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The Group-basEd Telehealth behavioral WEight Loss Program Among Breast Cancer Survivors: A Pilot and Feasibility Study

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ABSTRACT

Objective: Obesity is related to the recurrence of breast cancer. In-person groups or individual telephone counseling currently comprise the behavioral weight loss (BWL) programs tested for cancer survivors. Group support via telehealth may be convenient and provide support from fellow survivors, but feasibility, acceptability, and efficacy testing are needed.

Methods: A single-arm, 6-month BWL program was conducted for female breast cancer survivors with an ECOG performance 0 or 1, BMI > 25 kg/m^2, and > 6 months from completion of adjuvant chemotherapy and/or radiation treatment. Participants attended 22 video group sessions over 6 months, completing acceptability ratings, weight measurements, Patient Health Questionnaire (PHQ-9), City of Hope Breast Cancer Quality of Life Scale (QOL), and International Physical Activity Questionnaire. Changes in survey scores and weight (last-observation carried forward) and differences in outcomes by patients' race were computed with paired *t*-tests, ANCOVAs and Chi-square tests.

Results: Twenty-one (5 Black, 15 White, 1 Asian American; Mean (SD) = 60.7 (11.6) years; BMI 33.1 (5.9) kg/m^2) survivors enrolled with 90% retention and 81.3% of sessions attended. Acceptability ratings were high (all > 4 on a five-point scale). Mean (SD) weight loss was 5.9% (5.2%), with 60% losing ≥ 5% of baseline weight; White participants lost 7.5% and Black participants lost 1.9% ($p = 0.04$). Significant improvements were observed in mood (PHQ-9; $p = 0.01$) and physical wellbeing QOL ($p = 0.01$). Physical activity did not change.

Conclusion: This telehealth group BWL program was feasible and acceptable for breast cancer survivors, yielding a clinically significant weight loss. Future studies should test this intervention in larger, more diverse samples.

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1 | Introduction

Obesity and the metabolic consequences related to obesity have long been linked to increased incidence of cancer and worse cancer outcomes [1–7]. Obesity is an independent risk factor for at least 19 types of cancer, including breast cancer, in postmenopausal women [7]. Evidence indicates that weight gain increases breast cancer risk by up to 40% in premenopausal and postmenopausal women [7–9]. Specifically, in the Nurses' Health Study, women who gained weight over their lifetimes, particularly after menopause, had an increased risk of breast cancer (45% increased risk if > 25 kg gained; 18% increased risk if > 10 kg gained), suggesting a dose response between weight and cancer risk [9].

Studies show that obesity is associated with worse overall and cancer-specific survival in breast cancer patients [3–6, 10]. One meta-analysis of 213,075 women and 41,477 deaths showed that overweight increased the risk of total mortality and breast cancer-specific death by 41% and 35%, respectively [3]. Findings from a systematic review of the literature demonstrated that breast cancer survivors with obesity had a greater risk of developing a new, second primary malignancy, and that obesity increased the risk of malignancy in the contralateral breast by 37% [4, 11].

Conversely, intentional weight loss with lifestyle modification reduces the incidence of breast cancer among premenopausal- and postmenopausal women [1, 11–16]. For example, in the Iowa Women's Health Study, postmenopausal women who intentionally lost ≥ 20 pounds (≥ 9 kg) through lifestyle modification reduced their risk of breast cancer by 21% [12]. However, results from a meta-analysis indicated limited evidence demonstrating that weight loss interventions positively impact survival rates, mainly due to the low quality and general lack of adequately powered long term follow-up studies [17]. Based on the literature, intentional weight loss may improve clinical outcomes in breast cancer survivors by two related but likely different mechanisms: (a) by reducing the incidence of new breast cancer and, (b) possibly reducing the risk of cancer recurrence; however, more trials are needed.

