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Patterns of Fitbit Use and Activity Levels Among African American Breast Cancer Survivors During an eHealth Weight Loss Randomized Controlled Trial

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Abstract

Purpose: This study examined adherence with a physical activity tracker and patterns of activity among different subgroups of African American/Black breast cancer survivors (AABCS).

Design: Secondary analysis of weight loss trial that used an activity tracker (FitBit) with or without a commercial eHealth program (SparkPeople) over 12 months.

Setting and Subjects: AABCS (N = 44) in New Jersey.

Measures and Analysis: Adherence with tracker use, steps per day, and active minutes per week were compared by demographic and clinical characteristics using nonparametric statistics.

Results: Median adherence was over 6 days per week throughout the 12-months. Adherence was significantly correlated with steps and active minutes ($p < 0.015$). Groups with lower adherence included: those with 5 or more conditions ($p = 0.039$), had higher number of household members ($p = 0.008$), and younger than 60 years ($p = 0.044$). Median number of steps per day remained consistently around 7000 throughout 12 months. Factors associated with lower activity included:

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Authors' Note

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

age ≥ 60; retirement; higher number of household members, comorbidity, or baseline BMI; and those in the SparkPeople + Fitbit group. Self-monitoring, goal setting, and self-efficacy were significantly correlated with activity levels ($p < 0.05$).

Conclusion: Use of a physical activity tracker may help increase activity levels in AABCS. Certain subgroups, e.g. those older than age 60 years, retired, with BMI over 40, higher number of comorbidities or more household members, may require additional interventions.

Keywords

breast cancer survivors; African American; activity trackers; physical activity

Purpose

Despite lower incidence in breast cancer, African American/Black women are 40% more likely than non-Hispanic White women to die from breast cancer.[1] Factors contributing to this disparity include disproportionate prevalence of more aggressive subtypes, diagnosis at later stages, socioeconomic and cultural barriers to care, and increased presence of comorbidities.[2] Many of the comorbid conditions, such as diabetes, hypertension, and cardiovascular disease, are related to higher rates of obesity among African American/Black breast cancer survivors (AABCS).[3] Additionally, this population has poorer adherence to dietary guidelines and lower rates of physical activity.[2]

Physical activity is an important component of care in breast cancer patients. Studies have demonstrated that exercise interventions decrease weight, body mass index (BMI), and body fat, and increase quality of life and survival.[4,5] Further, regular exercise improves anxiety, depression, fatigue, and cognitive function in cancer patients.[6] Breast cancer survivorship care guidelines recommend avoiding inactivity and aiming for at least 150 minutes of moderate aerobic exercise per week with strength training exercises 2 times a week.[7] High-risk breast cancer patients who met these guidelines before and after diagnosis had a 55% reduced risk of recurrence and 68% reduced all-cause mortality.[8] Furthermore, patients who did not meet guidelines pre-diagnosis but did so after treatment reduced their recurrence and mortality by nearly 50%. Most breast cancer survivors do not meet physical activity guidelines, with African American breast cancer survivors having the lowest adherence of all racial/ethnic groups.[9] This highlights the importance of developing interventions to increase physical activity in this population to optimize survival, recurrence, and quality of life outcomes.

One potential intervention to increase physical activity and improve health outcomes is the use of wearable physical activity accelerometers (or activity trackers). Breast cancer survivors have an interest in utilizing activity trackers and believe they help them achieve their health-related goals.[10,11] Importantly, these self-directed tools can bypass the common barriers these populations face to increasing physical activity, including lack of time and access to facilities.[12] Studies that utilized activity trackers in breast cancer survivors in conjunction with other behavioral strategies have found improvements in physical activity, weight, and quality of life.[13,14] However, there have been few studies in AABCS. Physical activity interventions that included pedometers in AABCS have led to increased total steps

per day and decreased BMI.[15,16] However, pedometers only provide step counts, do not measure minutes or intensity of activity, and do not store long term activity. To our knowledge, only 2 studies have examined the use of accelerometers in AABCS. Valle et al demonstrated that utilization of a smart scale and activity tracker resulted in prevention of weight gain and increase in activity in AABCS.[17] However, the study used self-report data to estimate physical activity levels, which is subject to bias. Our group is the first to utilize activity trackers to longitudinally and objectively measure physical activity in AABCS. We previously demonstrated that use of an activity tracker with or without a commercial online weight loss program helped AABCS with weight loss over a 6 and 12-month period, even without behavioral counseling.[18] Adherence with the tracker was high with mean of 5–6 days per week throughout the study period. In this paper, we describe adherence with Fitbit use and patterns of activity levels among different subgroups of AABCS during this weight loss trial. This will help determine those in need of more intensive interventions to increase physical activity.

