Weight fluctuation during adulthood and weight gain since breast cancer diagnosis predict multiple dimensions of body image among rural breast cancer survivors

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Abstract

Objective—Obesity and weight gain after breast cancer treatment are common among survivors, yet the relationship between weight and body image has received little attention. The purpose of the current study was to examine the relationship between current body mass index, weight gain since diagnosis, and largest weight fluctuation in adulthood with six dimensions of body image among overweight/obese breast cancer survivors.

Methods—The current study used data obtained from a weight control trial with 210 rural overweight/obese breast cancer survivors. Using data collected at baseline, multiple regression models were constructed to examine the relative association of the three weight variables with breast cancer-specific dimensions of body image, while controlling for demographic characteristics, and cancer treatment-related variables.

Results—Largest weight fluctuation in adulthood significantly predicted overall body image (p=.01) and was associated with the three socially-oriented dimensions of body image: social activity restriction, embarrassment about appearance, and sexuality (all ps = .01). Weight gain since diagnosis approached statistical significance in predicting overall body image (p = .05) and was associated with embarrassment about appearance (p = .03). Current body mass index was not significantly associated with overall body image when controlling for the other weight variables (p=.07) and was negatively associated with social activity restriction (p = .01) and sexuality (p = .01).

Conclusions—Obese breast cancer survivors with a history of a large weight fluctuation in adulthood may be prone to poorer breast-cancer specific body image several years after treatment.

Keywords

Breast cancer survivorship; body image; weight history; obesity; oncology

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The authors declare no conflicts of interest.

Background

Breast cancer and corresponding treatments can cause bodily changes that may put survivors at risk for poor body image [1,2]. Bodily changes can include appearance alterations (e.g., breast alterations, scarring), sensory changes (e.g., pain, numbness) and functional impairment (e.g., dysphagia, dysarthria) [1]. The degree and type of changes that occur depend on the characteristics of the disease, such as the tumor histology and stage, and the type of treatment(s) received [1]. Any type of surgery is associated with poorer body image compared to non-surgical treatments [3], and mastectomy and reconstruction surgeries generally result in poorer body image [4–6] than breast conserving surgeries [7]. Common side effects of treatment can also affect body appearance and functioning, including hair loss from chemotherapy [4], changes to sexuality and sexual functioning [8], change in body composition (decreased muscle mass and increased adiposity), and weight gain from treatment-induced menopause [9] or from changes in physical activity during and post-treatment [2,10]. Research indicates that over 70% of breast cancer survivors experience body dissatisfaction post-treatment [9,11]. Body image among breast cancer survivors generally decreases in the first 1–6 months after treatment [4,12,13] and remains lower but stable during the subsequent years [12,13].

Body image among breast cancer survivors is important to examine because it impacts survivors' quality of life and physical rehabilitation following cancer treatment. Poor body image among survivors is associated with increased depression and emotional distress [14,15], poorer psychosocial functioning [15] and lower quality of life [16]. In addition, among women in physical therapy rehabilitation following breast cancer treatment, poor body image was associated with less improvement in functioning both during physical rehabilitation and after [17].

Obesity and weight gain during breast cancer treatment are common problems among survivors. As many as 68–71% of breast cancer patients are overweight/obese at diagnosis [18,19] and 50–80% of breast cancer patients gain weight during treatment [2,20]. Further, obese breast cancer patients have higher surgery complication rates when compared to their lean counterparts [21]. In addition to increasing the relative risk for breast cancer recurrence and long term survival [22], obesity and its complications during treatment may also make overweight/obese breast cancer survivors vulnerable to poor body image following treatment [5,23,24]. In addition to treatment-related weight gain, substantial weight gain during adulthood may exacerbate the body image consequences from breast cancer diagnosis and treatment to the extent that overweight/obese women have pre-existing body image distress [25,26]. However, the contribution of current body mass index (BMI), weight gain after diagnosis, and a prior history of weight gain to body image concerns among breast cancer survivors has received minimal attention. In a few studies, young breast cancer survivors and long-term survivors who gained weight after cancer diagnosis reported significantly poorer body image [5,8,24] when compared to those who did not gain weight post-diagnosis.