Research indicates that Black women who are breast cancer survivors are more likely to have obesity and lower levels of physical activity than women from other racial groups [18]. Furthermore, Black women gain more weight following breast cancer treatment than White women, increasing their risk of recurrence and morbidity [19]. However, most behavioral weight loss trials for breast cancer survivors have largely enrolled White women (e.g., [20]), the results of which may not be generalizable to other racial groups, or they include a higher proportion of Black women (e.g., 36%), but do not report how race may be related to weight loss and associated outcomes (e.g., [21]).

Previous lifestyle modification interventions for breast cancer survivors have largely been in person using either individual or group intervention sessions [22, 23], or via individual telephone-based sessions [24–26]. Telehealth, the delivery of health care through technology such as mobile phones or computers, may be an effective and efficient means of delivering a behavioral intervention to patients who otherwise cannot participate in in-person visits, thus overcoming structural barriers to care [27]. One previous pilot study tested a commercially available web-based program that included coaching as needed and discussion boards for breast and testicular cancer survivors with a participation rate of 42%, a retention rate of 59% and a weight loss of 3.5% at 6 months [28]. One possible way to build on a such a telehealth approach would be the use of a live, group session format to deliver the intervention, which could foster additional support for breast cancer survivors who have disease-specific challenges to weight loss and body image, such as lymphedema or mastectomy, and may help improve outcomes [29]. In person studies have shown that the social support provided by the group format has been endorsed as valuable to participants when evaluating these interventions [30], and a recent systematic review favored group interventions over individual interventions for weight loss [31]. To test this concept, a pilot single-arm study (NCT04855552) was conducted to examine the feasibility and acceptability of a weight loss group program via telehealth for breast cancer survivors, with efforts to include a racially diverse sample.

2 | Materials and Methods

2.1 | Participants

Using electronic medical record data, potentially eligible patients were identified who met the following criteria at the time of study enrollment: diagnosis of breast cancer, aged 18 years or older, Eastern Cooperative Oncology Group (ECOG) [32] performance of 0 or 1, BMI of ≥ 25 kg/m^2, completion of adjuvant radio- and/or chemotherapy for breast cancer at least 6 months prior to recruitment, and free of any other current cancer diagnosis. These eligible patients were informed about the study by their surgical provider, which included an initial questionnaire asking patients about their knowledge of a link between breast cancer and obesity, as well as demographics, socioeconomic status, ability to access the Internet, and whether they had an interest in participating in a behavioral weight loss intervention [33].

Exclusion criteria included: current use of weight-loss medication (over the counter or prescription), currently participating in a behavioral weight loss program, self-report of alcohol or substance abuse within the past 12 months, including at-risk drinking (current consumption of more than 14 alcoholic drinks per week), history of anorexia nervosa or bulimia nervosa, inability to provide informed consent, current pregnancy, non-English speaking, uncontrolled medical conditions, and steroid use or use of other medications known to cause weight gain.

These patients completed informed consent with the study staff and the initial survey. Those who indicated they would be open to participating in a behavioral weight loss intervention were contacted to screen and enroll them in the group telehealth behavioral weight loss program. This study was conducted in line with the principles of the Declaration of Helsinki. Approval was granted by the Penn Medicine Institutional Review Board.

The GET WEL program was conducted in two cohorts. In the first pilot group of participants (n = 12) only one Black

participant enrolled. This unintended low reach and retention rate for Black participants in the first pilot cohort prompted recruitment of a second pilot cohort with explicit consideration to overrecruit Black participants from our remaining pool of eligible patients (as identified by electronic medical records), resulting in recruiting 4 Black and 6 White participants in the second cohort.

2.2 | Intervention

This Group-basEd Telehealth behavioral WEight Loss (GETWEL) program was a single-armed and unblinded pilot and feasibility study. Participants were recruited in two cohorts. They attended weekly, teleconference group sessions via Zoom either at 12:00 p.m. or 5:00 p.m. offered on the same day led by a licensed clinical psychologist for 20 weeks, followed by sessions every other week for 1 month. Participants had flexibility to attend either noon or 5 p.m. session to improve attendance.