Methods

Design

This is a secondary analysis of a weight loss trial in AABCS; details have been previously published.[18] Briefly, the overall goal of the primary study was weight loss in overweight and obese AABCS with the focus on decreasing energy intake and increasing physical activity, facilitated by commercial eHealth/mHealth tools. All participants received a handout of their goals for weight loss (5% weight loss over 6 months), caloric intake (1200–1500 kcal daily), and physical activity (starting with mild-moderate exercise 10 minutes per day with stepwise increase in time and intensity to 30 minutes per day of moderate activity and 10,000 steps per day).[19] Additionally, all participants received an activity tracker (Fitbit Charge, later replaced with Fitbit Alta for future participants and when the tracker was lost or damaged) to wear and monitor their activity daily. Combined intervention group participants also received one 30-minute training session on the use of SparkPeople, a free online weight management program, along with weekly text message reminders during the first 3 months to log onto the website. SparkPeople features educational and motivational articles and videos (on nutrition, fitness, wellness, stress management), self-monitoring nutrition and weight tracking tools, direct integration with many popular physical activity trackers, recipes, daily meal plans, inspirational quotes, incentives, and social support communities (including discussion forums, teams, challenges, and expert blogs). It also has options for daily or weekly content delivered to members' email. At month 6, Fitbit only participants received the SparkPeople treatment, while combined group participants were monitored for adherence for an additional 6 months. Each week, text message reminders were sent to participants who had not synced their Fitbit data. There was no other education or counseling provided by the research team. Because some participants commented that SparkPeople was too complicated, at the end of trial, we piloted a 6-month single group enhanced intervention (SparkPeople Premium plus Fitbit) with 10 additional AABCS using the same procedures. SparkPeople Premium is a fee-based version of SparkPeople that adds a structured online coaching program, as well as weekly email access to a live coach. The daily coaching program includes a specific, sequential list of activities to complete: 1.

conduct self-assessment of healthy habit goals; 2. watch a video-based coaching session; 3. track food intake, physical activity, and self-chosen small, short-term goals; 4. complete a community task (e.g., join a challenge, or post to a message board); and 5. read an inspirational message. Data from baseline to 6-months from these additional participants are included in this analysis.

Sample

Women were recruited from 2016 to 2018 via: 1) letters to eligible AA cases in a population-based case-control study of breast cancer (Women's Circle of Health Study)[20] who agreed to be contacted for future studies; and 2) flyers at cancer support group organizations and oncology practices in New Jersey. Eligibility criteria included: self-identification as African American; age 21–75 years; BMI at least 25 kg/m^2; Stage 0-III BC at least 2 years from diagnosis; ability to read English; and home internet access via computer or smartphone. Participants were randomized 1:1 to the SparkPeople program plus a wrist worn physical activity tracker (Fitbit) or an active wait-list control group (Fitbit only) and were blocked on age (older/younger than 60 years). This secondary analysis includes all participants who completed at least 6 months follow-up (N = 34), along with an additional 10 participants who subsequently enrolled in the single group 6-month enhanced intervention (SparkPeople Premium plus Fitbit). The Scientific Review Board of Rutgers Cancer Institute of New Jersey (#131404) and the Institutional Review Board of Rutgers, The State University of New Jersey (Pro20150001595) approved all study procedures, and all participants provided written informed consent.

Measures

Participants self-reported demographic information at baseline. Breast cancer history, comorbid conditions, and treatment were obtained from a medical clearance form (completed by participants' physicians) and by self-report. Trained staff measured height at baseline, and weight at 3-, 6-, 9-, and 12-month follow-up visits. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). At baseline and at each follow-up visit, participants answered a survey that included questions regarding quality of life, physical and mental health, and physical activity-related self-regulation and self-efficacy. Quality of life was measured using the Quality of Life in Adult Cancer Survivors Scale (QLACS); a lower score represents better quality of life.[21] Physical activity-related self-regulation and self-efficacy were assessed using the Health Beliefs Survey.[22] Cardiopulmonary fitness was estimated by the total distance walked, rounded to the nearest meter, during a 6-minute walk test.[23]

Each week, research staff downloaded steps and active minutes data from the Fitabase research platform (Small Steps Labs, CA) to collect our main outcomes of interest, physical activity and Fitbit adherence. Missing Fitbit data and days with less than 1000 steps (an indication of incomplete wear or data capture) were considered non-adherent. For outcomes of steps per day and active minutes per week, we conservatively excluded days with less than 1000 steps (6.07% of total days), based on the typical average of 3500–5500 steps/day in the elderly and those with chronic diseases,[24] and prior literature defining a valid wear day as at least 1500 steps.[25] Total active minutes per day were summed for each week.

