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Effects of a multicomponent physical activity behavior change intervention on breast cancer survivor health status outcomes in a randomized controlled trial

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Abstract

Purpose—Little is known about the effects of physical activity behavior change interventions on health outcomes such as lower extremity dysfunction and SF-36 physical health (predictor of mortality) in breast cancer survivors. Furthermore, effect moderators are rarely reported. Therefore, we report the effects of the 3-month BEAT Cancer physical activity behavior change intervention on global health status and health indicators along with moderators of intervention outcomes.

Methods—Post-primary treatment breast cancer survivors (N=222) were randomized to BEAT Cancer or usual care (UC). SF-36, muscle strength, body mass index, lower extremity dysfunction (WOMAC) and life satisfaction were measured at 3 months (M3) and 6 months (M6).

Results—At M3, adjusted linear mixed-model analyses demonstrated statistically significant effects of BEAT Cancer versus UC on SF-36 physical health [mean between group difference (*M*)=2.1; 95% confidence interval (CI)=0.3 to 3.9; *P*=.023], SF-36 mental health (*M*=5.2; CI=2.8 to 7.6; *P*<.001), and all SF-36 subscores. Intervention benefits occurred for lower extremity

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physical dysfunction (M =−2.7; CI=−5.0 to −0.5; P=0.018), WOMAC total (M=−3.7; CI=−6.7 to −0.6; P=0.018), and life satisfaction (M=2.4; CI=0.9 to 3.9; P=0.001). Statistically significant effects persisted at M6 for mental health and vitality. Baseline value, income, marital status, cancer treatment, cancer stage, and months since diagnosis moderated one or more outcomes.

Conclusions—BEAT Cancer improves SF-36, WOMAC, and life satisfaction outcomes with improvements in vitality and mental well-being continuing 3 months post-intervention. Several moderators with potential to guide targeting individuals for optimal intervention benefit warrant further study.

Keywords

oncology; survivorship; psychosocial; exercise; WOMAC

Introduction

Due to early detection and current treatment modalities, the 5-year breast cancer survival rate is 89% in the United States with over 3 million breast cancer survivors living into and beyond middle age [1, 13]. The combination of a breast cancer diagnosis with advancing age contributes to progressive loss in muscle strength, unfavorable changes in body composition, and lower extremity dysfunction all of which negatively affect physical function and quality of life in breast cancer survivors [35, 37]. Recently, Petrick et al. [28] reported that functional status trajectory declines dramatically within one year after cancer diagnosis compared to non-cancer controls. Furthermore, breast cancer survivors who report poorer physical health (measured by the SF-36 composite score) are 42% more likely to experience additional breast cancer events and 37% more likely to die from any cause [34]. Interventions that improve or reverse this negative sequela experienced by breast cancer survivors are needed.

Exercise training can improve quality of life, muscle strength, and body composition after cancer diagnosis [5, 26]. However, only two randomized controlled trials have reported that exercise training can favorably influence arthralgias (i.e., joint pain) among breast cancer survivors [7, 18]. Moreover, few randomized trials have reported the effects of exercise on health status measured with the SF-36, of particular importance given its association with breast cancer events and mortality [25, 34].

Physical activity is the primary outcome when testing physical activity behavior change interventions. In contrast to exercise training trials, behavior change trials include various health parameters as secondary measures to determine if the increases in physical activity adherence are sufficient for improved health status [9]. Few randomized controlled physical activity behavior change trials in breast cancer survivors have reported intervention effects on muscle strength or lower extremity dysfunction [4, 32]. Also, little is known about the factors that moderate the health status response to physical activity behavior change interventions. Identifying moderators can be used for cost-effective targeting of the intervention to cancer survivors more likely to benefit while also providing information for intervention refinements [23]. Therefore, this report presents the effects of the Better

Exercise Adherence after Treatment for Cancer (BEAT Cancer) physical activity behavior change intervention on health status outcomes and examines the moderators of these effects.