The 60-min sessions were based on the Diabetes Prevention Program [34] and were adapted previously for the endometrial cancer population [35]; it was further adapted for breast cancer survivors in the current trial by clinical psychologists (K.C.A. and C.M.-W.) in collaboration with a breast cancer surgeon (J.T.) to include specific examples of challenges breast cancer survivors may face (manual is available by request from the authors). The content of the sessions addressed the domains commonly associated with behavioral weight control, including nutrition, physical activity, and lifestyle modification strategies, including stimulus control, stress management, and cognitive restructuring to improve adherence to the diet and activity plan. Modifications of this intervention for the breast cancer population included providing facts about several topics that were often seen as sources of confusion. These included links between higher weight and cancer recurrence, discussion points about consuming certain fruits and vegetables with phytochemicals and antioxidants to protect against recurrence, information about nutrition facts and myths regarding cancer, and facts about the potential positive benefits of activity on health and cancer outcomes. Group discussions also allowed for sharing of resources for cancer-specific resources for physical activity through our health system as well as in the community.

Participants were encouraged to use MyFitnessPal.com to monitor calorie intake and physical activity to share these logs with their group leader for weekly feedback, and they were provided digital scales (Etekcity) to monitor weight change to share with study staff to enhance accountability and provide opportunity for feedback. They were encouraged to start with at least 10 min of moderate activity (e.g., brisk walking, swimming, chair exercises), at least 5 days per week, and build up to at least 30 min per day (150 min per week) by week 6.

2.3 | Outcomes

The primary outcome, feasibility, was pre-defined as a ratio of enrolled/eligible patients of at least 50% who expressed interest in the weight loss intervention on the initial questionnaire as well as the proportion of sessions attended. Acceptability was assessed with the Acceptability of Intervention (AIM) measure pre- and post-treatment that queried: approval, appeal, liking, and degree that the program was welcomed by them on a 1–5 scale [36]. An exit interview also assessed the acceptability of the program on a scale of 0 (not at all) to 10 (extremely).

Secondary endpoints included changes from baseline to the end of treatment in weight, energy intake, quality of life, depressed mood, and physical activity; each is described below. Weight was measured on digital scales at participants' homes. Participants took a picture of the weight and sent it to the study staff once per week. For participants who did not provide a weight at the final group visit due to drop out ($n = 2$), the last reported weight was carried forward for the final percent weight loss and absolute weight change analyses. Energy intake was estimated from entries in MyFitnessPal. Seven days of "complete" entries, which were defined as entries that contained at least two meals, totaling at least 1000 kcals for the day, within 2 weeks of baseline and treatment end were averaged to yield the change in energy intake.

Questionnaires included the City of Hope Quality of Life-Breast Cancer Patient (QOL-BC) questionnaire containing 46 items assessing four domains with a mean for each of 0–10, including physical (8 items), psychological (22 items), social (9 items), and spiritual (7 items) wellbeing [37]. The Patient Health Questionnaire (PHQ-9) contains nine items, yielding a range of 0–27, assessing the core criteria for major depressive disorder [38]. Physical activity was measured using the International Physical Activity Questionnaire—Short Form (IPAQ) [39], which contains seven items assessing activity over the past week, yielding estimates of vigorous, moderate, and walking activity, as well as sedentary time.

2.4 | Analyses

Descriptive statistics were completed to characterize the sample, and paired *t*-tests were used to compare changes in the primary and secondary outcomes from baseline to 24 weeks. For weight change, last observation carried forward was used for a more conservative estimate of efficacy compared to a complete analysis. Analysis of Covariance tests were used to compare outcomes between racial groups covarying for baseline weight, as well as Chi-square tests to compare the proportion reaching 5% weight loss. Statistical Package for the Social Sciences (SPSS), version 28.0.1.1, was used for all analyses.

