Determinants of adherence to physical activity guidelines among overweight and obese African American breast cancer survivors: implications for an intervention approach

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Abstract

Objective—Public health agencies encourage breast cancer survivors (BCSs) to follow their physical activity guidelines (PAGs). However, adherence to these guidelines is low. African American (AA) BCSs are more often overweight or obese and less likely than women of other races to report adherence to physical activity recommendations. This study examined socioeconomic, clinical, and psychosocial correlates with meeting PAGs.

Design—AA women diagnosed and treated for breast cancer and participating in a breast cancer support group ($N = 193$) completed a lifestyle assessment tool capturing demographic characteristics; breast cancer diagnosis and treatment history; health-related quality of life; weight history, including body mass index and post-diagnosis weight gain; and physical activity. Logistic regressions were used to determine if these covariates were associated with meeting [>8.3 metabolic equivalent task (MET) hr/wk]; partially meeting (4.15–8.3 MET hr/wk); or not meeting (<4.15 MET hr/wk) PAGs.

Results—Only 54% of AA BCSs reported meeting current PAGs. Participants reporting weight gain of 5 lbs post-diagnosis, and those who received surgical treatment for breast cancer were more likely to complete at least 8.3 MET hr/wk. Better physical functioning and lesser pain intensity were associated with meeting PAGs.

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Conclusion—Several factors influence physical activity behaviors and are likely to be important in developing effective interventions to assist AA survivors manage their weight. It is essential that providers and breast cancer support groups that assist survivors to remain physically active and to manage their weight should be aware of these factors. These findings may help generate hypotheses for future research to undergird efforts to increase physical activity among African American BCSs.

Keywords

Physical activity guidelines; adherence; African Americans; breast cancer survivors; health-related quality of life; body mass index

Introduction

The US Department of Health & Human Services (DHHS) 2008 physical activity guidelines (PAGs) (US Department of Health and Human Services 2008) serve as a benchmark for science-based recommendations on exercise. For adults, at least 150 min/wk of moderate-intensity or 75 min/wk of vigorous-intensity aerobic physical activity (PA) is advised. According to the American Cancer Society (ACS) (Kushi et al. 2012) and the American Institute for Cancer Research (AICR) (Marmot et al. 2007), about one-third of the most common cancers in the US could be prevented by a healthy lifestyle, including being physically active. To reduce risk of cancer recurrence, the AICR also recommends that cancer survivors meet PAGs (Marmot et al. 2007).

Outcomes of breast cancer diagnosis and treatment may include weight gain (Irwin et al. 2005), fatigue (Bardwell and Ancoli-Israel 2008), depression (Deshields et al. 2006), pain (Gärtner et al. 2009), impaired health-related quality of life (HR-QoL) (Trentham-Dietz et al. 2008), and fear of recurrence (O'Neill et al. 2013). Of women diagnosed with breast cancer, 50–96% experience weight gain during treatment (Vance et al. 2011), and weight gain after diagnosis usually ranges from 2.5 to 6.2 kg (5.5 to 13.6 lbs) (Rock and Demark-Wahnefried, 2002). An estimated 70–99% of those diagnosed with breast cancer experience cancer-related fatigue during treatment (Phillips and McAuley 2013); 45% report an episode of depression during the first 90 days post-diagnosis; and 10–25% suffer from major depressive disorder (Fann et al. 2008). As many as two-thirds of women who undergo surgery for breast cancer report developing chronic pain (Peuckmann et al. 2009), and women who develop chronic pain after breast cancer surgery demonstrate diminished HR-QoL, including impaired physical functioning (Poleshuck et al. 2006). Survivors of stages I, II, and III breast cancer have 5-year risks of recurrence of 7%, 11%, and 13%, respectively (Brewster et al. 2008); and 22–99% report fear of their disease returning (Simard and Savard 2009).