Our group has previously reported that BEAT Cancer significantly improved physical activity behavior, cardiorespiratory fitness, and quality of life measured using the Functional Assessment of Cancer Therapy (FACT)-Breast scale [31, 33]. Specifically, a statistically significant mean between group difference favoring BEAT Cancer was noted for self-report weekly minutes of moderate-to-vigorous physical activity immediately post-intervention (+93 minutes) and 3 months later (+74 minutes) [31]. Accordingly, the primary purpose of the current report was to compare the effects of BEAT Cancer to usual care (UC; written materials) on health status as measured by the composite SF-36 scores (primary outcomes for this report). We also report the effects on the SF-36 subscores and the health status outcomes of muscle strength, body mass index (BMI), lower extremity dysfunction, and satisfaction with life. We hypothesized that, when compared with UC, BEAT Cancer would result in significant improvements in all outcomes immediately post-intervention (month 3; M3) and 3 months post-intervention (month 6; M6). The secondary aim was to determine moderators of BEAT Cancer compared to UC on the aforementioned outcomes. Demographic (age, income, marital status) and medical (cancer stage, months since diagnosis, cancer treatment) were chosen based on plausibility and literature review [6, 8, 10-12, 20, 27, 29].

Methods

Study design

The methods for this multicenter randomized controlled trial have been previously described [31, 33]. In brief, women (ages 18 to 70) with history of ductal carcinoma in situ (DCIS) or stage I-IIIA breast cancer who self-reported engaging in ≤30 minutes of vigorous or ≤60 minutes of moderate intensity physical activity per week on average over the past 6 months were enrolled. Participants had to be post-primary treatment, ≥8 weeks post-surgery, English speaking, and medically cleared by their physician. Exclusion criteria included conditions that would interfere with assessment or intervention completion (e.g., dementia, inability to ambulate, physical activity contraindication, surgery or travel planned for during the intervention) and current participation in another exercise study (see Rogers et al. [33] for additional details regarding study criteria). Institutional Review Board (IRB) approval was obtained and all participants provided written informed consent. As described [33], 222 breast cancer survivors were randomized (in the order of baseline assessment completion) using computer generated numbers in blocks of 4 within each recruiting site. Research personnel were blinded to the order of randomization until allocation was revealed following completion of the baseline assessment.

Better Exercise Adherence after Treatment for Cancer (BEAT Cancer) intervention

Details regarding the 3-month social cognitive theory-based BEAT Cancer intervention have been published elsewhere [33]. This intervention includes 12 supervised exercise sessions tapered over six weeks followed by three face-to-face update counseling sessions every two weeks with a trained exercise specialist. Six group sessions led by trained facilitators

provided additional behavioral counseling (e.g., time management, stress management, behavioral modification strategies, etc.). The exercise prescription gradually increased participants to 150 weekly minutes of moderate-intensity exercise using a progression as previously reported [33]. An educational notebook and personal heart rate monitor were provided as part of the intervention. Intervention participants also received the same written materials given to the usual care group. Quality control for fidelity and participant adherence has been previously described [31, 33].

Measures

Outcomes were measured at baseline, M3 (immediately post-intervention), and M6 (3 months after intervention completion) [33]. Staff members completing physical assessments and data entry were blinded to the participant's study group allocation. A self-administered survey assessed global health status using the 36-item SF-36 health-related quality of life survey [38]. The 8 subscores (i.e., physical functioning, social functioning, role-physical, role-emotional, mental health, vitality, pain, and general health) and two composite scores (physical and mental) were calculated according to published protocol and reported as scores transformed to a 0 to 100 scale [38]. Muscle strength was measured using a portable back/leg dynamometer (best of three efforts) (Takei Back Strength Dynamometer TKK5002). For anthropometrics, height and weight were measured in light clothing without shoes using a stadiometer and scale; BMI was calculated from the following equation [weight (kg)/height (m^2)].

The self-administered survey also included the Western Ontario and McMaster Universities Arthritis index (WOMAC) to assess lower extremity pain (5 items), stiffness (2 items), and physical dysfunction (17 items) using a 5-point Likert scale (i.e., 1=none to 5=extreme) [30]. Items were summed for the 3 subscores and the subscores were summed for the overall score (higher score indicates greater dysfunction). Life satisfaction was measured with the 5-item Satisfaction with Life Scale (SWLS; 7-point Likert scale from 1 = strongly disagree to 7 = strongly agree) [14].

