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# Correlates of Objectively-Measured Sedentary Behavior in Breast Cancer Survivors

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## Abstract

**Background—**Emerging evidence indicates increased sedentary behavior is associated with poorer health outcomes and quality of life among cancer survivors. However, very little is known about which factors are associated with increased sedentary behavior. The purpose of the present study was to examine potential correlates of sedentary behavior among breast cancer survivors.

**Methods—**We used hierarchical general linear modeling to examine the associations between demographic, disease specific and psychosocial factors at baseline and accelerometer-estimated daily proportion of time spent sedentary at 6 months in breast cancer survivors [n=342; $M_{age}$= 56.7 (SD=9.4)]. All models adjusted for objectively measured moderate and vigorous intensity physical activity and sedentary behavior at baseline.

**Results—**The final model including all baseline potential predictor variables and physical activity and sedentary behavior explained 49.8% of the variance in the proportion of daily time spent sedentary at 6 months. The following factors were significantly ($p < 0.05$) associated with increased sedentary behavior among breast cancer survivors: higher number of comorbidities, more advanced disease stage, and increased fatigue severity. Additionally, being treated with surgery and chemotherapy was significantly related to a lower proportion of time spent sedentary compared to women who had received surgery alone.

**Conclusions—**This study provides preliminary insight into factors associated with sedentary behavior in breast cancer survivors. Future research is warranted to understand the potential

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All data collected for this project were collected at the University of Illinois at Urbana-Champaign.

**Compliance with Ethical Standards**

**Conflicts of Interest:** The authors declare that they have no conflict of interest.

**Ethical approval:** 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:** Informed consent was obtained from all individual participants included in the study.

demographic, disease-specific, psychosocial correlates of sedentary behavior to determine which correlates are potential mechanisms of behavior change and intervention targets.

### Keywords

Sedentary behavior; breast cancer survivors; psychosocial factors; disease characteristics

## Introduction

Breast cancer survivors are at an increased risk of early mortality, comorbid conditions [1] and second primary cancers [2] and compromised quality of life (QOL) [3]. Emerging evidence indicates increased time spent in sedentary behavior [≤1.5 metabolic equivalents (METs); i.e. sitting, reclining] may exacerbate many of the negative side effects of cancer treatment including increased functional decline [4], fatigue [5], and compromised QOL [6–8], even after accounting for moderate to vigorous physical activity (MVPA; ≥3.0 METs; jogging, brisk walking). Further, increased sedentary behavior is associated with poorer cardiovascular and metabolic health [9,10] and body composition [11] and increased mortality [12]. However, breast cancer survivors spend ~70% of their waking time in sedentary behavior [11,13–15] and engage in more sedentary behavior than controls [13]. Additionally, up to 70% of breast cancer survivors do not meet MVPA recommendations (i.e. 150 minutes/week) [16–18]. Thus, replacing sedentary behavior with light intensity physical activity (1.6 to <3.0 METs; i.e. activities of daily living, climbing stairs, slow walking, household chores), even without increasing MVPA, may improve survivors' health and be a more achievable target than MVPA guidelines [19, 20]. Reducing sedentary behavior by replacing it with light intensity activity may also facilitate the gradual adoption of MVPA by improving physical function and providing mastery experiences whereby survivors gradually sit less and move more [21].

Too much sedentary behavior is distinct from too little moderate/vigorous physical activity (MVPA; ≥3.0 METs; i.e. jogging, brisk walking) as an individual can meet MVPA guidelines (i.e. 150 min/week) but still engage in high levels of sedentary behavior [22]. Data from the general adult population indicate individual factors including increased age, lower education, higher body mass index (BMI), being unemployed or retired and increased depressive symptoms are associated with increased sedentary behavior [23]. While many of these determinants may be similar in breast cancer survivors, there may be other factors related to breast cancer and cancer treatment-related side effects that may contribute to sedentary behavior in this population. Because few studies have specifically focused on sedentary determinants and correlates among breast cancer survivors, very little is known about which factors may influence their sedentary behavior. Before intervening on sedentary behavior, it is important to: a) develop the evidence-base for the relationship between sedentary behavior and health outcomes and b) understand which factors influence sedentary behavior to identify potential intervention targets or subsamples who are most/least likely to engage in sedentary behavior and may substantially benefit from such interventions. To the best of our knowledge, no studies, to date, have examined potential demographic, disease or psychosocial correlates of sedentary behavior in breast cancer survivors. As these factors have demonstrated consistent relationships with MVPA participation among breast cancer