Among breast cancer survivors (BCSs), PA improves physical functioning, cardiovascular fitness, emotional wellbeing, and psychological adjustment; lowers fatigue, depression and anxiety; and helps maintain a healthy body weight (Knobf et al. 2014). Nevertheless, levels of PA in this population are low. Compared to other race/ethnic groups, African American (AA) women have the largest potential reductions in breast cancer risk from PA (41%)

(Friedenreich 2010), yet they are generally less physically active and more sedentary than women of other racial/ethnic groups (Marshall et al. 2007). Data from the Behavioral Risk Factor Surveillance System (BRFSS) show that relative to AA women, White women are 1.2 times more likely to meet PAGs (56.5% and 67.5%, respectively; $p < .01$) (Centers for Disease Control and Prevention 2008). Despite the importance of PA as a factor influencing post-breast cancer diagnosis morbidity and mortality, little is known about the barriers that hinder overweight and obese AA BCSs from adhering to PAGs (Oyekanmi and Paxton 2014).

Partnering with a breast cancer support group, researchers sought to determine PA needs and experiences of AA BCSs as an initial step to developing interventions aimed at promoting adherence to PAGs. The purposes of this report are to: (1) describe adherence to PAGs among AA BCSs; (2) determine associations between adherence to PAGs and socioeconomic, clinical, and psychosocial covariates; and (3) discuss implications of these associations in developing lifestyle interventions to promote adherence to PAGs, as an approach to reduce breast cancer recurrence risk among AA BCSs. The hypothesis was that BCSs meeting or partially meeting PAGs would report less depression, pain interference and pain intensity, and better physical functioning than those not meeting recommended PAGs.

Methods

Study population

In 1995, Survivors Involving Supporters to Take Action in Advancing Health (SISTAAH) Talk was established as a support group aimed at mitigating traumatic events (i.e. breast cancer-related concerns, poorer physical wellbeing, isolation, loneliness, distress, depression, and anxiety) for AA BCSs. The goal of SISTAAH Talk is to provide a forum for AA women to communicate about and make sense of their breast cancer experience in order to achieve improved physical and mental health outcomes. The study population included SISTAAH Talk members, diagnosed with breast cancer, at least one year post-treatment.

Data collection

SISTAAH Talk members partnered in a study entitled, *Assessing Lifestyle Modification Needs and Experiences of AA BCSs*, which has been described elsewhere (Smith et al. 2015). Briefly, the two-year needs assessment (2013–2015) included: conducting a literature review to identify evidence-based lifestyle intervention strategies; completing a secondary analysis of the 2010 National Health Interview Survey (NHIS) Cancer Control Supplement to examine HR-QoL (National Health Interview Survey 2009–2010); administering a lifestyle assessment tool (LAT) to discern breast cancer diagnosis and treatment history, weight, PA, and dietary intake and engaging in focus group discussions to determine salient features for inclusion in a lifestyle intervention. Researchers recruited eligible support group members through mailed letters (outlining the specific aims of the study) or in face-to-face encounters (during monthly support group meetings). Following consent, BCSs ($n = 240$) who were English-speaking/reading completed the 45-min LAT through various modes (e.g. self-administered on-line or mailed version; or facilitator-administered in-person or by telephone interview).

Primary outcome

The measure of PA used in the 2011 Behavioral Risk Factor Surveillance System (BRFSS) (Behavioral Risk Factor Surveillance System 2011) for monitoring population-level exercise among adults was included in the LAT. The BRFSS, a cross-sectional telephone survey administered throughout the US, is based on a standard set of questions on current health behaviors. For the LAT, eight BRFSS questions determined the accumulated time that BCSs participated in non-occupational exercise. The type of PA was captured in response to two questions: 'What type of PA or exercise did you spend the most time doing in the past month?' and 'What other type of PA gave you the next most exercise during the past month?' Frequency (number of times performed), duration (length of time performed), and intensity (how much was performed) of each reported activity were combined to estimate the time spent per week in moderate-intensity or vigorous-intensity PA. Validity of the BRFSS survey (using the PA log as the standard) was 0.40–0.52 for recommended activity, and test–retest reliability was 0.35–0.86 for the different categories of recommended PA. The validity and reliability of the BRFSS PA questions suggests that this instrument can classify groups of adults into the levels of recommended and vigorous activity as defined by Healthy People 2010 (Yore et al. 2007).