In addition to the baseline value of the outcome, the following potential moderators were self-reported at baseline: age, annual household income, marital status, cancer stage, months since breast cancer diagnosis, history of chemotherapy, history of radiation therapy, and months on hormonal therapy [16]. Moderators were dichotomized as follows: age (<55 versus ≥55), annual income (<$50,000 versus ≥$50,000), marital status (married or living with significant other versus other), cancer stage (DCIS or stage I versus stage II or III), months since diagnosis (≤12 versus >12) [15], time on hormonal therapy (none versus ≤ 1 year versus >1 year), and BMI (<30 versus ≥30).

Statistical analyses

Statistical analyses for our primary study purpose used adjusted linear mixed models incorporating an unstructured covariance matrix and SAS® statistical software (Cary, NC). Previously identified covariates were included in the model (i.e., baseline value of the outcome, study site, breast cancer stage, history of chemotherapy, history of radiation, time on hormonal therapy, comorbidities, and marital status) [31]. Our retained sample size of

213 participants at M6 allowed detection of a small to medium effect size = 0.39 ($p < 0.05$, power of 0.80). For our secondary study aim, the change over time across the intervention-moderator interaction term was modeled. All analyses were intention-to-treat with all data available being used. Only 162 participants had back/leg dynamometer data due to equipment failure. Statistical significance was defined by two-sided p-value < 0.05.

Results

Overview

Participant enrollment took place from 2010 to 2013 during which 222 participants were randomized to either the BEAT Cancer ($n = 110$) or UC ($n = 112$) groups. Mean data from both groups indicated participants were aged 54 ± 9 years and had 16 ± 3 years of education while 84% self-identified as White. Cancer stages were as follows: DCIS (11%), stage I (42%), stage II (35%), and stage III (12%). On average, the time since cancer diagnosis was 54 ± 55 months with 58% and 68% reporting a history of chemotherapy and radiation therapy, respectively. Nearly half (49%) of all participants reported current hormonal therapy [31].

BEAT Cancer effects on health status outcomes at month 3 (M3) and month 6 (M6)

As shown in Table 1, significant between-group differences favoring BEAT Cancer occurred for both SF-36 composite scores and all 8 SF-36 subscores at M3. Notable mean between group differences in a beneficial direction for the intervention group were as follows: mental health composite score (5.2; CI = 2.8 to 7.6; $p < 0.001$), vitality (12.5; CI = 8.0 to 17.0; $p < 0.001$), and role-emotional (9.8; CI = 4.7 to 15.0; $p < 0.001$). Additional statistically significant between-group differences were observed at M6, indicating a continued positive effect on mental health composite (3.0; CI = 0.5 to 5.4; $p = 0.017$), vitality (7.8; CI = 3.3 to 12.4; $P = 0.001$), and mental health subscore (4.3; CI = 0.2 to 8.5; $p = 0.038$) for the intervention. As shown in Table 2, no between-group differences were observed at M3 or M6 for muscle strength, BMI, and lower extremity joint pain or stiffness. In contrast, statistically significant between group differences favoring the intervention were found at M3 for lower extremity physical dysfunction (−2.7; CI = −5.0 to −0.5; $p = 0.018$), WOMAC total (−3.7; CI = −6.7 to −0.6; $p = 0.018$), and satisfaction with life (2.4; CI = 0.9 to 3.9, $p = .001$).

Moderator results

Neither age nor time on hormonal therapy moderated any of the outcomes. Improvements in the physical composite score and multiple SF-36 subscores favored participants who were >12 months compared with those ≤12 months since diagnosis (physical composite score = +2.23 versus −3.61, $p = 0.004$; physical functioning = +7.40 versus −7.11, $p = 0.005$; role-physical = +7.59 versus −6.78, $p = 0.018$; pain = +6.84 versus −6.42, $p = 0.012$; general health = +5.18 versus −5.18; $p = 0.009$; vitality = +12.27 versus +1.31, $P = 0.031$). Intervention effects on physical functioning also favored participants with <$50,000 annual income compared to ≥$50,000 (+15.05 versus +0.79, $p = 0.002$) and marital status categorized as other compared with married/living with significant other (+14.07 versus +0.74, $p = .003$). Participants with a history of chemotherapy were less likely to experience

intervention improvements in mental health composite score (+2.24 versus +6.57, p = 0.044), role-emotional (+3.12 versus +12.62, p = .032), and mental health subscore (+2.53 versus +10.02, p = 0.037). The intervention effects on mental health composite score, physical functioning, vitality, social functioning, role-emotional, and mental health subscore were more pronounced in participants with lower baseline scores (all p values < 0.05). The moderators of the composite scores other than baseline value are provided in **Fig 1**.