survivors, it is plausible that they may also influence the volume of sedentary behavior in this population. Classifying the characteristics of highly sedentary individuals is necessary to identify intervention candidates to reduce sedentary time [20]. For example, if individuals who received a specific type of treatment are more likely to engage in higher volumes of sedentary behavior, interventions could be targeted towards these individuals. Additionally, if fatigue is identified as a correlate of sedentary behavior, testing interventions targeted at reducing fatigue to reduce sedentary behavior may be a logical next step.

The purpose of the present study was to examine the relationship between demographic, cancer-specific and psychosocial factors and objectively-measured sedentary behavior among breast cancer survivors. We hypothesized older, less educated, overweight/obese women who were closer to time of diagnosis, had more comorbidities and more aggressive disease and experienced poorer psychosocial well-being (i.e. more fatigue, depression and anxiety and poorer well-being) would engage in more sedentary behavior.

## Methods

### Participants

The present study consists of a subset of breast cancer survivors who participated in a larger 6-month prospective on-line questionnaire study. Full study details are provided elsewhere [24]. Briefly, survivors were recruited from the Army of Women© to participate in a study on QOL. Inclusionary criteria included: age ≥18 years, prior breast cancer history, English-speaking and access to the Internet. Women (n=500) from the original study were randomized to wear an accelerometer. Only those who had ≥3 valid days of accelerometer data at 6 months and complete data on variables of interest (n=342) were included in the present analyses.

### Procedures

Participants answered on-line questionnaires pertaining to demographic, disease characteristics and psychosocial factors at baseline. Survivors randomized to receive accelerometers were sent accelerometer packets via standard mail at baseline and 6 months. The accelerometer packet contained the accelerometer, a log to record daily monitor wear time, and a self-addressed stamped envelope to return the accelerometer to study investigators. All participants were sent reminders to return the accelerometer at the end of the 7 day period. Reminders were continued until the monitor was received. All participants were sent a maximum of three reminders to complete questionnaires.

### Measures

**Demographics—**Participants self-reported age, education, height and weight. Body mass index (BMI) was estimated using the standard $kg/m^2$ equation.

**Health and cancer history—**Survivors self-reported information regarding breast cancer disease stage, time since diagnosis, treatment type, and whether they had had a recurrence. Women were also asked to report whether they had ever been diagnosed (yes or no) with 18

other chronic conditions (i.e. diabetes, hypertension, hyperlipidemia). The number of chronic conditions reported was summed to obtain a total comorbidity score.

**Sedentary behavior—**Participants were instructed to wear an Actigraph accelerometer (*Model GT1M*, *Health One Technology, Fort Walton Beach, FL)*, a valid and reliable objective measure of activity [25, 26] and sedentary behavior [27], on the non-dominant hip for 7 consecutive days during all waking hours, except when bathing or swimming. Activity data were collected in one-minute intervals (epochs). Raw counts from the accelerometer were summed over wear minutes to obtain "total valid counts" for the reporting day. Non-wear time was defined as intervals of ≥60 consecutive minutes of zero counts, with allowance for up to 2 minutes of observations of <100 counts/min within the non-wear interval [28]. A day of accelerometer wear was considered valid if it registered ≥10 hours of wear time. Each minute of wear time was classified according to intensity (counts/min) using commonly accepted activity count cut-points [27, 28] as follows: sedentary (<100), light (100-2019), and MVPA (≥ 2020). For each valid day, the number of wear time minutes classified as sedentary, light, and MVPA were taken as estimates of time spent in these activities on that day and were averaged across all valid days per participant to estimate mean daily minutes in each activity. The number of minutes in each category was also divided by wear time to estimate proportions of the day spent in the respective behavior. The daily estimates of proportion of time in each activity category were averaged across all valid days per participant to estimate mean daily proportion of time in a given activity. For the purposes of this study, we focus only on the estimates of average daily minutes of sedentary behavior and MVPA and average daily proportion of time spent in sedentary behavior and MVPA.