PA was based on meeting the DHHS recommendation of >150 min total PA/wk as sufficient and >0 minutes but <150 minutes per week as insufficient (US Department of Health and Human Services 2008). Reported PA was used to calculate total weekly metabolic equivalent task (MET)-hr/wk. MET values were multiplied by the number of hours per week reported for each activity type and summed across amounts, captured by: (1) estimating BCSs' age-gender specific maximum oxygen uptake to create an indicator for intensity of the first and second activities; and (2) counting the number of physical activities or exercises for muscle strengthening per week (DHHS 2008). The total weekly PA in the range of 500–1000 MET- minutes produces substantial health benefits for adults.

Based on scores developed for analyses of adherence by the ACS cancer prevention guidelines, PA levels closest to PAGs were scored highest ($n = 2$), and those least consistent with the guidelines scored lowest ($n = 0$). The PAG minimum of 500 MET min/wk (8.3 MET hr/wk), was assigned a score of 2 (meeting); 4.15–8.3 MET hr/wk a score of 1 (partially meeting); and <4.15 MET hr/wk a score of 0, or not meeting recommended PAGs.

Independent variables

Information collected also included demographic variables, breast cancer diagnosis, and treatment history, HR-QoL (depression, fatigue, pain interferences, pain intensity, and physical functioning), body mass index (BMI) and post-diagnosis weight gain.

Demographics assessed included five items: age (<50, 50–64, and 65 years of age and older); education (Less than college, College, or greater); income (<$25,000, $25,000–$49,999, $50,000); marital status (Single, Married, Divorced/Widowed); and insurance coverage (none, Medicare, Medicaid, health insurance/HMO).

Breast Cancer Diagnosis and Treatment History was captured through the NHIS Cancer Control Supplement (National Health Interview Survey 2009–2010) questions focused on

issues pertaining to knowledge, attitudes, and practices in cancer-related health behaviors, screening, and risk assessment. It has 220 items related to cancer survivorship. For the LAT, breast cancer diagnosis and treatment history were captured as year of diagnosis; stage at diagnosis (I, II, II & III, Don't Know); hormone receptor status (negative or positive: estrogen, progesterone, and/or HER/2Neu); type of treatment received (surgery, chemotherapy, radiation, hormonal therapy, bone marrow or stem cell transplantation); and history of recurrence. BMI and post-diagnosis weight gain were captured in the LAT. Weight and height at the time of LAT administration were recorded in pounds and inches and BMI was calculated as weight in kilograms divided by height in meters squared. Weight history was determined based on responses to the National Health and Nutrition Examination Survey (NHANES) (National Health and Nutrition Examination survey 2009–2010], a national questionnaire assessing the health and nutritional status of adults and children in the US. The NHANES weight history scale includes 20-items related to body weight; post-diagnosis weight gain was captured based on participants' reported weight since being diagnosed with breast cancer. BMI<25 kg/m^2 is considered healthy weight; BMI = 25–29.99 kg/m^2 as overweight; and BMI 30 kg/m^2 as obese (CDC). The validity and reliability of the NHIS and NHANES surveys were similar to those of the BRFSS, since they all produced similar estimates for several outcome measures, and many of the observed differences were found to have limited consequences for implementing related public health programs (Fahimi et al. 2008).