No studies have specifically examined body image among overweight and obese survivors; thus it is currently unknown whether and to what degree body image among overweight/

obese survivors differs from body image in the general survivor population. Further, prior studies in breast cancer survivors have measured body image as a single construct, e.g. body dissatisfaction or distress [4–6,8,24]. While this is important to evaluate overall body image among survivors, it is also necessary to examine dimensions of body image. Body image is described as a multi-dimensional construct comprised of thoughts, feelings, and behaviors [1,27,28] and in breast cancer survivors, body image includes some unique dimensions such as loss of femininity and avoidance of activities due to embarrassment from treatment side effects [29]. The Body Image and Relationships Scale (BIRS) [29] was developed specifically for female breast cancer survivors and provides an overall body image score, as well as dimension scores, thus allowing for a nuanced examination of body image in this population and providing a venue through which body image scores among survivors with different characteristics, such as weight can be compared across samples.

The purpose of the current study was to evaluate the effects of weight gain since diagnosis, largest weight fluctuation in adulthood, and current BMI on breast cancer specific body image constructs among overweight/obese breast cancer survivors, as measured by the BIRS. Investigating the complex relationship between weight factors and multiple body image dimensions may facilitate the identification of women who may be at particular risk for poor body image following treatment and may inform the focus of potential prevention and intervention efforts. Because of a lack of prior research on this topic, no a priori hypotheses were specified.

Methods

Study Design

Data from the current study were obtained from a baseline assessment conducted during a randomized controlled trial designed to examine the effectiveness of an 18-month phone-delivered weight management intervention (NIH R01 CA155014) with 210 postmenopausal breast cancer survivors from large rural (n=98) or small rural/isolated (n=112) communities [30]. The study protocol has been described previously [31]. During the baseline study visit the following data were collected: anthropomorphic measurements, chart verified breast cancer history, and self-report questionnaires about medical history, physical activity, and body image. Eligible criteria consisted of: 1) female breast cancer survivor, 2) BMI between 27–45 kg/m^2, 3) diagnosed with Stage 0-IIIc disease within the past 10 years, 4) completed treatment within three months of starting the study, and 5) had clearance from their oncologist/medical provider. Women were ineligible if they participated in a formal weight loss program or took medication for weight loss six months prior to enrollment, gained or lost 10 pounds or more within three months of enrollment, or if they screened positive for substance abuse, major depression, or binge eating disorder. The University of Kansas Medical Center Human Subjects Committee approved the study.

Measures

Body image—Breast cancer specific body image was measured with the Body Image and Relationships Scale [29]. The BIRS includes 32 items that assess self-perceptions of health and physical strength, appearance, sexuality, and social functioning. Items are phrased to

assess the impact of breast cancer treatment on each of the domains, and are rated on a five-point Likert scale, from 1 "strongly disagree" to 5 "strongly agree" with higher scores indicating poorer body image. The BIRS has demonstrated internal consistency, test-retest reliability, and convergent validity with the Short-Form 36 and other quality of life measures [29,32]. Prior factor analysis using data from obese, rural breast cancer survivors revealed six dimensions: 1) social activity restriction due to concern about physical effects from breast cancer treatment (e.g., "I restricted my social activities because of my hot flashes"), 2) energy and strength ("My lack of energy prevented me from doing things I wanted to do"), 3) embarrassment about appearance ("I felt uncomfortable or embarrassed because I was out of shape"), 4) body integrity ("My body felt whole to me"), 5) sense of control over physical health ("The things that determined my health felt beyond my control"), and 6) sexuality ("I have felt sexually attractive") [33].