No statistically significant moderators were noted for muscle strength. Intervention effects on BMI favored participants with prior history of radiation (−0.36 for prior radiation versus 0.54 for no prior radiation, p = 0.012) and higher baseline BMI (−0.95 for BMI ≥ 30 versus 0.47 for BMI < 30, p = 0.035). Intervention effects on lower extremity pain (WOMAC pain subscore) favored participants with >12 months since diagnosis (−0.77 versus +1.00 for participants ≤12 months, p = 0.041) and lower breast cancer stage (−1.22 for DCIS/stage I versus 0.48 for stage II/III, p = 0.011). Effects on lower extremity physical dysfunction also favored participants >12 months since diagnosis (−3.00 versus +2.50 for participants ≤12 months, p = 0.033) and lower breast cancer stage (−3.79 for DCIS/stage I versus 0.17 for Stage II/III, P = 0.047). Only months since diagnosis moderated total WOMAC score (−3.92 for >12 months since diagnosis versus +3.33 for participants ≤12 months; p = 0.039) (**Fig 2**). Baseline scores moderated the intervention effects on satisfaction with life with lower baseline scores reporting greater intervention benefit (4.08 if < 26 and 0.32 if ≥ 26, p = 0.016).

Discussion

When compared to UC (i.e., printed physical activity materials), BEAT Cancer demonstrated significant beneficial effects on all components of the SF-36 health-related quality of life scale, lower extremity dysfunction, and satisfaction with life. Statistically significant benefit favoring BEAT Cancer continued 3 months after intervention completion for SF-36 vitality subscore and mental health (subscore and composite score). No statistically significant intervention effects on back/leg muscle strength, BMI, lower extremity pain, and lower extremity stiffness were found at 3 or 6 months. Along with baseline values, demographic characteristics (income, marital status) and cancer-related factors (cancer treatment, cancer stage, and time since diagnosis) moderated one or more of the outcomes.

Intervention effects on SF-36 outcomes exceeded the minimally important difference (MID) for general health, vitality, social functioning, mental health subscore, and mental health composite score at month 3 and continued to reach or exceed the MID at month 6 for vitality and mental health [22]. The intervention's effect on vitality is of substantial clinical relevance given that fatigue is a frequent and persistent side effect of cancer treatment that causes disability and negatively impacts quality of life [3, 19]. Similarly, the significant between group difference in the physical health composite score is of clinical importance given that breast cancer survivors with higher scores are at lower risk for breast cancer events and all-cause mortality [34]. The attenuation of SF-36 physical health benefits at month 6 is most probably related to recidivism in physical activity behavior. Hence, intervention refinements (e.g., ongoing booster sessions or contacts) are needed to maintain the increases in physical activity over a longer period of time.

Importantly, BEAT Cancer's effects on lower extremity physical dysfunction and total WOMAC exceed the minimally important clinical difference (MCID) of an improvement of ≥17% of baseline [2]. Given the prevalence of joint symptoms post-breast cancer treatment and in older patient populations, these improvements are clinically noteworthy and consistent with exercise training trials [7, 18, 36]. It is conceivable that the individualized attention provided by the exercise specialists in our intervention facilitated effective tailoring of the exercise prescription to better cope with joint complaints. However, further research is needed to test this possibility.

Several moderators warrant discussion. First, additional study is needed to determine why a history of chemotherapy blunted the intervention benefits on mental health measured by SF-36, including but not limited to the possible role of long term effects on cognitive function and related poor quality of life [36]. Further research is also needed to determine why a shorter time since diagnosis blunted the intervention benefits on SF-36 and WOMAC outcomes. It is possible that cancer survivors who are within a year of their diagnosis suffer greater limitations that would benefit from a longer intervention period.

