explains that vigorous activity participation was more strongly associated with the highest health status of older adult survivors than functional disability, depression, or the number of chronic illnesses.

Although the findings from the current study point to the association between vigorous activity and better self-rated health status, not all older adult survivors have the physical capacity or motivation to jog or take part in strenuous sports. In these cases, working with survivors to establish realistic and individually tailored physical activity goals is strongly recommended. These goals can be organized into sequential targets (i.e., from short- to long-term and from light to vigorous intensity) so that the survivor can establish a baseline physical activity level and then increase the frequency and intensity of the activities. This individually focused strategy may help older adult survivors achieve an optimal level of physical activity that reflects their functional capacity, enhances their motivation to be physically active, and subsequently reduces their risk of mortality and cancer recurrence (Lahart et al., 2015). Future research can test the degree to which tailored physical activity programs are successful in improving motivation and increasing participation in vigorous physical activity among older adult survivors.

Limitations

One main study limitation is the use of data from the NLTCS. These data were collected and managed for the purpose of examining trends in functional disability, cognitive impairments, and mortality of older American adults (U.S. Census Bureau, 2006). Therefore, information in the survey was limited and did not include variables for cancer sites, treatments, stages, or duration. Although the 1994 wave of the survey included detailed information about 23 physical activities, the 2004 data only included three questions for physical activities. The study findings were based on respondents who reported that they had cancer at the time and engaged in any level of physical activity, from light to vigorous. Another limitation is the inclusion of few older adult survivors from racial or ethnic minority groups. Data were sampled from the Medicare enrollment file, and information on minority or immigrant older adult survivors was limited. In addition, since 1984, NLTCS has maintained longitudinal cohorts and replaced cross-sectional cohorts every five years. Therefore, people in the longitudinal cohorts may have had a better health status and consequently survived longer, which coincides with the current study finding (i.e., a positive association between age and health status). Older adult survivors residing in the community are more likely to manage their health status better, and those with a poor health status may

be less likely to participate in physical activity. Therefore, care must be taken when interpreting the results because of potential reliability and validity problems associated with the measures used in the analyses. Finally, a causal relationship between physical activity and health status cannot be inferred because of the use of cross-sectional data. Additional studies should use a longitudinal design to investigate the causal relationship.

Implications for Practice

Studies of physical activity levels among older adult survivors have important implications for oncology nursing practice, particularly in the development of survivorship care plans (SCPs) (Ganz, Casillas, & Hahn, 2008; Mayer et al., 2014). As recommended by the Institute of Medicine, SCPs should be used to "provide information to survivors regarding possible late and long-term effects of cancer and its treatment as well as age-appropriate health care and the social, economic, and emotional impacts of a cancer diagnosis" (Hill-Kayser et al., 2013, p. 3,854). Beginning in 2015, a new Cancer Program Standard will be enacted in regarding SCPs. Specifically, standard 3.3 states the following.

> [T]he cancer care committee develops and implements a process to disseminate a comprehensive care summary and follow-up plan to patients with cancer who are completing cancer treatment. The process is monitored, evaluated, and presented at least annually to the cancer committee and documented in minutes. (American College of Surgeons Commission on Cancer, 2012, p. 78)

This emphasis on formalizing care planning for survivors will provide an outstanding opportunity to incorporate physical activity and exercise as key lifestyle recommendations post-treatment.

For older adult survivors, engaging in a moderate to vigorous activity regimen may not occur because of limited awareness about the benefits of such a regimen or not having exercise included as a primary part of the SCP. Research has shown that older adult survivors are typically less likely to exercise and commit to an exercise program than younger survivors (Courneya & Karvinen, 2007), in part because of low motivation, physical impairment, fatigue, or depression. Although the findings from the current study point to the association between vigorous activity and better self-rated health status, survivors should be encouraged to engage in physical activity and incorporate this recommendation into the SCP.

Oncology nurses are well positioned to educate and support older adult survivors as part of an SCP process (Dulko et al., 2013; Marbach & Griffie, 2011). Guidance from oncology nurses could help these survivors develop a realistic approach to being physically active that can bolster their motivation and self-efficacy. These physical activities can be planned in a way that will help the survivor develop a sense of mastery and competence associated with being physically active. Other research suggests that even high levels of light-intensity activities may be a viable option to enhance health maintenance among older adult survivors unable to participate in vigorous exercises (Blair et al., 2014). An individual's unique exercise plan can be incorporated into the SCP so that older adult survivors achieve an optimal level of physical activity that reflects their functional capacity and subsequently improves their self-rated health status.

Studies indicate that many survivors do not meet national guidelines for weekly aerobic activity (Coups et al., 2009; Courneya & Karvinen, 2007; Haskell et al., 2007). Although physical limitations and mental health conditions (e.g., depression) may contribute to some survivors not meeting the national benchmark for aerobic activity, many others may not engage in vigorous exercise because they are unaware of its benefits or do not know how to start a physical activity program. This is an area that offers potential opportunities for using web-based technology to implement an SCP (Hill-Kayser et al., 2013). For example, survivors can be sent online information about how different types of physical activity can improve their health outcomes, and they can use this information to modify their activities. In a study of an Internet-based cancer SCP, Hill-Kayser et al. (2013) found that 54% of survivors reported that they changed or had plans to change their lifestyle behaviors as a result of the SCP. In this group of survivors who changed their behaviors or planned to do so, 44% indicated that they increased their participation in exercise because of the online SCP. Providing easy-to-understand education about the link between vigorous activity and health status using an online SCP is a low-cost and time-efficient way oncology nurses can help older adult survivors live longer and healthier lives.

Knowledge Translation

Despite limitations from cancer and its treatment, the majority of older adult survivors engage in some form of physical activity daily.

More vigorous physical activity is associated with better self-rated health status among older adult survivors, reinforcing the link between exercise and quality of life.

Vigorous physical activity has a stronger relationship with health status than functional disability, depression, or number of chronic illnesses.

Conclusion

The current study makes an important contribution to the understanding of how vigorous physical activity is associated with older adult survivors' self-rated health status. In addition, the current study also underscores the need for oncology nurses and other members of the healthcare team to include moderate or vigorous physical activity as a key component of the SCP. Developing patient-centered SCPs that provide tailored recommendations and guidance (Mayer et al., 2014) is a critical first step in helping survivors overcome barriers that will prevent them from achieving long-term health and vitality. However, additional research is needed to test how SCPs can be used to promote survivors' engagement in regular physical activity and how web-based technology can be implemented to improve their health-related behaviors, motivation, self-efficacy, and self-rated health status.

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