Weight history—Weight history was measured with a Weight History Questionnaire modified from the National Health and Nutrition Examination Survey (NHANES) [34]. Items inquire about weight at the time of breast cancer diagnosis, heaviest weight in adulthood (since age 18, not including pregnancies) that was maintained within five pounds for at least one year, and lowest weight in adulthood that was maintained for at least one year. Retrospective recall of weight in early adulthood has been demonstrated to have adequate reliability and validity among older women [35–37] and correlates highly ($r = .88$) with weight reported up to 26 years earlier [37]. Weight change since diagnosis was calculated by subtracting self-reported weight at diagnosis from current weight, as has been done previously [24]. Largest weight fluctuation was calculated by subtracting heaviest weight in adulthood from lowest weight in adulthood. The retrospective self-report measure of largest weight fluctuation is an acceptable measure that has been used in previous studies [25,39,40].

Weight and BMI—Participants were weighed without shoes in light clothing (shorts and T-shirt) to the nearest 0.1 pound using a digital scale (Befour, Inc). Height was measured without shoes and rounded to the nearest 0.1 cm. Height and weight measurements were used to calculate body mass index (BMI; kg/m^2).

Treatment information—Treatment-related information was reported by participants and verified by chart review including time since treatment completion, anti-hormone therapy status, surgery type, and history of radiation and chemotherapy.

Data Analysis

Analyses were conducted using SPSS Version 22 [41]. All data used in the current analyses were required for study entry and there were no missing data.

Multiple linear regression models were used to examine the relationship between three weight variables: weight gain since diagnosis, largest weight fluctuation in adulthood, and current BMI with breast cancer specific body image, while controlling for potential confounding variables: age, marital status, years since treatment completion, type of surgery (breast-conserving surgery or mastectomy), history of chemotherapy treatment, history of

radiation therapy and current/past use of anti-hormone therapy [1,5,6,24,42]. Separate regression models were constructed for the BIRS total score and six body image subscales.

In addition to the main analyses, we explored whether a prior history of weight fluctuation and weight gain since diagnosis had compounded effects on body image by including an interaction term in the model predicting the BIRS total score.

Results

Participant demographic information is displayed in Table 1. Nineteen percent of participants were overweight (BMI of 27–29.9 kg/m2) and 81% were obese (BMI of 30–45 kg/m2).

Table 2 presents descriptive statistics for predictor and outcome variables. Mean BMI for the sample was 34.0 (SD= 4.4). Mean weight change since diagnosis was 6.5 kg and the mean for largest weight fluctuation in adulthood was 32.1 kg. Mean total BIRS score was 81.7 (SD = 17.3). When accounting for the differences in the number of items in each subscale, scores on the energy and strength subscale were highest (M = 3.7 out of 5) and scores for social activity restriction subscale were the lowest (M = 1.9 out of 5). The Cronbach's alpha for the six dimensions indicated high internal consistency among three dimensions (restriction of social activities: α= .88; energy and strength: α= .89; and body integrity: α= .82) and moderate internal consistency among three dimensions (embarrassment about appearance: α= .69; sense of control: α= .64; sexuality: α= .48).

Multiple Regression Models

Results from our first multiple regression model indicated that largest weight fluctuation in adulthood was significantly associated with overall body image (b = 0.35, p = .006, CI = .12, .57) and weight change since diagnosis approached significance (b = 0.26, p = .05, CI = .002, .512) (Table 3). Every 1 kg increase in weight fluctuation in adulthood was associated with a 0.35 point increase in BIRS total score after controlling for age, marital status, years since treatment, type of surgery (breast-conserving surgery or mastectomy), history of chemotherapy, history of radiation, and current/past use of anti-hormone therapy. Every 1 kg increase in weight gain since diagnosis was associated with a 0.26 point increase in BIRS total score, when controlling for the aforementioned variables. Current BMI was not significantly associated with BIRS total score (b = −0.63, p = .07, CI = −1.31, .04; Table 3). In addition, age was significantly associated with BIRS total score, with older individuals having lower BIRS scores (indicating better body image) than younger individuals (b = −0.36, p = .02, CI = −0.66, −0.06; Table 3).

Results from the model that included an interaction term between weight gain since diagnosis and weight fluctuation indicated there was no moderating relationship with total BIRS score when controlling for the aforementioned potential variables (b = −0.007, p= .52, CI = −.03, .01).