HR-QoL was measured through the Patient Reported Outcomes Measurement Information System (PROMIS 2016), an assessment measuring survivors' subjective physical, emotional, social, and cognitive functioning in the context of their breast cancer symptoms and treatment. PROMIS has constructed item banks (a collection of questions measuring the same thing that can be administered in short forms or adaptively through computerized adaptive testing). Short forms require 4–10 items; computerized adaptive testing require 3–7 items for more precise scores. PROMIS item banks and their short forms provide evidence that they are reliable and precise measures of generic symptoms and functional reports comparable to legacy instruments (Cella et al. 2010). For the present study, one dimension of mental health (depression) and four dimensions of physical health (fatigue, pain interference, pain intensity, and physical functioning) were measured. Depression assessed negative mood (sadness, guilt), views of self (self-criticism, worthlessness), social cognition (loneliness, interpersonal alienation), and decreased positive affect and engagement (loss of interest, meaning and purpose). For fatigue, frequency, duration and intensity and its impact on physical, mental, and social activities were assessed. Pain interference questions determined the consequences of pain on relevant life activities and pain intensity provided a quantitative estimate of the pain experienced by BCSs. Physical functioning assessed their capacity to perform activities of daily living (e.g. running errands) as well as upper extremities (dexterity), lower extremities (walking or mobility), and central regions (neck, back). The Depression, Fatigue, Pain Interference, and Pain Intensity item banks utilized a 7-day recall period (include the phrase 'the past 7 days'). Physical function items emphasize current capabilities and therefore did not employ a recall period. Targeted HR-QoL component raw scores were translated into a standardized score (T-score) with a mean of 50 and a standard deviation of 10 (PROMIS). A higher PROMIS T-score represents more of the

concept being measured. For negatively-worded concepts like depression, a T-score of 60 is one SD worse than average. By comparison, a depression T-score of 40 is one SD better than average. Each component was coded into two categories: Good HR-QoL (Excellent, Very good, Good) (Not at all, A little bit, Somewhat) (Pain rating: 0,1,2,3,4,5) and Poor HR-QoL (Fair, Poor)(Quite a bit, Very much)(Pain rating: 6,7,8,9,10).

Statistical analyses

Adherence to PAGs was reported using frequencies and proportions. Descriptive statistics were generated to characterize socio-demographic variables, diagnostic history, treatment type, BMI, and HR-QoL variables using means and standard deviations for continuous data as well as frequencies (proportions) for all categorical data. Chi-square tests and *t*-tests were performed to identify the association between adherence to PAGs and socio-demographic, BMI, and HR-QoL data. An ordered logistic model with a cumulative logit link function was performed to examine the association between adherence to PAGs and related determinants of adherence to PAGs, such as treatment type, BMI, post-diagnosis weight gain, and physical functioning, after adjusting for age, income, education, marital status, and stage at diagnosis (Agresti 2002); adjusted odds ratios and related 95% confidence intervals were derived from these analyses. We determined the power for the set of variables included in a multivariable model with the assumption of a sample size of 200, 5% level of significance, and that age, education, income, marital status are included in the model to account for approximately 5% of the variability of adherence to PAGs. Addition of six variables to the model with 8% of variability increment gives a power of 88.9%. Our sample (N = 193) had at least 80% of power to identify significant variables from a given multivariable model. Collinearities were examined in the model for those predictor variables to avoid biased coefficient estimation and a loss of power using eigenvalues and condition index (Kleinbaum et al. 2008; Yoo et al. 2014). All statistical analyses were accomplished with SAS version 9.4 (SAS Institute Inc). A statistical probability level of p < .05 was considered significant.

Compliance with ethical standards—The Institutional Review Board of Morehouse School of Medicine approved this study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Results

Of the 240 BCSs completing the LAT, 47 were excluded for failure to complete the PA scale; the overall response rate was 80.4%. The final study population was 193 with mean age of 55.6 years (SD = 12.8). Most (78.5%) reported college or higher education, and were married (37.4%). The largest income group (36.0%) earned $25,000–$49,999 annually.

Table 1 shows independent variables stratified by level of adherence to PAGs: meet (>8.3), partially meet (4.15–8.3), or not meet (<4.15) MET hr/wk. Many participants were diagnosed with breast cancer for five years or more (46.2%), with stage I cancer (41.2%), had surgery (86.5%), and received chemotherapy (57.5%). More than half (n = 105 (54.4%))

reported meeting the recommended PAGs of >8.3 MET hr/wk. None of the demographic, diagnosis history and treatment type variables were significantly associated with meeting PAGs.