Fitbit devices calculate active minutes for activities spent at or above 3 metabolic equivalents (METs) for at least 10 minutes.[26]

Analysis

Descriptive statistics describe participant characteristics. Due to outliers and skewed distribution of outcomes data, we used nonparametric statistics (Mann-Whitney U-Test or Kruskal-Wallis Test) to compare median (interquartile range [IQR]) adherence, steps per day, and active minutes per week for each 3-month interval by participant demographic and clinical characteristics. We used nonparametric Spearman's ρ to describe correlation of adherence with activity (steps per day and active minutes per week). Likewise, we used Spearman's ρ to measure correlation of steps per day with physical activity self-efficacy, self-monitoring, and goal setting. All analyses were conducted using SPSS software version 26 (IBM Corporation, Armonk, NY), and an overall significance level of 0.05 was used.

Results

Characteristics of the participants at baseline and the median adherence (IQR) for each subgroup during each 3-month period are described in Table 1. Median adherence was greater than 6 days per week throughout the 12-month period. Significantly lower adherence was observed in participants younger than 60 years (Months 10–12; $p = 0.044$), those with higher number of people in the household (Months 7–9; $p = 0.008$ and Months 10–12; $p = 0.012$), and participants with 5 or more number of conditions (Months 1–3; $p = 0.039$). While not statistically significant, those with higher number of household members, number of conditions, and more days with fatigue consistently had lower adherence throughout the 12-month period. Greater declines in adherence over the study period were observed in participants under 60 years of age, widowed or divorced, unemployed, with some college, in single households, had breast cancer stage III, BMI 40 or higher, were current or former smokers, and those reporting more fatigue. Notably, participants who received chemotherapy, reported worse quality of life or more days with poor mental health were as adherent to wearing the Fitbit as those who did not.

Tables 2 and 3 describe median steps per day and active minutes per week, respectively, by baseline demographic and clinical characteristics. Overall, the median number of steps per day remained consistently around 7000 throughout the 12-month period; however, median active minutes decreased from above 54 minutes per week during Months 1–6 to 42.50 minutes per week by Months 10–12. While not statistically significant, subgroups of participants with lower number of steps and active minutes throughout the 12 months included those in the SparkPeople + Fitbit group, age 60 and above, who were retired, had higher number of people in the household, more chronic conditions/higher comorbidity, and with baseline BMI of 40 or more. Subgroups of participants with greater declines in steps over the 12-month period included: SparkPeople + Fitbit group, those who were married, retired, had higher number of people in the household, Stage III diagnosis, were greater than 6 years since diagnosis, with BMI 35–39.9, and higher number of poor physical health days. Those with greater declines in active minutes per week included: SparkPeople + Fitbit group, participants less than 60 years of age, those who were married, unemployed, with at

least some college, higher number of people in the household, higher number of conditions, Stage III diagnosis, those who received chemotherapy, were 6 or more years since diagnosis, and never smokers.

Adherence with Fitbit wear was significantly correlated with steps and active minutes during Months 1–9 (Table 4). Additionally, number of steps per day was highly correlated with active minutes per week ($p < 0.001$). Furthermore, activity levels for the 3-month period prior to the follow-up visit was correlated with higher fitness levels at the 3- and 6-month visits ($p = 0.002$ and $p < 0.05$, respectively).

Table 5 presents the correlation of reported physical activity self-efficacy, self-monitoring, and goal setting/planning during the clinic visit preceding the 3-month period of activity. Higher survey scores for tracking walking were moderately correlated with number of steps per day for each 3-month period following the clinic visit (Spearman's ρ 0.395–0.656; $p = 0.003$–0.008). Physical activity goal setting and planning was correlated with number of steps per day during Months 1–9 (Spearman's ρ 0.395–0.514; $p = 0.001$–0.020). Self-efficacy to increase physical activity at the 3-month visit was significantly correlated with steps per day during months 4–6 (Spearman's ρ 0.316; $p = 0.041$).

Discussion

This eHealth weight loss trial is the second study to utilize wearable activity accelerometers in AABCS, and to our knowledge, the first to objectively measure physical activity longitudinally using activity trackers throughout 12 months in this population. Previous studies have demonstrated that increased physical activity for breast cancer survivors is associated with an increase in survival, quality of life, and health outcomes.[4,27] Furthermore, utilization of activity trackers has been shown to increase physical activity and improve health outcomes.[13,14] We found AABCS in our study to be highly adherent with wearing a Fitbit activity tracker, which helped them maintain physical activity throughout the 12 months. Higher number of steps and active minutes were correlated with higher cardiopulmonary fitness levels. Additionally, along with self-monitoring, more frequent goal setting and planning was significantly correlated with activity.