3 | Results

Twenty-one women (5 Black, 15 White, 1 Asian American) were enrolled in two cohorts; cohort one ran from July 2021 through January 2022, and cohort two ran from April 2022 through October 2022. The participants had a mean (SD) age of 60.7 (11.6) years and a BMI of 33.1 (5.9) kg/m^2 at the intervention baseline. Two additional participants were enrolled but withdrew from the study before attending any sessions, and one of the 21 attended two sessions but dropped out without providing

weight data and thus was not included in the analyses (all White, mean age 68 years, see consort diagram, Figure 1). Baseline characteristics of the participants are summarized in Table 1.

3.1 | Feasibility

The ratio of enrolled ($n = 23$)/eligible ($n = 42$) participants was 55%. Retention was 90% of those who started intervention sessions and provided weight data ($n = 20$), with 2 dropping out at weeks 6 and 20 (one Black and one White participant), respectively. Overall, 335 of 412 participant-sessions (81.3%) were attended, thus confirming study feasibility.

3.2 | Efficacy

Using last observation carried forward analysis, mean (SD) percent weight loss 5.9% (5.2%) and for completers ($n = 18$) it was 6.8% (4.4%). BMI and weight were also significantly reduced across treatment by 2.20 (1.44) kg/m^2 and 5.80 (3.98) kg, respectively (see Table 2). Examining standards for evaluating clinically meaningful weight losses [40], 60% of the sample reached a 5% weight loss or greater, with 25% reaching a 10% weight loss. Participants' use of MyFitnessPal varied, with 9 participants completing at least 7 full days of logging at both baseline and treatment end, yielding a reduction of 245.03 (485.76) calories per day at 24 weeks. Changes in self-reported calorie intake were not significantly correlated with weight loss.

When examining racial differences in percent weight loss between the White and Black participants, Black participants lost 1.9% (6.6%) and White participants lost 7.5% (3.8%) (see Table 3), which was significantly different between groups ($p = 0.037$); weight (kg) and BMI changes were not significantly different between these groups. Chi-square analysis showed significant differences between the proportion of Black and White participants reaching a 5% or greater weight loss, at 20% and 80%, respectively (Chi-square (1, $n = 19$) = 4.92, $p = 0.026$).

3.3 | Mood and Quality of Life

Participants' mood significantly improved on the PHQ-9 from 3.5 to 1.7 ($p = 0.014$), with both scores falling within the "minimally depressed range." On the QOL-BC Scale, physical well-being improved significantly ($p = 0.012$), but psychological, social, and spiritual well-being did not change. On the IPAQ, physical activity did not significantly change for vigorous, moderate, or walking activity or time spent sitting (see Table 1). There were no differences at baseline or in changes in these variables by race.

3.4 | Acceptability

Questionnaires administered before and after the intervention indicated that the format and delivery of the program remained highly acceptable across domains (all ratings between 4 and 5 on a 5-point scale) with increases in "approval" from 4.2 (0.75) to 4.7 (0.49), $p = 0.014$, and "welcoming the program" from 4.5 (0.77) to 4.7 (0.51), $p = 0.041$. Exit interviews completed by 18 of the 20 participants also revealed extremely satisfied ratings for ease of connecting to the sessions, mean 8.3 (3.1), and acceptability of telehealth groups for weight loss, mean 9.6 (0.61), both on a 10-point scale. All participants indicated adequate privacy