Table 2 shows BMI by level of adherence to PAGs. Overweight and obese survivors accounted for 32.1% and 30.6% of the study population respectively; 37.3% reported a healthy weight. Although not statistically significant ($p = .0572$), weight gain after breast cancer diagnosis was inversely associated with meeting the PAGs; 54.8% of participants who gained 5 lbs after diagnosis met the PAGs, compared to 45.2% who gained 6 lbs or more. Most survivors ($n = 101$ (52.6%)) reported gaining 6 lbs or more.

Four domains of HR-QoL, namely, physical functioning, fatigue, depression and pain were assessed as determinants of adherence to the PAGs (Table 3). The T-scores for responses provided by survivors were calculated, and the means of the T-scores for the four domains indicate that physical functioning (mean T-score = 28.48) was associated with adherence to the PAGs. A reported ability to perform household chores ($p = .0441$), go up and down stairs ($p = .0016$), and walk for at least 15 min ($p = .0428$) were associated with meeting the PAGs. Higher levels of pain intensity experienced by survivors were also associated with meeting PAGs ($p = 0243$); fatigue (mean T-score = 49.23), depression (mean T-score = 48.27), and pain interference (mean T-score = 51.34) did not contribute significantly to determining adherence to PAGs.

The cumulative logit model (Table 4) shows that after adjusting for some independent variables, weight gain post-diagnosis and type of treatment received were significantly associated with adherence to PAGs. Participants reporting surgical treatment were 3.3 times more likely to meet PAGs compared to those not receiving this treatment (OR = 3.3, 95% CI 1.3, 8.1). Post- diagnosis weight gain >10 lbs was inversely associated with meeting PAGs (51%), compared to weight gain of 5 lbs (OR = 0.5, 95% CI 0.08, 0.9). For HR-QoL, the association with the different domains and meeting PAGs was no longer statistically significant.

Discussion

The results from this study provide important information about factors that influence adherence to PAGs among AA BCSs. The final study population of 193 AA BCSs participated in this study, with 63% being overweight or obese, and 54% reporting meeting current PAGs. Post-diagnosis weight gain had a borderline correlation of meeting PAGs; survivors who gained 5 lbs were more likely to meet PAGs, compared to those who gained more weight. Physical functioning and level of pain intensity were the only domains of HR-Qol that correlated significantly with meeting PAGs. After adjusting for some of the independent factors, two variables remained significantly associated with meeting PAGs, namely, having surgical treatment for breast cancer, and weight gain of more than 10 lbs post-diagnosis. BCSs are usually encouraged by their care givers to participate in exercise in order to reduce the complications of surgery such as lymphedema (Cheifetz and Haley 2010), and many obese survivors engage in sedentary behaviors due to complications (e.g. pain), that may prevent them from adhering to PAGs.

The results from the study of the Sisters Network Inc., a national organization of AA BCSs with mean age of 54 years, showed that less than half of the women (44.6%) were meeting PAGs (Oyekanmi and Paxton 2014). The most prevalent barriers to PA in the study population were a lack of discipline, energy, time, and interest. Factors associated with these barriers include age, level of education, and obesity. Younger women reported higher mean scores for having a lack of time and energy than did older women; less educated women reported higher mean scores for feeling discouraged and having fear of injury, equipment, facilities and good health; while obese women had a higher mean score for feeling discouraged and having a lack of facilities. Another study that utilized the same group of participants to examine the association between neighborhood characteristics and PA (Jones and Paxton 2015), revealed that median household income and the percentage of households who rent were associated with PA. Increase in median household income resulted in increase in PA MET-minutes/week; and when the percentage of households who rent increases, the PA MET-minutes/week decreased. Diggins et al. (2016) reported that 40.2% AA BCSs engaged in PA. Mood, spiritual, social/family, functional and physical wellbeing were associated with PA.