Adherence to the activity tracker was significantly correlated with steps and active minutes throughout the majority of the study, and the number of steps per day was highly correlated with active minutes per week. One study utilizing activity trackers in breast cancer survivors also found a significant association between adherence and moderate-vigorous physical activity levels.[28] Subgroups of AABCS who had significantly lower adherence in our study included those with 5 or more chronic conditions, as well as individuals with a higher number of household members. For those with several chronic conditions, this finding is unsurprising, as chronic disease is associated with decreased physical activity adherence.[29] It is possible that their conditions may have impacted their ability to participate in and sustain physical activity. Previous studies have also found that lack of time, lack of social support, and lack of energy can serve as a barrier to physical activity for breast cancer survivors.[30] For individuals with a higher number of household members, increased responsibilities may lead to lack of time, lack of energy, and decreased social support. This

finding will require future studies to better understand how household number may impact physical activity. For example, interventions that involve additional household members, such as providing activity trackers to all members of the household, may be needed.

Although not statistically significant, groups who consistently had lower levels of activity in our study included those who were older than 60 (despite having better adherence), retired, had BMI of 40 or greater, or have higher comorbidity. This is congruent with what has been reported in larger population studies: older adults are the most sedentary age group,[31] retirement is associated with a 10% decrease in moderate-vigorous physical activity,[32] individuals with obesity have about 2000 fewer steps per day than normal-weight individuals,[33] and chronic disease is associated with decreased physical activity.[29] These patients are most in need of increasing their physical activity, so a more intensive intervention will be needed in these subgroups, such as pairing an activity tracker with additional behavioral strategies. Extra support may also be needed for certain subgroups to maintain their activity levels, such as those with more household members, later cancer stage, and longer-term cancer survivors.

It was reassuring to see that participants who reported fatigue, poor quality of life, and poor physical and mental health at baseline adhered to wearing the activity tracker. Additionally, except for the group reporting poor physical health, these participants sustained their number of steps per day throughout the 12-month period. While the median number of steps in our sample was 7000 per day, and most of the physical activity did not comprise fairly active to very active minutes, any activity is beneficial. While sedentary time is correlated with coronary artery disease risk,[34] as little as 4000 steps per day is associated with lower all-cause mortality,[35] and each additional 1000 daily steps confers lower cardiovascular disease morbidity and mortality and risk of all-cause mortality.[36] Moreover, breast cancer survivors with consistent but low levels of regular physical activity have similar 60% decrease in all-cause mortality as patients meeting moderate activity guidelines.[8]

Interestingly, participants in the combined SparkPeople + Fitbit group had less physical activity throughout the intervention compared to the Fitbit only group, as well as a greater decline in steps and active minutes per week throughout the 12-month period. Two studies that have compared sequentially vs simultaneously delivered dietary and physical activity interventions did not find significant differences in physical activity levels between the 2 approaches.[37,38] Though King et al found that interventions delivered together in healthy adults were superior to those delivered sequentially when evaluating all behaviors combined at the end of the 12-month period, the exercise-first group had significantly more physical activity than the group receiving both exercise and dietary interventions simultaneously.[38] Our study suggests that starting with a simple exercise only intervention may be more successful in increasing physical activity among AABCS. The Fitbit only group had highest number of steps and active minutes and continued to maintain adherence, steps, and active minutes even after adding the SparkPeople intervention at Month 7. Future studies are needed to compare sequentially vs simultaneously delivered dietary and physical activity interventions. Importantly, our study demonstrates that simply providing an activity tracker may help several subgroups of AABCS increase physical activity, even without additional behavioral interventions.

There are several limitations that need to be considered when interpreting our results. Our small sample size limited the ability to demonstrate statistically significant differences among subgroups or conduct multivariate analysis; therefore, there is great potential for confounding. More than 50% of our sample were college graduates which may have contributed to high adherence and activity levels of our population and limit generalizability to other AABCS. However, participants with lower levels of education in our sample had higher adherence and activity levels. Additionally, the statistically significant results may have been achieved due to randomness. However, the trends we found in the absolute numbers for adherence, steps, and active minutes were consistent throughout the study and congruent with the literature. While this study is limited due to the small and relatively highly educated sample, our findings may serve as a road map for future research. We identified several subgroups of African American breast cancer survivors in which an activity tracker may be sufficient to increase physical activity levels, but other subgroups may need more intensive behavioral interventions.

Conclusion

Providing a physical activity tracker to some AABCS may be a convenient, efficient, and efficacious tool to increase their physical activity and decrease sedentary time. Activity trackers may also provide clinicians with objective and quantifiable measures of physical activity in their patients. Because those age 60 years and older did not effectively increase activity even with better adherence with the activity tracker, additional strategies may be useful in this subpopulation. In addition, other subgroups, e.g. those who are retired, have BMI over 40, with higher number of comorbidities or household members, will likely need more intensive interventions. Furthermore, future research is needed regarding how the number of household members and sequential vs. simultaneously delivered dietary and physical activity interventions may affect physical activity levels in this population.