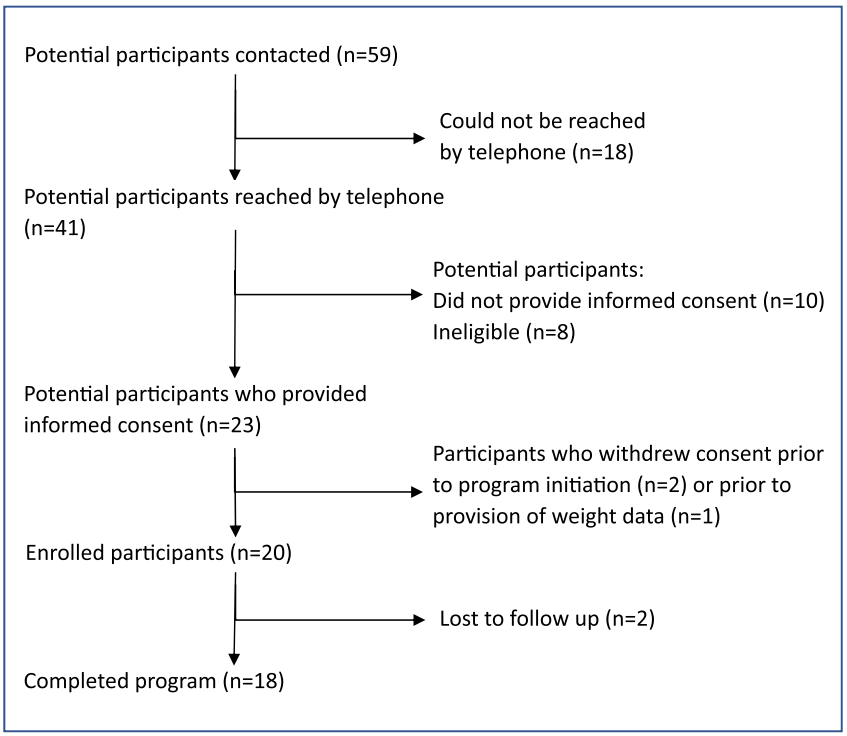

FIGURE 1 | Consort diagram.

TABLE 1 | Participant characteristics.

	Overall sample	White	Black	Other	*p*-value
N	20	14	5	1	
Age at enrollment (mean, SD)	59.8 (11.5)	62.0 (11.9)	55.8 (9.31)	47	0.32
Age at diagnosis (mean, SD)	54.7 (11.2)	56.6 (11.6)	51.8 (10.5)	44	0.47
Ethnicity					
Non-Hispanic	20	14	5	1	—
ECOG performance status					
0	11	10	1	0	0.04
1	8	3	4	1	
NA	1	1	0	0	
Breast cancer stage					
Pathologic tumor stage					
pT0	7	3	3	1	0.61
pT1	9	7	2	0	
pT2	2	2	0	0	
pT3/T4	1	1	0	0	
NA	1	1	0	0	
Pathologic nodal stage					
pN0	15	9	5	1	0.31
pN1	4	4	0	0	
NA	1	1	0	0	
Types of breast cancer surgery					
Lumpectomy	8	7	1	0	0.29
Mastectomy	11	6	4	1	
NA	1	0	0	0	
Unilateral	5	3	1	1	0.38
Bilateral	6	3	3	0	
Free Flap	6	3	3	0	0.16
Implant	2	2	0	0	
Other	2	1	0	1	
Lymph node surgery					
None	2	1	1	0	0.81
SNB	15	10	4	1	
AND	2	2	0	0	
NA	1	1	0	0	
Systemic therapy					
Endocrine	7	5	2	0	0.74
Chemotherapy	7	5	2	0	0.73
Radiation therapy					
Yes	8	8	0	0	0.04
No	11	5	5	1	
NA	1	1	0	0	

(Continues)

TABLE 1 | (Continued)

	Overall sample	White	Black	Other	*p*-value
Lymphedema					
Yes	1	1	0	0	0.78
No	18	12	5	1	
NA	1	1	0	0	
Income					
< $25,000	1	1	0	0	0.77
$50,000–$75,000	3	2	1	0	
> $75,000	12	10	1	1	
Unknown	4	1	3	0	
Employment status					
Employed	11	9	2	0	0.31
Retired	5	5	0	0	
Unknown	4	0	3	1	
Job or unpaid work outside home					
Yes	12	10	2	0	0.16
No	4	3	0	1	
Unknown	4	1	3	0	
Average home distance in miles from hospital in miles estimated by zip codes (mean, SD)	33.1 (38.9)	44.6 (42.2)	6.3 (7.3)	16.3	0.16

to connect to the sessions and all but one endorsed having a reliable and adequate internet connection.