### Psychosocial Factors

**Functional Assessment of Cancer Therapy-Breast (FACT-B) [29, 30]:** The FACT-B assessed physical, social, emotional and functional well-being and breast cancer specific concerns. Participants were asked to indicate how true each statement had been for them over the last 7 days from 0 (not at all) to 4 (very much). Subscale scores were calculated by multiplying the sum of each subscale's items by the number of subscale items and dividing by the number of items answered. Scores range from 0 to 28 for the physical, social and functional well-being subscale, from 0 to 24 for emotional well-being, and from 0 to 40 for breast cancer specific concerns. Higher scores indicate better health-related quality of life (HRQOL).

**The Hospital Anxiety and Depression Scale [31]:** This scale assessed the frequency of depressive states (7 items) and anxiety (7 items) over the past week from 0 (not at all) to 3 (most of the time). Positively worded items were reverse scored. Higher scores indicate greater symptomology. Scores range from 0 to 21 for each subscale.

**Fatigue Symptom Inventory [32, 33]:** This measure assessed fatigue severity, duration, and its perceived interference. Higher scores are indicative of greater fatigue severity, duration of interference. Scores for the severity subscale range from and 0 to 10 for severity and interference and 0 to 7 for duration.

## Data Analysis

Initially, bivariate relationships between each baseline predictor variable and proportion of time spent sedentary at 6 months were conducted. Subsequently, general linear modeling analyses were used to examine relationships between each group of potential correlates (demographic, disease-specific and psychosocial factors) at baseline and the average accelerometer-estimated daily proportion of time spent sedentary at 6 months. Only variables with a bivariate correlation where $p<0.20$ were included in the models. Model 1 included demographic correlates only while Model 2 included demographic and disease-specific correlates. Model 3 included psychosocial factors in addition to the variables from Model 1 and 2. Finally, Model 4 adjusted for accelerometer-measured average daily proportion of time spent in MVPA and sedentary behavior at baseline.

Women who were included in the present analyses did not differ from the women who only completed questionnaires or those in the accelerometer subsample who were excluded because of incomplete data by current age, age at diagnosis, time since treatment, stage, treatment, BMI, education, income, chronic conditions or HRQOL indicator scores. Thus, we assumed data were missing at random. All analyses were conducted using IBM SPSS Statistics version 19.0.

## Results

### Participants

Sample demographic and medical characteristics are detailed in Table 1. The mean age was 56.3 years (SD=9.2). The majority of women were White (96.2%), highly educated (67.5% ≥college degree) and higher income (80.1% annual household income ≥$40,000). About half were overweight/obese (46.9%). Over two-thirds (70.2%) had at least one co-occurring chronic condition. Mean time since diagnosis was 84.3 months (SD=69.4; 7.0 years). About half (53.2%) were ≥5 years since diagnosis. All women underwent surgery with 40.4% reporting a lumpectomy and 34.8% reporting a mastectomy. The majority (85.9%) were diagnosed with early stage (0, I or II) disease. Approximately two-thirds (67.8%) received radiation therapy and 57.9% received chemotherapy (84.7%). A small proportion (11.1%) had a cancer recurrence. Half were post-menopausal at diagnosis (50.3%).

### Sedentary Behavior

On average, women wore the accelerometer for 867.3 (SD=67.4) and 855.4 (SD=69.6) minutes/day and had 6.8 (SD= 0.43) and 6.8 (SD= 0.73) average valid days of wear time at baseline and 6 month follow-up, respectively. At baseline, survivors spent an average of 10.0 (SD=1.3) hours sedentary each day and 69.2% (SD=7.6) of their time sedentary each day. At 6 month follow-up, survivors spent an average of 10.0 (SD=1.3) hours sedentary each day and approximately 70.5% (SD=7.7) of their day engaged in sedentary behavior. Survivors engaged in an average of 22.3 (SD=18.5) and 19.0 (SD=20.2) minutes of MVPA each day at baseline and follow-up, respectively. Finally, they spent 2.6% (SD=2.3) and 2.2% (SD=2.3) of their time in MVPA at baseline and 6 months, respectively.

### Bivariate Correlations

Correlation coefficients between each of the baseline determinant variables and proportion of daily time spent sedentary at 6 months are shown in Table 2. At baseline, increased number of comorbidities, higher BMI, working at least part time, more advanced disease, receipt of surgery, radiation and chemotherapy, combined, increased fatigue severity, interference and duration and greater average proportion of daily time spent sedentary were significantly ($p < 0.05$) associated with higher average daily proportion of time spent sedentary at 6 months. Increased physical well-being, fewer breast cancer specific concerns and greater average proportion of daily MVPA at baseline were significantly ($p < 0.05$) associated with a lower average daily proportion of time spent sedentary at 6 months.