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So What?

What is already known on this topic?

Activity trackers can help improve physical activity levels, weight, and quality of life in breast cancer survivors. Little is known about use of activity trackers in African American breast cancer survivors (AABCS).

What does this article add?

Most AABCS are highly adherent with wearing activity trackers, which can help them to maintain physical activity levels over a 12-month period. AABCS with higher number of comorbidities or household members have lower adherence, and those older than age 60 years, retired, have BMI over 40, and higher number of comorbidities or household members have lower activity levels.

What are the implications for health promotion practice or research?

Simply providing a physical activity tracker to many AABCS may be a convenient, efficient, and efficacious tool to increase their physical activity and decrease sedentary time. However, certain subgroups will need more intensive multimodal interventions.

Table 1.

Adherence in Wearing Activity Tracker among African American Breast Cancer Survivors in eHealth Weight Loss Trial.

Baseline characteristics	N[a]	Months 1–3 days/ week Median (IQR)	p-value[b]	Months 4–6 days/ week Median (IQR)	p-value[b]	N[a,c]	Months 7–9 days/ week Median (IQR)	p-value[b]	Months l0-l2 days/ week Median (IQR)	p-value[b]
Overall	44[c]	6.73 (1.09)		6.35 (1.73)		34	6.42 (l.8l)		6.23 (l.40)	
Intervention group			0.738		0.868			0.73		0.65
Fitbit only[d]	17	6.85 (1.50)		6.00 (1.61)		l7	6.62 (2.23)		6.23 (l.27)	
SparkPeople + Fitbit	17	6.69 (1.23)		6.54 (l.88)		l7	6.38 (l.54)		6.l5 (2.77)	
SparkPeople Premium + Fitbit	10	6.81 (0.44)		6.39 (2.46)		0	—		—	
Age			0.693		0.439			0.l2		0.044
< 60 years	19	6.69 (1.85)		6.08 (2.00)		l4	5.88 (2.46)		5.69 (2.98)	
≥ 60 years	25	6.85 (0.73)		6.62 (l.65)		20	6.65 (0.85)		6.46 (0.92)	
Marital Status			0.645		0.857			0.826		0.9l6
Married	17	6.77 (0.92)		6.54 (2.16)		l3	6.38 (l.08)		6.23 (3.23)	
Widowed/divorced	12	6.47 (1.59)		6.00 (1.76)		l2	6.00 (2.83)		5.85 (l.62)	
Never married/unknown	14	6.77 (0.69)		6.62 (l.l3)		8	6.65 (l.40)		6.3l (3.38)	
Employment status			0.859		0.78l			0.4l3		0.305
Employed	17	6.85 (0.80)		6.62 (l.6l)		l0	6.35 (l.46)		5.96 (0.87)	
Unemployed	7	6.77 (1.92)		6.08 (2.85)		7	5.77 (2.77)		4.85 (3.60)	
Retired	20	6.69 (1.30)		6.3l (2.27)		l7	6.46 (2.l5)		6.46 (l.00)	
Education			0.051		0.799			0.874		0.654
High school or less	6	6.27 (3.56)		6.08 (4.60)		5	6.69 (3.69)		6.27 (4.46)	
Some college	15	7.00 (0.38)		5.08 (l.46)		ll	6.38 (2.46)		5.85 (2.3l)	
College graduate	23	6.69 (1.15)		6.62 (l.69)		l8	6.42 (l.l0)		6.62 (l.35)	
Number of people in household			0.161		0.l25			0.008		0.0l2
1	10	6.77 (1.15)		6.35 (l.77)		7	4.92 (2.69)		5.69 (3.00)	
2–3	25	6.85 (0.54)		6.62 (l.l5)		20	6.69 (0.69)		6.62 (0.85)	
4–5	9	4.69 (3.62)		3.77 (4.66)		7	3.46 (4.85)		3.69 (4.54)	
Number of conditions			0.039		0.062			0.l4		0.205
0–2	20	6.92 (0.44)		6.66 (l.29)		l2	6.42 (0.7l)		6.27 (l.l0)	
3–4	14	6.73 (0.98)		6.08 (l.62)		l2	6.77 (l.l0)		6.3l (l.2l)	