The Women's Healthy Eating and Living (WHEL) Study (Hong et al. 2007), with participants from different ethnic groups, showed that higher levels of education, physical functioning, and treatment type were positive correlates of meeting PAGs, while BMI , cancer stage and depression were inversely correlated with meeting PAGs. Year since diagnosis and age were not significantly associated with meeting PAGs. Ethnicity was a demographic correlate of meeting PAGs in the Hong study; Whites accounted for 85% of the study population, while Blacks were 4%, and Blacks had lower PA levels than whites and Asian-Americans. The WHEL study did not state the proportion of survivors in each ethnic group meeting PAGs. The Exercise to Enhance Recovery and Good Health for You (ENERGY) trial (Liu et al. 2015), comprising of 79% whites and 10% AAs, showed that overall, 23% of survivors met PAGs, and higher BMI, number of co-morbidities and number of prescribed medications, were inversely correlated with PA levels. Emery et al. 2009, revealed that adherence to PA was significantly determined by level of education, BMI and type of surgery (mastectomy vs. lumpectomy; while poor physical health and depression were associated with lower levels of PA.

The data from the current study are likely to be helpful for developing tailored interventions to assist AA BCSs manage their weight. Potential interventions for assisting AA BCSs manage their weight include one-on-one and small group education, the use of small media such as pamphlets and brochures, and provider counseling about the importance of remaining physically active and eating a healthy diet. Both providers and breast cancer support groups have a role in assisting AA BCSs to remain physically active and to manage their weight. The use of new technologies such as smartphone applications (apps) and interactive computer programs are promising approaches for promoting PA and weight control among BCSs. There is currently a paucity of research-tested, culturally appropriate interventions aimed at helping AA BCSs manage their weight and to meet recommended PAGs following a breast cancer diagnosis.

The current investigation is limited by its cross-sectional design and use of self-reported information. Nevertheless, the questions on PA were used that have previously been used in national surveys conducted for the general US population. In addition, patients' self-report of the level of pain they are experiencing has generally been found to be more reliable than provider assessments based upon physical signs (Pasero and McCaffery 2010). Although 47 of 240 (19.6%) women did not complete the PA scale, we generally did not find significant differences between the respondents who did or did not have missing information on PA except surgery (results not shown). Some of the cell sizes for the analysis contain less than five persons, which may bias the chi-square test. Differences in the categorization of PA and PAGs in the studies that were compared to the current one may influence the outcome of the statistical analyses, and may account for the observed differences in the results. This current study contributes to the literature on cancer survivorship, being among the few that have investigated the levels of adherence, and the factors associated with PAGs solely among AA BCSs, a group that is at disadvantage in health and disease outcomes.

Implications for BCSs

Providers who care for AA BCSs should be aware that survivors who did not receive surgical treatment, gained more than 5 lbs post-diagnosis, and reported poor physical functioning, are at increased risk of being overweight or obese due to physical inactivity. The results of this study may help guide efforts by breast cancer support groups to identify at-risk AA BCSs who may benefit from programs on PA and weight management. The findings may also generate hypotheses for future research to undergird efforts to increase PA among AA BCSs.

Acknowledgments

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Key messages

- Nearly half (46%) of AA breast cancer survivors in this study do not meet current recommended PAGs.

- Weight gain post-diagnosis, and receiving surgical treatment are determinants of adherence to PAGs among AA breast cancer survivors who participated in the current study.

- Factors that determine adherence to PAGs should be considered when developing interventions aimed at promoting PA among AA breast cancer survivors.

Table 1

Physical activity by demographics, diagnosis history and treatment type.