The remaining six multiple regression models examined the relationship between the three weight variables with each of six BIRS body image dimensions, again controlling for age,

marital status, years since treatment, type of surgery (breast-conserving surgery or mastectomy), history of chemotherapy, history of radiation, and current/past use of anti-hormone therapy. Results are presented in Table 4. Larger weight fluctuation in adulthood was associated with greater social activity restriction (b = 0.15, p = .002, CI = .05, .24), more embarrassment about appearance (b = 0.06, p = .02, CI = .01, .11), and poorer sexuality (b = 0.04, p = .004, CI = .01, .07) as a result of breast cancer treatment. Weight change since diagnosis was significantly associated with greater embarrassment about appearance as a result of breast cancer treatment (b = 0.07, p = .03, CI = .01, .12). Higher current BMI was associated with less social activity restriction (b = −0.45, p = .002, CI = −.72, −.17) and better sexuality scores (b = −0.12, p = .01, CI = −.20, −.03). Weight gain since diagnosis, weight fluctuation, and current BMI were not significantly associated with energy and strength, body integrity, or sense of control dimensions (Table 4).

Conclusions

The purpose of the study was to examine the association between multiple dimensions of body image and weight-related variables that may be associated with breast-cancer specific body image. Our findings indicated that largest weight fluctuation in adulthood was associated with overall body image and the three socially-related body image dimensions (social activity restriction, embarrassment about appearance, and sexuality), indicating that the larger the weight fluctuation, he poorer the body image. These moderately-sized effects were present even when controlling for weight change since diagnosis, BMI, and treatment-related variables. It may be that pre-existing general body image concerns resulting from a history of weight gain predisposes women to breast-cancer specific body image concerns. We did investigate whether there were compound effects from both gaining weight previously in adulthood and after diagnosis with breast cancer, however a resultant non-significant interaction indicated that the two variables are independently associated with breast-cancer specific body image following treatment. There were small effect sizes that corresponded to the associations between weight history and three body image dimensions. In addition, there was a pattern to the associations with body image dimensions: significant associations were found with the socially-related dimensions, but not the internally-oriented dimensions (e.g., body integrity); thus our findings may suggest that largest weight fluctuation in adulthood may be relevant to the social aspects of body image.

Weight gain since diagnosis had weaker associations with overall body image and the six dimensions when we controlled for largest weight fluctuation in adulthood and current BMI. Thus, our findings indicate that among overweight/obese survivors who are several years (Mean = 3.5) beyond treatment, weight gained during treatment may not be as important to breast cancer specific body image as is weight fluctuation during adulthood.

Current BMI was not significantly associated with overall body image when controlling for the effects of largest weight fluctuation and weight gain since diagnosis. Our findings are in contrast to other studies with breast cancer survivors that reported significantly higher BMI was associated with worse body image [6,24,43,44]. Our results suggest that largest weight fluctuation in adulthood may actually be more strongly related to current body image than current BMI and speak to importance of examining weight fluctuation history. In addition,

we found that current BMI was significantly associated with two body image dimensions related to social effects of breast cancer treatment, however the association was negative, indicating that women with higher current BMI had less social activity restriction and better body image related to their sexuality. Overweight/obese women often have a history of negative social interactions or negative feelings related to sexual attractiveness due to their weight [45], and this may make them more resilient when dealing with negative social or sexual breast cancer treatment effects. Alternatively, overweight/obese breast cancer survivors may already restrict social activities due to concerns about their bodies compared to normal weight peers [46], and thus the effects from the cancer treatment may not have further changed their concerns. More research in this area is warranted, particularly if it points to potential areas of resilience.

Finally, in line with previous research [1,9], we found small to moderate associations between age and breast cancer specific body image; older participants had better body image than younger participants. This relationship was maintained even after controlling for the weight and treatment-related variables. Thus, our results add to the body of literature indicating that younger breast cancer survivors may be at higher risk for poor body image following cancer treatment.