Baseline characteristics	N[a]	Months 1–3 days/ week Median (IQR)	p-value[b]	Months 4–6 days/ week Median (IQR)	p-value[b]	N[a,c]	Months 7–9 days/ week Median (IQR)	p-value[b]	Months l0-l2 days/ week Median (IQR)	p-value[b]
≥5	10	5.10 (3.42)		4.66 (4.48)		l0	4.69 (4.l5)		4.46 (4.90)	
Charlson comorbidity			0.641		0.27			0.7l4		0.9l3
0	23	6.85 (0.69)		6.62 (l.54)		l6	6.54 (l.l7)		6.l5 (l.l0)	
1	13	6.69 (1.54)		6.00 (l.88)		l0	6.l9 (l.98)		6.23 (3.96)	
≥2	8	6.73 (3.04)		5.35 (4.50)		8	6.l9 (3.8l)		6.23 (3.77)	
Breast cancer stage			0.259		0.637			0.034		0.08
0 or I	16	6.85 (0.83)		6.39 (l.3l)		l3	6.77 (0.73)		6.62 (0.65)	
II	15	6.62 (2.3l)		6.08 (4.39)		l0	5.27 (3.l7)		5.69 (2.88)	
III	7	7.00 (0.46)		6.54 (1.3l)		7	6.38 (l.08)		5.92 (l.l7)	
Chemotherapy			0.416		0.75			0.86l		0.803
No	16	6.54 (1.32)		6.70 (l.93)		l3	6.46 (2.62)		6.35 (3.l2)	
Yes	28	6.77 (0.42)		6.l2 (l.79)		2l	6.38 (l.42)		6.l5 (0.98)	
Years since diagnosis			0.29		0.93l			0.558		0.053
1–5	20	6.92 (0.56)		6.08 (l.52)		l5	6.38 (l.38)		6.65 (l.56)	
≥ 6	14	6.66 (0.7l)		6.08 (l.99)		9	6.23 (2.l2)		5.85 (0.69)	
Baseline BMI (kg/m^2)			0.239		0.473			0.304		0.245
25–29.9	7	6.69 (1.30)		6.00 (l.62)		6	6.l9 (l.58)		6.46 (2.l3)	
30–34.9	17	6.69 (1.00)		6.00 (2.23)		ll	6.23 (l.38)		6.l5 (l.96)	
35–39.9	7	6.92 (0.15)		6.77 (0.30)		7	6.77 (0.23)		6.3l (0.85)	
40+	11	6.62 (3.23)		6.62 (4.77)		l0	5.50 (3.62)		5.69 (4.58)	
Smoking status			0.524		0.056			0.074		0.254
never	31	6.77 (1.00)		6.69 (l.6l)		22	6.54 (0.69)		6.23 (l.08)	
current or former	13	6.69 (2.54)		6.00 (2.85)		l2	5.62 (3.08)		5.69 (3.46)	
Baseline QOL category			0.469		0.11			0.418		0.788
1 (best)	12	6.92 (0.83)		6.81 (0.32)		10	6.77 (1.21)		6.27 (1.31)	
2	11	6.69 (1.38)		5.92 (l.3l)		8	5.88 (2.13)		6.69 (1.08)	
3	12	6.62 (2.17)		5.54 (4.22)		8	5.65 (4.69)		5.69 (5.38)	
4 (worst)	9	6.69 (0.81)		6.62 (0.81)		8	6.46 (0.48)		6.15 (2.69)	
Fatigue in past 4 weeks			0.437		0.111			0.251		0.737
Never—sometimes	25	6.85 (0.77)		6.62 (1.46)		18	6.50 (0.90)		6.23 (1.00)	

Baseline characteristics	N[a]	Months 1–3 days/ week Median (IQR)	p-value[b]	Months 4–6 days/ week Median (IQR)	p-value[b]	N[a,c]	Months 7–9 days/ week Median (IQR)	p-value[b]	Months l0-l2 days/ week Median (IQR)	p-value[b]
More often—always	19	6.69 (1.92)		6.08 (3.00)		16	6.35 (3.54)		5.85 (3.69)	
Poor physical health in past			0.246		0.339			0.585		0.427
30 days										
0	22	6.88 (0.71)		6.12 (2.23)		14	6.31 (2.23)		6.62 (1.38)	
1–5	13	6.85 (0.54)		6.62 (0.77)		12	6.54 (0.71)		6.23 (0.96)	
> 5	9	5.77 (2.66)		6.00 (5.12)		8	5.77 (4.06)		5.85 (4.77)	
Poor mental health in past			0.605		0.15			0.585		0.89
30 days										
0	17	6.85 (0.65)		6.77 (1.38)		12	6.69 (1.71)		6.23 (1.00)	
1–5	11	6.92 (1.38)		6.54 (1.31)		8	6.38 (0.81)		6.15 (1.02)	
> 5	13	6.62 (l.54)		6.00 (3.31)		12	6.35 (2.48)		6.23 (3.62)	

Abbreviation: IQR Interquartile range.

[a]Numbers may not add to total due to missing data.

[b]p-value using non-parametric Mann-Whitney U-Test or Kruskal-Wallis Test.

[c]N = 34 for Months 7–12 data (Spark Premium + Fitbit group was only in study for 6 months).

[d]Fitbit only group started SparkPeople in Month 7.

Table 2.