Although not a weight loss intervention and no significant between group difference with regard to BMI for all participants combined was noted, baseline BMI as a moderator (i.e., participants with a BMI >30 were more likely to lose weight with the intervention) is noteworthy because reducing obesity after a cancer diagnosis can reduce recurrence and death [24]. Also, the greater intervention benefit in those reporting lower annual incomes is significant because lower socioeconomic status is associated with less physical activity and participation in physical activity behavior change interventions [21, 39]. Further research to replicate this finding and identify potential key intervention components responsible for this benefit is warranted. Lastly, the greater benefit in participants who were unmarried is consistent with two previous reports by Courneya et al. [11, 12]. and the greater improvements in physical functioning seen with psychosocial interventions among individuals with less support at home [17].

Our study limitations include lack of generalizability to survivors with other cancer types and exercise without behavioral support. Also, our moderator testing can only be considered exploratory because our study was not originally powered for nor we were able to adjust for multiple secondary comparisons. Nevertheless, support for the potential moderating role of factors such as time since cancer diagnosis and history of chemotherapy is strengthened by their moderation of multiple outcomes.

Our study strengths include its randomized design, inclusion of understudied health-related outcomes (e.g., lower extremity dysfunction, SF-36 physical health associated with cancer and mortality risk), and exploration of moderating factors. Our study also identifies several areas warranting further study including but not limited to why a history of chemotherapy and shorter time since diagnosis moderated the intervention effects and how the blunting effect of these factors can be overcome. Furthermore, these results suggest additional research is needed to determine how to best tailor physical activity interventions based on cancer-related moderating factors so that optimal improvements in health, well-being, and risk of cancer outcomes can be achieved after a breast cancer diagnosis.

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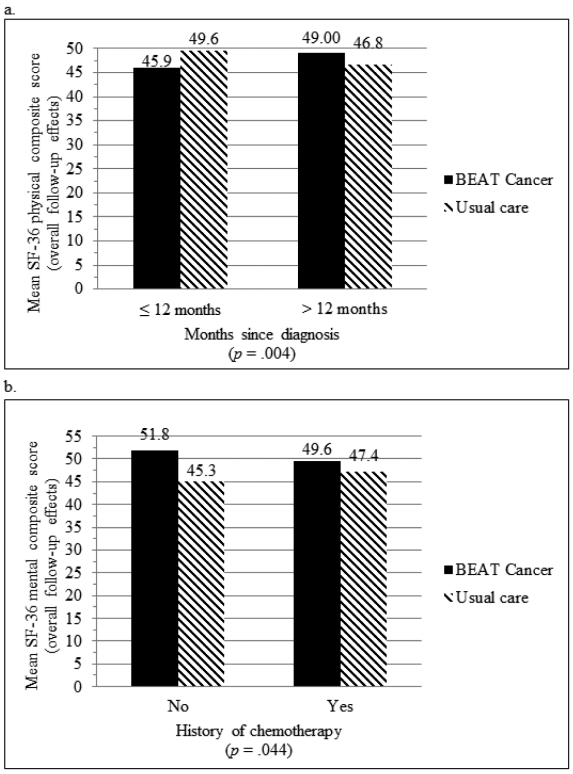

Fig 1.

Months since diagnosis as a moderator of overall BEAT Cancer intervention effects on SF-36 physical composite score (a) and history of chemotherapy as a moderator of overall BEAT Cancer intervention effects on SF-36 mental health composite score (b) at follow-up

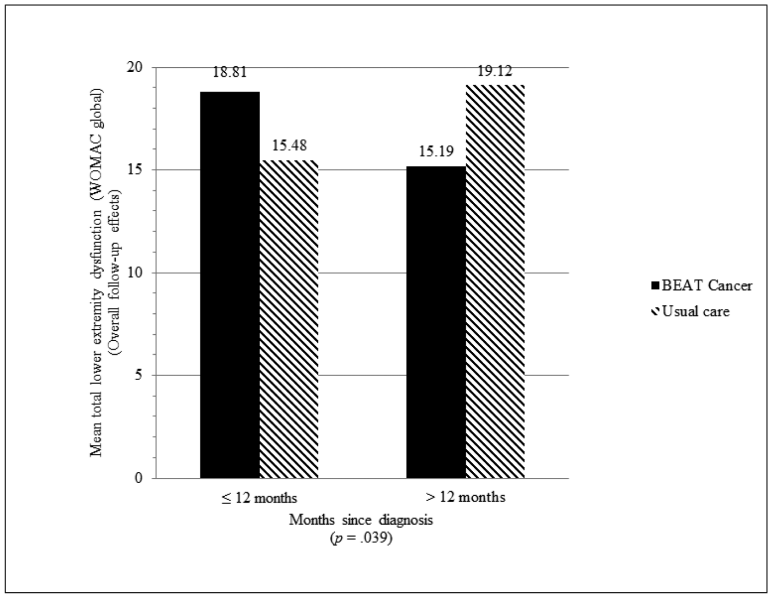

Fig 2.