Our study was conducted in a sample of overweight/obese breast cancer survivors who were seeking treatment for weight management. Thus, it is possible that these participants may have had more body image concerns than overweight/obese survivors not seeking weight loss or the general survivor population. While there are no BIRS cut point scores that indicate clinically significant body image impairment, we can say that most scores were moderate when considered within each dimension's subscale range and that our sample did have higher BIRS scores than those in a general breast cancer survivor sample [47]. Also, our sample had similar scores to survivors with lymphedema [48], a body and treatment-related issue. The degree to which these weight-related constructs are related to breast cancer-specific body image concerns in a general survivor population should be investigated. Further examination and comparison of these weight constructs in overweight/obese survivors versus normal weight survivors would provide information about the treatment needs of these individuals and would inform early supportive care and intervention efforts.

Several studies have evaluated change in body image among breast cancer survivors during lifestyle or physical activity-based interventions [43,47,48]; however, no studies have been conducted to directly treat body image dissatisfaction among obese breast cancer survivors. Findings from the current study indicate that for survivors with a large weight fluctuation in adulthood and weight gain following treatment, addressing these issues within the context of a weight loss or physical activity intervention may further enhance intervention effects on body image. For example, cognitive-behaviorally based interventions could add treatment modules on body image related to both cancer and weight, and directly address negative thought and behavior patterns that might be related to previous weight fluctuation and weight gain during treatment.

The study had several limitations. First, the study was cross-sectional and thus could not determine at what time in participants' lives weight fluctuation influenced body image. Also,

the study used retrospective recall of weight fluctuation and weight at diagnosis, however retrospective recall of weight during adulthood has been found to be valid, particularly in older women [35–37,49] and was assessed using a commonly used approach [34]. Finally, multiple analyses were run; thus the possibility of encountering a Type I error was increased. However, we chose not to adjust p values in these exploratory analyses to avoid increasing the probability of a Type II error [50–53], a method considered appropriate for exploratory investigations [54].

The study had several strengths. First, we assessed body image using a questionnaire designed specifically for female breast cancer survivors [29] and evaluated the influence of weight history variables on multiple dimensions of body image, providing a more nuanced approach to examining these relationships than has been conducted previously in the literature. In doing so, we identified that largest weight fluctuation during adulthood was more strongly associated with overall body image and socially-related body image dimensions than weight gain following diagnosis or BMI.

Implications

Our findings indicate that women with a history of a large weight fluctuation in adulthood and weight gain following cancer diagnosis may be particularly prone to poorer breast cancer specific body image after treatment. Largest weight fluctuation may be particularly relevant to social aspects of body image. Patients with a history of these weight issues should be identified at the time of diagnosis or early in cancer treatment in order to intervene early with body image issues that may arise. In this regard, basing risk for body image problems on current BMI alone may not be sufficient, and weight fluctuation in adulthood should be considered. Weight loss and physical activity interventions for obese breast cancer survivors that directly address these weight history factors may further improve survivors' body image, a topic that warrants further investigation. Early intervention is ideal in order to help survivors optimize their quality of life post-treatment.

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Table 1

Participant Characteristics (n = 210)

Demographic Variable	M (SD) or n (%)
Age	58.0 (8.2)
Age at Diagnosis	54.0 (8.3)
BMI	34.0 (4.4)
Time since treatment (years)	3.5 (2.4)
Stage	
0	18 (8.6%)
I	85 (40.5%)
II	76 (36.2%)
III	31 (14.8%)
Race/Ethnicity (Caucasian)	204 (97.1%)
Marital Status	
Married/Cohabitating	182 (86.7%)
Treatment Received	
Breast-conserving surgery	104 (49.5%)
Mastectomy	106 (50.5%)
Radiation	145 (69.0%)
Chemotherapy	145 (69.0%)
Anti-hormone Therapy	149 (71.0%)