Median Number of Steps Per Day Among African American Breast Cancer Survivors in eHealth Weight Loss Trial.

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
Overall	44	6787.37 (4610.47)		6744.95 (3975.27)		34	7162.89 (4766.93)		6880.34 (4342.89)	
Intervention group			0.331		0.321			0.102		0.l22
Fitbit only[d]	17	7328.73 (5092.47)		7666.66 (4551.39)		17	8043.57 (5238.08)		7087.09 (4864.29)	
SparkPeople + Fitbit	17	6283.85 (3580.10)		5835.41 (3222.39)		17	6082.80 (3931.91)		5276.86 (4886.28)	
Spark Premium + Fitbit	10	6386.03 (5769.07)		6302.65 (4955.91)		0	—		—	
Age			0.152		0.173			0.931		0.l95
< 60 years	19	7328.73 (3357.42)		7068.26 (2906.48)		14	7162.89 (3116.82)		7217.04 (2951.84)	
≥ 60 years	25	5906.80 (5934.04)		5763.84 (5275.74)		20	6692.99 (5357.63)		4890.96 (4900.02)	
Marital Status			0.993		0.798			0.505		0.6ll
Married	17	6358.59 (6250.48)		6468.80 (4920.41)		13	4483.79 (4881.09)		3706.07 (5048.33)	
Widowed/divorced	12	6787.37 (2703.66)		6744.95 (3658.22)		12	7162.89 (2406.56)		6927.54 (3308.74)	
Never married/unknown	14	6594.23 (4925.92)		6416.05 (4457.97)		8	7007.84 (6229.65)		683314. (6155.11)	
Employment status			0.204		0.162			0.05		0.223
Employed	17	7328.73 (3603.55)		7637.97 (4115.27)		10	7909.72 (1737.36)		7552.20 (3576.63)	
Unemployed	7	8410.06 (6928.39)		7068.26 (5422.17)		7	6089.62 (6864.17)		6714.94 (8408.12)	
Retired	20	5689.39 (4663.82)		5487.59 (3774.06)		17	5742.97 (5067.95)		4763.25 (4605.67)	
Education			0.151		0.136			0.966		0.757
High school or less	6	7111.33 (5670.45)		7393.70 (5790.51)		5	7677.66 (9530.38)		7829.44 (6465.94)	
Some college	15	7845.56 (4223.68)		7637.97 (3437.01)		11	6352.81 (2300.61)		6927.54 (3031.64)	
College graduate	23	5371.14 (4237.08)		5376.51 (4021.86)		18	7219.46 (5570.18)		5649.53 (4884.66)	
Number of people in household			0.449		0.488			0.253		0.573
1	10	6095.33 (6996.88)		6240.82 (7502.76)		7	6089.62 (5785.20)		6446.26 (5089.40)	
2–3	25	7021.27 (3703.90)		7228.79 (2974.14)		20	7390.65 (3752.35)		6983.63 (3236.92)	
4–5	9	5055.32 (6336.86)		4381.79 (5498.32)		7	3074.78 (4717.75)		3896.30 (6875.58)	
Number of conditions			0.273		0.254			0.086		0.388
0–2	20	6887.14 (5464.96)		7583.65 (4537.57)		12	7452.33 (3929.56)		7050.11 (3647.30)	
3–4	14	6868.76 (3850.44)		6880.54 (3771.77)		12	7246.62 (3264.96)		6955.59 (4447.38)	