Months since diagnosis as a moderator of overall BEAT Cancer intervention effects on lower extremity dysfunction (WOMAC global) at follow-up (lower score indicates less dysfunction)

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Table 1

Effects of the BEAT Cancer intervention on global health status (i.e., SF-36 composite and subscores) post-intervention (month 3) and 3 months after intervention completion (month 6) in breast cancer survivors

	Unadjusted means			Adjusted[a] between-group differences Estimated least square mean with (95% CI[b]); *p* value	
Outcome	**Baseline mean (SD[c])**	**Month 3 mean (SD)**	**Month 6 mean (SD)**	**BEAT Cancer vs usual care at month 3 (post-intervention)**	**BEAT Cancer vs usual care at month 6 (3 months post-intervention)**
SF-36 Physical health composite score				2.1 (0.3 to 3.9); .023	0.1 (−1.8 to 1.9); .93
BEAT Cancer	47.9 (8.3)	49.2 (8.7)	47.6 (10.9)		
Usual care	47.9 (9.8)	47.4 (9.8)	47.6 (9.9)		
SF-36 Mental health composite score				5.2 (2.8 to 7.6); <.001	3.0 (0.5 to 5.4); .017
BEAT Cancer	48.1 (10.2)	52.0 (8.8)	50.2 (10.7)		
Usual care	49.0 (9.8)	47.7 11.3)	47.8 (11.2)		
SF-36 subscores					
Physical functioning				6.4 (1.9 to 11.0); .006	2.7 (−1.9 to 7.3); .25
BEAT Cancer	75.8 (19.6)	82.6 (19.1)	78.4 (23.5)		
Usual care	75.6 (23.7)	76.6 (23.6)	75.5 (23.9)		
Role-physical				8.6 (3.0 to 14.2); .003	1.0 (−4.7 to 6.7); .72
BEAT Cancer	78.8 (22.9)	83.3 (21.6)	79.2 (26.6)		
Usual care	76.5 (24.9)	74.1 (29.6)	77.1 (26.0)		
Bodily pain				6.2 (1.4 to 11.0); .012	2.4 (−2.5 to 7.3); .34
BEAT Cancer	69.6 (21.5)	71.3 (21.1)	66.2 (25.0)		
Usual care	72.8 (23.1)	68.3 (24.1)	66.8 (25.1)		
General health				5.8 (2.2 to 9.4); .002	0.5 (−3.1 to 4.2); .78
BEAT Cancer	66.7 (12.1)	71.1 (20.1)	68.7 (23.2)		
Usual care	68.2 (23.1)	66.9 (23.9)	68.9 (24.8)		

Outcome	Unadjusted means: Baseline mean (SD[c])	Unadjusted means: Month 3 mean (SD)	Unadjusted means: Month 6 mean (SD)	Adjusted[a] between-group differences: Estimated least square mean with (95% CI[b]); *p* value: BEAT Cancer vs usual care at month 3 (post-intervention)	Adjusted[a] between-group differences: Estimated least square mean with (95% CI[b]); *p* value: BEAT Cancer vs usual care at month 6 (3 months post-intervention)
Vitality				12.5 (8.0 to 17.0); <.001	7.8 (3.3 to 12.4); .001
BEAT Cancer	50.7 (18.9)	62.5 (16.3)	57.3 (19.4)		
Usual care	51.3 (21.8)	51.1 (23.9)	49.8 (22.1)		
Social functioning				9.8 (4.1 to 15.4); .001	3.1 (−2.6 to 8.9); .29
BEAT Cancer	81.5 (21.1)	87.4 (20.5)	81.7 (24.9)		
Usual care	82.8 (21.6)	79.8 (25.6)	80.2 (26.9)		
Role-emotional				9.8 (4.7 to 15.0); <.001	4.6 (−0.6 to 9.8); .09
BEAT Cancer	82.0 (21.3)	89.3 (17.4)	85.8 (21.7)		
Usual care	84.1 (20.2)	81.3 (25.6)	82.6 (23.7)		
Mental health				7.1 (3.1 to 11.2); .001	4.3 (0.2 to 8.5); .038
BEAT Cancer	73.5 (17.7)	79.1 (15.0)	76.4 (18.1)		
Usual care	74.4 (18.0)	72.7 (18.0)	72.4 (19.1)		