4 | Discussion

This proof-of-concept telemedicine weight loss program was feasible and acceptable in this group of participants with breast cancer, yielding a clinically significant weight loss over 6 months in the majority of patients, along with improvements in physical wellbeing and mood. The participation and retention rates were higher than those noted previously by Lynch et al. at 6 months, as was the overall weight loss [28]. This group-based telehealth approach represents an intervention strategy that overcomes travel and distance barriers and thus could be widely disseminated and may provide stronger accountability and support than a one-on-one or an Internet-guided approach in some patients.

Attendance at the sessions was high, which likely helped with the strategy of offering two groups at different times on the same day that participants could choose between. This study was planned prior to the pandemic, but the women were used to telemedicine sessions by the time the study was executed, so technology access issues were minimal, with only one of the 20 participants having trouble navigating the system most weeks. This was addressed by having one staff member help with tech and communication issues along with the group leader who presented content and facilitated the discussions.

However, the intervention showed less efficacy among our Black participants as compared to our White participants, with only 20% of Black participants losing a clinically significant amount of weight. Other studies have shown this disparity in a breast cancer population, with Sheng et al. [26] reporting that 20% of non-White participants (who comprised 29% of the total sample) as compared to 40% of White participants lost 5% or more of their baseline weight. Agurs-Collins and colleagues propose that metabolic differences related to adipose tissue distribution may play a role between Black and White women and may impact their weight management, as well as their cancer survivorship [41].

It also remains unclear to what extent social determinants of health (SDOH), such as access to healthy foods and the built environment, that might limit physical activity, or limited social support for making healthy dietary changes may influence these disparities in weight loss [30, 42]. For example, the Black participant who withdrew at 6 weeks reported that she was unable to participate due to caretaking demands. This feedback suggested the need to identify and mitigate SDOH at the social/community context level (e.g., identifying the participant's need for support services for her family member so that she could attend sessions). For other participants, resources could have been helpful at the built environment level (e.g., access to ability-adjusted activities in facilities and safe neighborhoods, access to reliable internet), and at the individual level to access healthy foods to meet dietary intake goals [43, 44]. Thus, building these support mechanisms going forward would be promising avenues for increasing the intervention's efficacy.

TABLE 2 | Change in weight and psychosocial variables in mean (SD) over the course of treatment. Sample size is $n = 20$ except where noted for individual measures.

Variable	Baseline	6-Months	Paired *t*-value	*p*-value
Weight (kg)	87.67 (17.95)	82.58 (18.27)	5.02	< 0.001
Body mass index (kg/m^2)	33.10 (5.88)	31.17 (6.07)	5.25	< 0.001
Percent weight loss	—	5.93 (5.17)	—	—
Percent weight loss (completers, $n = 18$)	—	6.54 (4.39)	—	—
Number (%) reaching 5% weight loss	—	12 (60%)	—	—
Number (%) reaching 10% weight loss	—	5 (25%)	—	—
Depressive symptoms (PHQ-9) ($n = 17$)	3.47 (2.38)	1.65 (2.00)	2.75	0.014
Quality of life—Breast cancer ($n = 17$)				
Physical wellbeing	5.37 (2.02)	6.48 (1.84)	2.85	0.012
Psychological wellbeing	6.25 (1.61)	6.65 (1.39)	1.63	0.122
Social wellbeing	6.04 (1.85)	6.44 (1.61)	1.48	0.157
Spiritual wellbeing	6.42 (2.23)	6.58 (2.28)	0.75	0.467
Physical activity (IPAQ)				
Vigorous (min/week) ($n = 18$)	132.22 (291.88)	121.39 (212.84)	0.21	0.833
Moderately vigorous (min/week) ($n = 17$)	150.00 (234.97)	190.88 (260.58)	0.90	0.383
Walking (min/week) ($n = 17$)	635.29 (820.18)	609.41 (667.17)	0.11	0.913
Sitting (min/week) ($n = 14$)	475.71 (230.54)	395.00 (218.52)	1.61	0.132
Acceptability ($n = 17$)				
Approve of program	4.24 (0.75)	4.65 (0.49)	2.75	0.014
Program is appealing	4.41 (0.62)	4.59 (0.51)	1.38	0.188
Liked program	4.29 (0.77)	4.59 (0.51)	2.06	0.056
Program is welcomed	4.47 (0.62)	4.71 (0.47)	2.22	0.41