### General Linear Modeling

General linear regression modeling analyses are presented in Table 3. In model 1 (demographics only), presence of more comorbidities ($p=0.01$) and being employed full/part-time ($p=0.001$) at baseline were associated with an increased proportion of time spent sedentary at 6 months. When disease characteristics were added in Model 2, both factors remained significantly ($p=0.01$ for both) associated with the proportion of time spent sedentary. In Model 3, the relationships between being employed full/part time ($p=0.02$ and number of comorbidities ($p=0.04$) and proportion of time sedentary remained statistically significant. Additionally, baseline fatigue severity was borderline ($p=0.05$) significantly related to a greater proportion of time spent sedentary at 6 months. All variables which were significantly related to the proportion of time spent sedentary in Model 3 remained significant when controlling for average daily proportion of time in MVPA sedentary behavior at baseline in Model 4 with the exception that employment status was no longer significant. In addition, disease stage became statistically significant ($p= <0.001$) such that more advanced disease stage was associated with a greater proportion of time spent sedentary at 6 months and being treated with surgery and chemotherapy was significantly ($p= 0.01$) related to lower proportion of time spent sedentary compared to the reference group who received surgery alone. Further, increased fatigue severity became statistically significantly ($p=0.04$) associated with increased proportion of time spent sedentary. Finally, average baseline daily proportion of time spent in sedentary behavior was significantly related to proportion of time spent sedentary at 6 months ($p=<0.001$). Proportion of time spent in MVPA at baseline was not significantly related to proportion of time spent sedentary at 6 months. Model 3 which included all variables except baseline proportion of time spent sedentary and in MVPA, explained 9.0% of the variance in the proportion of time spent sedentary at 6 months. The final model including sedentary behavior and MVPA explained 49.8% of the variance in proportion of time spent sedentary at 6 months.

## Discussion

The purpose of this study was to examine associations between demographic, disease and psychosocial factors with sedentary behavior among breast cancer survivors. After controlling for all variables tested and baseline MVPA and sedentary behavior, having more comorbidities, being employed full-/part-time, more advanced disease stage, receipt of

radiation therapy and fatigue severity were associated with an increased proportion of daily time spent sedentary.

The findings regarding comorbidities are consistent with Lynch et al. [34] and may have implications for targeting sedentary behavior interventions, especially in the context of aging breast cancer survivors. Future research should explore whether specific co-occurring chronic conditions are associated with a higher volume of sedentary behavior. That being employed full- or part-time was associated with increased sedentary behavior is consistent with findings from the general population that reflect the highly sedentary nature of most U.S. jobs. The association between more advanced disease stage and higher sedentary behavior is highly plausible as more advanced disease may be associated with greater symptom burden which may require more “rest” and impact individuals’ ability to carry out activities of daily living. It was somewhat surprising that receipt of chemotherapy in addition to surgery emerged as being related to lower proportion of time spent sedentary than surgery alone. However, while statistically significant, this difference (3.1%) is likely not clinically significant. Future research is warranted to explore how different treatment regimens may impact sedentary behavior. Finally, our previous study [5] indicated that higher sedentary behavior was associated with greater fatigue. The present study suggests this relationship may be reciprocal such that greater fatigue severity is associated with higher sedentary behavior. Combined, these data indicate targeting women with high fatigue severity for sedentary behavior reduction interventions may be particularly important for reducing *both* sedentary behavior and fatigue severity.

Contrary to our hypotheses, associations between physical and functional well-being and breast cancer specific concerns and proportion of sedentary time were null. This may be attributed to our sample being relatively healthy and indicate there may be a ceiling effect between these factors. Thus, relationships may be stronger in less-healthy subgroups (i.e. older, overweight, functionally limited, metastatic disease) or with the use of objective measures of physical and functional performance. It is also possible that, after cancer treatment, these factors are confounded with other factors (i.e. comorbidities, disease stage, treatment), and, therefore, not independently related to sedentary behavior. Finally, it could also be that these factors are simply not related to sedentary behavior and, rather, other factors such as environment may play a more crucial role. Before ruling out any potential relationships, future longitudinal research that adopts socioecological and/or biopsychosocial approaches is needed to explore the relationship between factors examined in the present analyses and other potential correlates including environmental and social factors.