[a]Adjusted for baseline value, study site, breast cancer stage, history of chemotherapy, history of radiation therapy, current hormonal therapy, comorbidities, and marital status

[b]Confidence intervals

[c]Standard deviation

Table 2

Effects of the BEAT Cancer intervention on health status indicators post-intervention (month 3) and 3 months after intervention completion (month 6) in breast cancer survivors

	Unadjusted means			Adjusted[a] between-group differences Estimated least square mean with (95% CI[b]); *p* value	
Outcome	**Baseline mean (SD[c])**	**Month 3 mean (SD)**	**Month 6 mean (SD)**	**BEAT Cancer vs usual care at month 3 (post-intervention)**	**BEAT Cancer vs usual care at month 6 (3 months post-intervention)**
Back/leg muscle strength (kg)[d]				2.0 (−3.1 to 7.2); .44	1.0 (−4.2 to 6.2); .70
BEAT Cancer	55.4 (25.5)	62.2 (24.7)	63.2 (26.7)		
Usual care	53.7 (20.7)	58.9 (20.6)	60.8 (20.7)		
BMI				−0.08 (−0.44 to 0.27); .65	−0.05 (−0.41 to 0.31); .77
BEAT Cancer	30.8 (6.9)	30.5 (7.0)	30.3 (7.1)		
Usual care	30.5 (6.8)	30.5 (6.8)	30.5 (7.0)		
Lower extremity dysfunction (WOMAC)					
Joint pain				−0.7 (−1.5 to 0.1); .08	−0.2 (−1.0 to 0.6); .68
BEAT Cancer	3.6 (3.4)	3.5 (3.3)	3.7 (4.3)		
Usual care	3.6 (3.4)	4.0 (3.8)	3.9 (3.7)		
Joint stiffness				−0.2 (−0.6 to 0.2); .24	−0.0 (−0.4 to 0.4); .87
BEAT Cancer	2.6 (1.6)	2.2 (1.6)	2.3 (1.6)		
Usual care	2.4 (1.7)	2.4 (1.8)	2.3 (1.8)		
Physical dysfunction				−2.7 (−5.0 to -0.5); .018	−1.2 (−3.4 to 1.1); .31
BEAT Cancer	10.1 (9.6)	8.1 (8.9)	9.2 (12.3)		
Usual care	9.7 (11.0)	10.3 (12.1)	10.3 (12.3)		
WOMAC total				−3.7 (−6.7 to -0.6); .018	−1.4 (−4.4 to 1.7); .38
BEAT Cancer	16.4 (13.6)	13.9 (12.6)	15.2 (17.3)		
Usual care	15.6 (15.3)	16.6 (16.6)	16.5 (16.9)		

	Unadjusted means			Adjusted[a] between-group differences Estimated least square mean with (95% CI[b]); *p* value	
Outcome	**Baseline mean (SD[c])**	**Month 3 mean (SD)**	**Month 6 mean (SD)**	**BEAT Cancer vs usual care at month 3 (post-intervention)**	**BEAT Cancer vs usual care at month 6 (3 months post-intervention)**
Satisfaction with life				2.4 (0.9 to 3.9); .001	1.3 (−0.2 to 2.8); .08
BEAT Cancer	24.9 (7.1)	26.4 (6.7)	25.8 (7.5)		
Usual care	24.3 (7.5)	23.6 (8.2)	23.9 (8.1)		

[a]Adjusted for baseline value, study site, breast cancer stage, history of chemotherapy, history of radiation therapy, current hormonal therapy, comorbidities, and marital status

[b]Confidence intervals

[c]Standard deviation

[d]Sample size = 162 due to equipment malfunction