Table 2

Outcome and Predictor Variables

Weight Predictor Variables	M ± SD (Range)	
BMI (kg/m^2)	34.0 ± 4.4 (27–45)	
Weight change from diagnosis to current weight (kg)	6.5 ± 9.7 (−20.8 – 36.2)	
Largest weight fluctuation during adulthood (kg)	32.1 ± 12.1 (4.5 – 67.1)	
BIRS Outcome Variables		**Scores Standardized on a 5 Point Scale** M± SD
Total score	81.7 ± 17.3 (33–129)	
Dimension scores		
Restriction of social activities (9 items)	16.9 ± 7.2 (6.0–38.7)	1.9 ± 0.8
Energy and strength (7 items)	22.2 ± 6.0 (7.0–28.7)	3.7 ± 0.7
Discomfort or embarrassment due to appearance (5 items)	17.9 ± 3.8 (6.0–25.0)	3.6 ± 0.8
Body integrity (3 items)	8.7 ± 2.7 (3.0–15.0)	2.9 ± 0.9
Sense of control (3 items)	6.5 ± 2.0 (3.0–12.0)	2.2 ± 0.7
Sexuality (3 items)	6.5 ± 2.0 (3.0–15.0)	2.2 ± 0.7

Note: BIRS total score ranges from 23–160. BIRS dimension scores are presented as they were used in data analysis and also standardized on a 5 point scale to facilitate comparison of dimension score means in the table. Scores were standardized by dividing the each dimension score by the number of items in the dimension.

Table 3

Main effects of weight change since breast cancer diagnosis, largest weight fluctuation in adulthood, and current body mass index on Body Image and Relationships Scale Total score.

	DV: BIRS total Score			
	b	**SE**	*p*	**95% CI (low, high)**
Weight change since diagnosis[a]	0.26	0.13	.05	(.002, .512)
Largest weight fluctuation[a]	0.35	0.12	**.006**	(0.12, 0.57)
Current BMI	−0.63	0.34	.07	(−1.31, .04)
Age	−0.36	0.15	**.02**	(−0.66, −0.06)
Marital status (married/not married)	4.85	3.50	.17	(−2.04, 11.75)
Type of breast cancer surgery[b]	3.72	3.11	.23	(−2.41, 9.85)
Years since treatment completion	0.14	0.49	.77	(−0.83, 1.12)
Chemotherapy treatment (yes/no)	4.39	2.79	.12	(−1.11, 9.89)
Radiation Therapy (yes/no)	2.24	3.27	.50	(−4.21, 8.69)
Anti-hormone therapy(yes/no)	0.68	2.65	.80	(−4.54, 5.90)

Note. DV: dependent variable; *b*: unstandardized regression coefficient; SE: standard error; *p*: p-value; CI: confidence interval; BMI: body mass index.

[a]Weight change in kilograms.

[b]Breast-conserving surgery/mastectomy. Breast-conserving surgery was the reference group.

Table 4

Main effects of weight change since breast cancer diagnosis, largest weight fluctuation in adulthood, and current body mass index on six Body Image and Relationships Scale dimensions.

	DV: BIRS Social Activity Restriction			
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.10	.05	.07	(−.01, .20)
Largest weight fluctuation[a]	0.15	.05	**.002**	(.05, .24)
Current BMI	−0.45	.14	**.002**	(−.72, −.17)
Age	−0.11	.06	.07	(−.23, .01)
Marital status (married/not married)[b]	0.86	1.43	.55	(−1.96, 3.68)
Type of surgery (breast-conserving/mastectomy)[c]	4.30	1.27	**.001**	(1.80, 6.81)
Years since treatment completion	−0.45	.20	**.03**	(−.85, −.05)
Chemotherapy treatment (yes/no)	0.30	1.14	.80	(−1.96, 2.55)
Radiation Therapy (yes/no)	2.24	1.34	.10	(−.40, 4.88)