Variable	Total N (%)	Physical activity guidelines (PAGs)[a]			p- value*
		Meet n (%)	Partially meet n (%)	Not meet n (%)	
Age, years					.3063
<50	52 (27.37)	30 (29.13)	16 (28.57)	6 (19.35)	
50–64	102 (53.68)	51 (49.51)	34 (60.71)	17 (54.84)	
65	36 (18.95)	22 (21.36)	6 (10.72)	8 (25.81)	
Education					.7765
Less than college	41 (21.47)	22 (21.36)	11 (19.30)	8 (25.81)	
College or greater	150 (78.53)	81 (78.64)	46 (80.70)	23 (74.19)	
Employment					.0659
Employed	90 (47.37)	47 (46.08)	33 (57.89)	10 (32.26)	
Not employed	100 (52.63)	55 (53.92)	24 (42.11)	21 (67.74)	
Income, annual					.3325
<$25,000	61 (32.28)	29 (28.16)	17 (30.91)	15 (48.39)	
$25,000–$49,999	68 (35.98)	39 (37.86)	20 (36.36)	9 (29.03)	
$50,000	60 (31.74)	35 (33.98)	18 (32.73)	7 (22.58)	
Marital status					.2630
Single	45 (23.68)	22 (21.57)	13 (22.81)	10 (32.26)	
Married	71 (37.37)	42 (41.18)	23 (40.35)	6 (19.35)	
Divorced/Widowed	74 (38.95)	38 (37.25)	21 (36.84)	15 (48.39)	
Year since diagnosis					.2879
<1	20 (10.75)	8 (8.00)	8 (14.04)	4 (13.79)	
1–5	80 (43.01)	50 (50.00)	19 (33.33)	11 (37.93)	
5	86 (46.24)	42 (42.00)	30 (52.63)	14 (48.28)	
Stage at diagnosis					.7668
I	77 (41.18)	42 (41.18)	23 (41.07)	12 (41.38)	
II	50 (26.74)	29 (28.43)	12 (21.43)	9 (31.03)	
III[b] & IV	41 (21.93)	21 (20.59)	13 (23.21)	7 (24.14)	
Don't know	19 (10.15)	10 (9.80)	8 (14.29)	1 (3.45)	

		Physical activity guidelines (PAGs)[a]			
Variable	**Total N (%)**	**Meet n (%)**	**Partially meet n (%)**	**Not meet n (%)**	**p- value***
Hormone status					
Estrogen[c]	55 (47.41)	29 (48.33)	17 (45.95)	9 (47.37)	.9742
Estrogen[d]	61 (52.59)	31 (51.67)	20 (54.05)	10 (52.63)	
Progesterone –	58 (77.33)	31 (79.49)	17 (77.27)	10 (71.43)	.8262
Progesterone +	17 (22.67)	8 (20.51)	5 (22.73)	4 (28.57)	
Her2/Neu–	60 (80.00)	31 (79.49)	19 (82.61)	10 (76.92)	.9134
Her2/Neu+	15 (20.00)	8 (20.51)	4 (17.39)	3 (23.08)	
Recurrence					.1830
Yes	39 (20.53)	16 (15.69)	15 (26.32)	8 (25.81)	
No	149 (78.42)	86 (84.31)	41 (71.93)	22 (70.97)	
Don't know	2 (1.05)	0 (0.00)	1 (1.75)	1 (3.22)	
Surgery					.7147
Yes	167 (86.53)	90 (85.71)	51 (89.47)	26 (83.87)	
No	26 (13.47)	15 (14.29)	6 (10.53)	5 (16.13)	
Chemotherapy					.4110
Yes	111 (57.51)	57 (54.29)	33 (57.89)	21 (67.74)	
No	82 (42.49)	48 (45.71)	24 (42.11)	10 (32.26)	
Hormone treatments					.8849
Yes	58 (30.05)	30 (28.57)	18 (31.58)	10 (32.26)	
No	135 (69.95)	75 (71.43)	39 (68.42)	21 (67.74)	
Bone marrow/Stem cell transplant					.5353
Yes	4 (2.07)	2 (1.90)	2 (3.51)	0 (0.00)	
No	189 (97.93)	103 (98.10)	55 (96.49)	31 (100.00)	
Total	N = 193 (100)	n = 105 (100)	n = 57 (100)	n = 31 (100)	

Note: Some variables reflect an $N < 193$ due to missing data for those variables.

[a] PAGs, physical activity guidelines (meet [>8.3 MET hr/wk] = 2; partially meet [4.15–8.3 MET hr/wk] = 1; not meet [<4.15 MET hr/wk] = 0)

[b] IIIa + IIIb, IV.

[c] Negative

dPositive

* $p < .05$ is significant.

Table 2

Physical activity by body mass index (BMI).