Note: Weight variables at 6 months use last observation carried forward except where noted as completers analysis. Quality of Life scores range of 0–10. PHQ-9 is Patient Health Questionnaire, nine-item, score range 0–27. IPAQ is International Physical Activity Questionnaire. Acceptability scores range from 1 to 5.

TABLE 3 | Comparison of weight change by racial identity groups, controlling for baseline weight.

Variable	Baseline		Change at 6-month				
LOCF	Black ($n = 5$)	White ($n = 14$)	Black ($n = 5$)	White ($n = 14$)	*F*-value *df* (1,16)	*p*-value	Partial eta squared
Weight (kg)	96.11 (17.49)	84.49 (18.39)	−2.23 (6.60)	−6.37 (3.27)	3.99	0.063	0.20
BMI (kg/m^2)	35.06 (6.41)	32.93 (6.39)	0.82 (2.35)	2.43 (1.16)	4.48	0.050	0.22
Percent weight loss	—	—	1.87 (6.63)	7.48 (3.80)	5.18	0.037	0.25

Note: ANCOVA, controlling for baseline weight, comparing change at 6 months between Black and White participants using last observation carried forward (LOCF), with one White and one Black participant dropping out before study completion. Completers analysis showed a non-significant difference in % weight loss between groups with 3.9% loss for Black ($n = 4$) and 8.2% for White ($n = 13$) participants at $F(1,14) = 4.39$, $p = 0.055$.

Quality of life in the domain of physical wellbeing improved for the total sample, with the other quality of life domains improving minimally. Mood also improved significantly, although at baseline, the group endorsed minimal depressive symptoms and stayed within that range. These findings support evidence from previous behavioral weight loss interventions in this population [20, 45]. Physical activity levels were highly variable, with several participants entering the study already at or beyond the recommended minutes of activity, while others were limited by lymphedema and other health issues that impacted their ability to meet the activity goals. Suggestions for less intensive forms of activity, such as chair exercises, were discussed in these cases, but remained difficult for participants to engage in on a regular basis.

The main limitation of this study is the single institution setting and small sample size. Additionally, self-reported weights without in-person validation, albeit with a photograph from the scale, are also a limitation that brought about the safe-distancing recommendations. Future studies should expand the sample size and include in-person assessments of weights at baseline and at intervention completion. Further, efforts to improve recruitment techniques to include more Black breast cancer survivors are also needed, as this group has the highest

rates of obesity and poorest survivorship outcomes [46]. This could involve efforts for community based participatory research strategies, as well as providing elimination of barriers to participation such as more resources for safe physical activity and access to healthy foods.

In sum, this telehealth-delivered group lifestyle intervention for weight loss was feasible and produced a clinically meaningful weight loss over 6 months. Future efforts should include larger samples with more diversity and analysis of possible mechanisms for differences in efficacy among racial groups.

Author Contributions

K.C.A., J.T., and R.S.K. contributed to the study conception and design. The intervention was delivered by C.M.-W. and K.C.A. Material preparation and data collection were performed by K.C.A., C.M.-W., A.R., and J.T. Analyses were performed by K.C.A., J.T., A.R., N.H., and M.G. The first draft of the manuscript was written by K.C.A. and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Conflicts of Interest

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