	DV: BIRS Energy and Strength			
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.04	.05	.40	(−.05, .13)
Largest weight fluctuation[a]	0.06	.04	.12	(−.02, .14)
BMI	0.02	.12	.87	(−.22, .26)
Age	−0.12	.05	**.03**	(−.22, −.01)
Marital status (married/not married)[b]	2.37	1.23	.06	(−.05, 4.79)
Type of surgery (lumpectomy/mastectomy)[c]	−0.65	1.09	.55	(−2.81, 1.50)
Years since treatment completion	0.24	.17	.17	(−.10, .58)
Chemotherapy treatment (yes/no)	2.07	.98	**.04**	(.14, 4.01)
Radiation Therapy (yes/no)	0.17	1.15	.88	(−2.09, 2.44)

	DV: BIRS Embarrassment about Appearance			
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.07	.03	**.03**	(.01, .12)
Largest weight fluctuation[a]	0.06	.03	**.02**	(.01, .11)
BMI	−0.08	.08	.33	(−.23, .08)
Age	−0.03	.03	.43	(−.10, .04)
Marital status (married/not married)[b]	0.03	.79	.97	(−1.52, 1.59)
Type of surgery (lumpectomy/mastectomy)[b]	−0.21	.70	.77	(−1.59, 1.18)
Years since treatment completion	0.16	.11	.15	(−.06, .38)
Chemotherapy treatment (yes/no)	0.88	.63	.17	(−.36, 2.12)
Radiation Therapy (yes/no)	−0.02	.74	.98	(−1.47, 1.43)

	DV: BIRS Body Integrity

	DV: BIRS Social Activity Restriction			
	b	**SE**	**p**	**95%CI (low, high)**
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.03	.02	.14	(−.01, .07)
Largest weight fluctuation[a]	0.01	.02	.50	(−.02, .05)
BMI	−0.02	.06	.73	(−.13, .09)
Age	−0.06	.02	**.02**	(−.12, −.01)
Marital status (married/not married) [b]	0.75	.56	.19	(−.36, 1.86)
Type of surgery (lumpectomy/mastectomy)[c]	−0.56	.50	.26	(−1.56, .43)
Years since treatment completion	0.03	.08	.68	(−.12, .19)
Chemotherapy treatment (yes/no)	1.04	.45	**.02**	(.15, 1.93)
Radiation Therapy (yes/no)	−0.52	.53	.33	(−1.56, .52)

	DV: BIRS Sense of Control			
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.01	.02	.52	(−.02, .04)
Largest weight fluctuation[a]	0.02	.01	.16	(−.01, .05)
BMI	0.01	.04	.88	(−.07, .09)
Age	−0.02	.02	.35	(−.05, .02)
Marital status (married/not married) [b]	0.80	.42	.06	(−.02, 1.62)
Type of surgery (lumpectomy/mastectomy)[c]	0.43	.37	.25	(−.30, 1.16)
Years since treatment completion	0.10	.06	.11	(−.02, .21)
Chemotherapy treatment (yes/no)	.0001	.33	1.00	(−.66, .66)
Radiation Therapy (yes/no)	−0.07	.39	.86	(−.84, .70)

	DV: BIRS Sexuality			
	b	SE	p	95%CI (low, high)
Weight change since diagnosis[a]	0.02	.02	.29	(−.02, .05)
Largest weight fluctuation[a]	0.04	.02	**.004**	(.01, .07)
BMI	−0.12	.04	**.01**	(−.20, −.03)
Age	−0.03	.02	.11	(−.07, .01)
Marital status (married/not married) [b]	0 .04	.45	.94	(−.84, .91)
Type of surgery (lumpectomy/mastectomy)[c]	0.41	.40	.30	(−.37, 1.19)
Years since treatment completion	0.07	.06	.29	(−.06, .19)
Chemotherapy treatment (yes/no)	0.11	.36	.76	(−.59, .81)
Radiation Therapy (yes/no)	0.43	.42	.30	(−.39, 1.26)

Note. DV: dependent variable; *b*: unstandardized regression coefficient; SE: standard error; *p*: *p*-value; CI: confidence interval; BMI: body mass index.

[a] Weight in kilograms.

[b] Not married was the reference group.

[c]Breast-conserving surgery was the reference group.