Variable	Total n (%)	Physical activity guidelines (PAGs)[a]			
		Meet n (%)	Partially meet n (%)	Not meet n (%)	p-value[*]
BMI, kg/m^2					.7781
Healthy weight, <25	72 (37.31)	36 (34.29)	25 (43.86)	11 (35.48)	
Overweight, 25–29.99	62 (32.12)	34 (32.38)	17 (29.82)	11 (35.48)	
Obese, 30	59 (30.59)	35 (33.33)	15 (26.32)	9 (29.04)	
Post-diagnosis weight gain, lbs					.0572
5	91 (47.40)	57 (54.81)	21 (36.84)	13 (41.94)	
6–10	8 (4.17)	3 (2.88)	5 (8.77)	0 (0.00)	
>10	93 (48.43)	44 (42.31)	31 (54.39)	18 (58.06)	
Total	N = 193 (100)	n = 105 (100)	n = 57 (100)	n = 31 (100)	

Note: Some variables reflect an N < 193 due to missing data for those variables.

[a] PAGs, physical activity guidelines (meet [>8.3 MET hr/wk] = 2; partially meet [4.15–8.3 MET hr/wk] = 1; not meet [<4.15 MET hr/wk] = 0).

[*] p < .05 is significant.

Physical activity and HR-QoL.

Table 3

Variable	Mean T-score (SD)	Total N (%)	Physical activity guidelines (PAGs)[a]			
			Meet n (%)	Partially meet n (%)	Not meet n (%)	p-value[*]
Physical functioning	28.48 (6.33)	188 (100.00)	103 (54.78)	56 (29.79)	29 (15.43)	
Do household chores						.0441
Go up and down the stairs						.0016
Go for a walk for at least 15 minutes						.0428
Fatigue	49.23 (10.55)	189 (100.00)	105 (55.56)	55 (29.10)	29 (15.34)	.0626
Depression	48.28 (9.17)	187 (100.00)	104 (55.61)	54 (28.88)	29 (15.51)	.4475
Pain		189 (100.00)	104 (55.03)	56 (29.63)	29 (15.34)	
Pain intensity	26.47 (5.78)					.0243
Pain interference	51.34 (10.27)					.1023

Note: Some variables reflect an $N < 193$ due to missing data for those variables.

[a] PAGs, physical activity guidelines (meet [>8.3 MET hr/wk] = 2; partially meet [4.15–8.3 MET hr/wk] = 1; not meet [<4.15 MET hr/wk] = 0)

[*]
 $p < .05$ is significant.

Table 4

Cumulative logit model of determinants associated with adherence to PAGs.

Variable	Categories	Adjusted ordered logit model			
		Coefficients	OR	95% CI for ORs	p-value*
Age	<50	−0.7011	0.496	0.180, 1.367	.1753
	50–64	−0.6138	0.541	0.222, 1.320	.1771
Education	College or greater	0.1750	1.191	0.526, 2.698	.6748
Income	$25,000–$49,999	0.0061	1.006	0.474, 2.137	.9874
	$50,000	0.6267	1.864	0.785, 4.424	.1580
Marital status	Married	0.3431	1.409	0.621, 3.198	.4119
	Divorced/Widowed	−0.0264	0.974	0.428, 2.218	.9498
Stage at diagnosis	II	−0.1287	0.879	0.354, 2.186	.7818
	III & IV	−0.1814	0.834	0.298, 2.338	.7301
Post-diagnosis	6–10	−1.1863	0.305	0.071, 1.307	.1099
Weight gain, lbs	>10	−0.6685	0.512	0.078, 0.946	.0325
Surgery	Yes	1.1833	3.265	1.322, 8.066	.0103
Chemotherapy	Yes	−0.5953	0.551	0.236, 1.289	.1695
Hormone treatment	Yes	0.3867	1.472	0.767, 2.824	.2447
Physical functioning	Do household chores	0.1653	1.180	0.857, 1.624	.3106
	Up & down the stairs	0.0809	1.084	0.618, 1.901	.7777
	Go for a walk 15 minutes	−0.4264	0.653	0.368, 1.160	.1459

Note: PAGs, Physical Activity Guidelines; OR: Odds ratio; CI: Confidence interval.

*
p < .05 is significant.