Results of this study should be interpreted in the context of its limitations. First, all data on potential correlates were self-report. Future research should explore the relationship between demographic and disease data obtained via medical records and objective measures of BMI and physical and functional performance. Second, psychosocial functioning was relatively high in our sample and time since diagnosis varied widely. Thus, findings relative to the relationships between psychosocial factors and sedentary behaviors should be interpreted with caution as the frequency and intensity of many of these factors may subside as time since diagnosis increases. Future studies should also evaluate how changes in modifiable

factors including psychosocial factors, contextual/environmental factors and behavioral factors (i.e. self-efficacy, goal-setting, motivation, etc.) influence changes in sedentary behavior across time with assessments pre-treatment and at multiple post-treatment time points to delineate whether these relationship change across the survivorship continuum. Additionally, because accelerometers were used, stationary standing was possibly included as sedentary time. Furthermore, we lack data on sedentary behavior context (i.e. reading v. television). Therefore, the true volume of time spent sitting or sitting in specific contexts, which may be specifically correlated with some of the variables explored, cannot be obtained. Future research should explore relationships between potential correlates and sedentary behavior using more precise, sensitive objective devices (e.g. ActivPals) and consider sedentary behavior context. In addition, although this was a prospective study, the time between our measurement time points was only 6 months. Future research should explore these relationships across longer periods of time to determine whether relationships differ based on length of time between measurement time points. Finally, the sample was mostly White, high income and highly educated; thus, it is important to confirm these findings in other, more demographically diverse samples.

Our study has several strengths. To the best of our knowledge, this is the first prospective study to examine relationships between potential demographic, disease and psychosocial factors and objectively-measured sedentary behavior in breast cancer survivors. Despite the short time period between measurement intervals, this represents an initial step towards trying to understand temporality among these relationships. Using an objective sedentary behavior measure reduces the risk of measurement error and misclassification. Additionally, there was adequate variability in sedentary time in this sample to the influence of potential correlates on a range of sedentary time. Finally, the study sample was a relatively large, nationwide sample that included a wide range of disease and treatment characteristics, suggesting findings could be relevant to many breast cancer survivors.

Our findings provide initial data to suggest that breast cancer survivors who report more co-occurring chronic conditions, are employed at least part-time, have more advanced disease, and have higher fatigue severity may particularly benefit form sedentary behavior reduction interventions. Other than fatigue severity, many of these factors are not modifiable suggesting that specific subgroups of survivors who represent a group of women who are experiencing greater disease burden may be particularly vulnerable to higher levels of sedentary behavior. Although survivors exhibiting these characteristics would likely benefit from increased MVPA, they may not be physically able to do such activities and could, therefore, substantially benefit from simply sitting less and moving more. Future research should explore how to effectively identify these women and engage them in developing a sedentary behavior reduction intervention that may be most useful, relevant and appropriate for them. Finally, engaging cancer care team members in educating patients who have these characteristics and may be at risk for high sedentary behavior about the benefits of reducing sedentary behavior may be particularly important.

In conclusion, more comorbidities, more advanced disease and greater fatigue severity at baseline are significantly associated with increased objectively-measured proportion of time spent sedentary at 6 months even when controlling for baseline sedentary behavior and

MVPA. These findings indicate that specific subgroups of the breast cancer survivor population may be particularly vulnerable to engaging in higher levels of sedentary behavior. Future research is warranted to explore relationships between potential correlates and sedentary behavior among breast cancer survivors to further refine potential sedentary behavior reduction intervention targets in order to improve health and disease outcomes among survivors.

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## Table 1

Breast Cancer Survivors Demographic and Disease Characteristics (n=342)

| Variable | Mean (SD) |
|---|---|
| **Demographics** | |
| ***Age*** | 56.3(9.2) |
| ***Race/Ethnicity*** | |
| Non-white | 3.8% |
| Hispanic | 2.1% |
| ***≥College Degree*** | 67.5% |
| ***Annual Income ≥ $40,000*** | 80.1% |
| ***Working at least part-time*** | 59.6% |
| ***Body Mass Index(kg/m$^2$)*** | 25.9 (5.1) |
| <25 (n=180) | 53.1% |
| 25 to <30 (n=87) | 25.7% |
| ≥30 (n=72) | 21.2% |
| ***Comorbidities (%)*** | 1.6 (1.6) |
| None | 29.85 |
| 1–2 | 46.2% |
| ≥3 | 24.0% |
| **Disease Characteristics** | |
| ***Time Since Diagnosis(months)*** | 84.3(69.4) |
| <5 years | 46.8% |
| 5 to <10 years | 30.4% |
| ≥10 years | 22.8% |
| ***Stage of Disease (%)*** | |
| 0 | 19.0% |
| I/II | 66.9% |
| III/IV | 14.0% |
| Experienced Menopause Prior to Diagnosis (%) | 50.3% |
| ***Treatment (%)*** | |
| Ever received chemotherapy | 57.9% |
| Ever received radiation | 67.8% |
| Ever receive surgery | 100% |
| Lumpectomy | 40.4% |
| Mastectomy | 34.8% |
| Other | 7.3% |
| Missing | 17.5% |
| Recurrence (%) | 11.1% |
| **Psychosocial Factors** | |

| Variable | Mean (SD) |
|---|---|
| ***Fatigue Symptom Inventory*** | |
| Severity | 3.2 (2.0) |
| Interference | 1.8 (2.0) |
| Duration | 2.7 (2.1) |
| ***Functional Assessment of Cancer Therapy-Breast*** | |
| Physical Well-being | 24.1 (4.3) |
| Functional Well-being | 22.4 (5.0) |
| Social Well-being | 21.9 (5.3) |
| Emotional Well-being | 19.9 (3.9) |
| Breast Cancer Specific Concerns | 26.2 (5.5) |
| ***Hospital Anxiety and Depression Scale*** | |
| Anxiety | 4.9 (3.3) |
| Depression | 4.1 (3.7) |
| **Baseline Behavior** | |
| Average Daily Proportion of Time Sedentary (%) | 69.1 (7.6) |
| Average Daily Time Sedentary (mins) | 599.4 (77.2) |
| Average Daily Proportion of Time in MVPA (%) | 2.6 (2.3) |
| Average Daily Time in MVPA (mins) | 22.3 (18.5) |

## Table 2

Bivariate Associations Between Baseline Predictor Variables and Sedentary Behavior at 6 months

| Variables | Proportion of Daily Time Spent Sedentary | p-value |
|---|---|---|
| **Demographic Variables** | | |
| Age | 0.09 | 0.09 * |
| Race (White v. Non-White) | −0.03 | 0.56 |
| Income (≥ $40K <$40K) | −0.08 | 0.14 * |
| Education (College v. No College) | 0.06 | 0.30 |
| Number of comorbidities | **0.20** | **<0.001** * |
| BMI | **0.12** | **0.03** * |
| Employment Status (Employed ≥ part-time v. < part-time) | **0.14** | **0.01** * |
| **Disease Characteristics** | | |
| Disease stage | **0.14** | **0.01** * |
| Treatment Received | −0.12 | **0.02** * |
| Menopausal status at diagnosis | 0.05 | 0.33 |
| Recurrence | −0.08 | 0.15 * |
| Time since diagnosis | −0.02 | 0.66 |
| **Psychosocial Factors** | | |
| Fatigue | | |
| Severity | **0.20** | **<0.001** * |
| Interference | **0.14** | **0.01** * |
| Duration | **0.14** | **0.01** * |
| Anxiety | −0.04 | 0.49 |
| Depression | 0.04 | 0.41 |
| FACT-B Subscale | | |
| Physical well-being | **−0.14** | **0.01** * |
| Functional well-being | −0.05 | 0.38 |
| Emotional well-being | −0.07 | 0.21 |
| Social well-being | −0.09 | 0.11 * |
| Breast cancer specific concerns | **−0.11** | **0.03** * |
| **Baseline Behavior** | | |
| Average daily proportion of time sedentary | **0.69** | **<0.001** * |
| Average daily proportion of time in MVPA | **−0.31** | **<0.001** * |

***Note:*** Values in bold indicate variable is significantly correlated *($p$<0.05).*

* Indicates variable was included in regression analyses ($p$<0.20).

**Table 3**

Relationship between Potential Demographic, Disease, Psychosocial and Behavioral Factors at Baseline and Proportion of Time Spent Sedentary at 6 months

| Variable | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| | β [95% CI] | p-value | β [95% CI] | p-value | β [95% CI] | p-value | B [95% CI] | p-value |
| **Demographics** | | | | | | | | |
| Age | 0.04 [−0.03–0.16] | 0.44 | 0.05 [−0.04–0.15] | 0.29 | 0.06 [−0.04–0.16] | 0.25 | −0.03 [−0.11–0.62] | 0.37 |
| Income | −0.84 [−1.9–0.26] | 0.13 | −1.04 [−2.13–0.06] | 0.06 | **−1.22 [−2.37– −0.09]** | **0.04** | −0.24 [−1.10–0.62] | 0.58 |
| Number of comorbidities | **1.09 [0.29–1.88]** | **0.01** | **1.06 [0.27–1.85]** | **0.01** | **0.60 [0.02–1.18]** | **0.04** | **0.67 [0.04–1.27]** | **0.04** |
| BMI | 0.09 [−0.08–0.26] | 0.30 | 0.07 [−0.10–0.23] | 0.45 | 0.02 [−0.15–0.20] | 0.80 | −0.04 [−0.18–0.09] | 0.54 |
| Employed Full/Part-time (Yes) | **2.51 [0.76–4.25]** | **0.001** | **2.46 [0.73–4.20]** | **0.01** | **2.20 [0.43–3.97]** | **0.02** | 0.97 [0.36–2.30] | 0.15 |
| **Disease Characteristics** | | | | | | | | |
| Disease Stage | --- | --- | 0.69 [−0.38–1.75] | 0.20 | 0.70 [−0.40–1.81] | 0.21 | **1.55 [0.71–2.40]** | **<0.001** |
| Surgery + Radiation Therapy + Chemotherapy v. Surgery Only | --- | --- | 2.42 [−0.46–5.32 | 0.10 | 2.56 [−0.38–5.50] | 0.09 | −0.59 [−2.82–1.63] | 0.60 |
| Surgery + Chemotherapy v. Surgery Only | --- | --- | −0.72 [−3.92–2.50] | 0.66 | −0.72 [−3.96–2.53] | 0.67 | **−3.15 [−5.58– −0.71]** | **0.01** |
| Surgery + Radiation v. Surgery Only | | | 1.23 [−1.38–3.81] | 0.35 | 1.54 [−1.13–4.21] | 0.26 | −0.08 [−2.07–1.92] | 0.94 |
| Recurrence (Yes) | --- | --- | −1.97 [−4.71–0.76] | 0.16 | −1.89 [−4.64–0.87] | 0.18 | 0.63 [−1.43–2.69] | 0.54 |
| **Psychosocial Factors** | | | | | | | | |
| Fatigue | | | | | | | | |
| Severity | --- | --- | --- | --- | **0.74 [0.01–1.46]** | **0.05** | **0.57 [0.03–1.11]** | **0.04** |
| Interference | --- | --- | --- | --- | −0.49 [−1.33–0.36] | 0.26 | 0.08 [−0.55–0.71] | 0.82 |
| Duration | --- | --- | --- | --- | 0.07 [−0.68–0.82] | 0.85 | −0.22 [−0.78–0.34] | 0.43 |
| FACT-B | | | | | | | | |
| Physical Well-being | --- | --- | --- | --- | −0.07 [−0.37–0.22] | 0.63 | 0.19 [−0.04–0.41] | 0.10 |
| Social Well-being | --- | --- | --- | --- | 0.02 [−0.16–0.20] | 0.87 | −0.03 [−0.16–0.11] | 0.69 |
| Breast Cancer Specific Concerns | --- | --- | --- | --- | −0.01 [−0.21–0.20] | 0.96 | 0.02 [−0.14–0.17] | 0.85 |
| **Baseline Behavior** | | | | | | | | |
| Average Daily Proportion of Time in MVPA (min) | --- | --- | --- | --- | --- | --- | 0.03 [−0.31–0.36] | 0.88 |
| Average Daily Proportion of Time Sedentary | --- | --- | --- | --- | --- | --- | **0.68 [0.59–0.77]** | **<0.001** |

***Note:*** CI= confidence interval; All values control for all other variables in the model.