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
≥5	10	4628.82 (5323.82)		5010.37 (4149.52)		10	2999.48 (5491.97)		4037.24 (6031.73)	
Charlson comorbidity			0.073		0.084			0.105		0.573
0	23	6568.61 (6525.90)		6577.81 (4836.65)		16	7306.92 (4625.23)		6686.90 (4497.72)	
1	13	7964.15 (2023.76)		7529.32 (1142.76)		10	7601.21 (4774.10)		7170.54 (3149.20)	
≥2	8	4626.82 (3356.58)		4330.36 (2995.74)		8	4333.57 (4115.36)		4622.32 (5310.58)	
Breast cancer stage			0.82		0.571			0.33		0.502
0 or I	16	6868.76 (3716.44)		7379.06 (3935.56)		13	7775.86 (4197.74)		7190.54 (4195.25)	
II	15	5906.80 (2372.83)		5763.84 (3387.73))		10	6086.21 (3712.ll)		5649.53 (3305.ll)	
III	7	8410.06 (5507.16)		7068.26 (4798.76)		7	4484.79 (5716.05)		5210.52 (7539.94)	
Chemotherapy			0.232		0.751			0.972		0.632
No	16	5657.25 (3923.82)		5840.07 (3290.89)		13	7303.19 (5166.24)		7859.94 (5402.38)	
Yes	28	7175.00 (3903.88)		6920.18 (4488.79)		21	7135.73 (4898.58)		6639.70 (4099.l4)	
Years since diagnosis			0.592		0.522			l		0.688
1–5	20	7102.08 (4575.50)		7125.76 (4958.20)		15	7478.11 (5716.05)		7087.09 (4870.85)	
≥ 6	14	7175.00 (4488.64)		7000.44 (4100.92)		9	7135.73 (2925.82)		5649.53 (3352.50)	
Baseline BMI (kg/m^2)			0.063		0.091			0.178		0.55
25–29.9	7	6358.59 (3432.88)		7183.26 (3698.28)		6	7601.21 (2990.62)		7011.84 (3715.16)	
30–34.9	17	7400.92 (5075.16)		7228.79 (4132.68)		ll	7190.50 (5739.83)		7318.79 (5043.48)	
35–39.9	7	7021.27 (8853.72)		9016.84 (4698.22)		7	8963.09 (6951.95)		5649.53 (6643.08)	
40+	11	4412.31 (3496.5l)		4610.64 (3665.33)		l0	5113.83 (4931.78)		4904.19 (4874.66)	
Smoking status			0.529		0.634			0.403		0.938
Never	31	6821.74 (4593.97)		7068.26 (3508.55)		22	7219.46 (5105.14)		6833.14 (4453.91)	
Current or former	13	6283.85 (5077.19)		6717.80 (4722.66)		l2	6639.84 (5093.92)		6983.63 (3947.89)	
Baseline QOL category										
1 (best)	12	6787.37 (2538.15)	0.707	7013.70 (3928.71)	0.52	l0	7364.87 (4166.10)	0.461	6642.31 (4348.61)	0.671
2	11	7328.73 (4973.30)		7183.26 (3901.20)		8	7334.08 (4459.5l)		6983.63 (820.82)	
3	12	5669.59 (4505.62)		5322.41 (4890.73)		8	4927.47 (4815.53)		5649.53 (4173.89)	
4 (worst)	9	7281.45 (8084.38)		7228.79 (6107.19)		8	7278.79 (6761.91)		6522.65 (7162.62)	
Fatigue in past 4 weeks			0.822		0.749			0.646		0.823
Never—sometimes	25	6568.61 (4603.76)		6772.09 (4380.58)		l8	7308.30 (4847.64)		6927.54 (4319.57)	

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
More often—always	19	7021.27 (4636.47)		6717.80 (3974.19)		l6	6612.68 (5176.72)		6446.26 (4970.83)	
Poor physical health in past 30 days			0.229		0.303			0.067		0.245
0	22	6518.43 (5024.58)		6276.61 (3618.15)		l4	6612.68 (5327.46)		5649.53 (4631.71)	
1–5	13	7964.15 (6350.28)		7872.75 (4617.68)		l2	7909.72 (4190.98)		7757.18 (4929.40)	
> 5	9	6568.61 (3705.19)		6468.80 (3674.62)		8	5912.88 (4313.94)		4904.19 (4954.73)	
Poor mental health in past 30 days			0.758		0.795			0.873		0.83
0	17	6821.74 (3650.77)		7183.26 (3451.22)		l2	7552.11 (4159.60)		6927.54 (4109.32)	
1–5	11	5471.97 (7028.42)		4364.20 (5297.29)		8	6636.43 (5650.67)		5802.97 (4452.59)	
> 5	13	7281.45 (3698.01)		7068.26 (2824.97)		l2	7219.46 (4828.24)		7190.54 (4087.57)	

Abbreviation: IQR, Interquartile range.

[a] Numbers may not add to total due to missing data.

[b] p-value using non-parametric Mann-Whitney U-Test or Kruskal-Wallis Test.

[c] N = 34 for Months 7–12 data (Spark Premium + Fitbit group was only in study for 6 months).

[d] Fitbit only group started SparkPeople in Month 7.

Table 3.

Median Active Minutes Per Week Among African American Breast Cancer Survivors in eHealth Weight Loss Trial.

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
Overall	44	54.03 (88.24)		54.92 (70.59)		34	36.73 (104.90)	32	42.50 (76.92)	
Intervention group			0.661		0.433			0.174		0.429
Fitbit only[d]	17	58.47 (270.61)		63.47 (180.25)		17	64.54 (194.96)		63.69 (150.50)	
SparkPeople + Fitbit	17	45.72 (69.98)		34.08 (49.76)		17	30.54 (42.73)		25.19 (64.83)	
Spark Premium + Fitbit	10	56.60 (91.07)		56.14 (121.27)		0	—		—	
Age			0.414		0.241			0.464		0.168
< 60 years	19	58.47 (67.47)		62.32 (60.37)		14	31.38 (50.27)		46.42 (64.71)	
≥ 60 years	25	45.72 (103.90)		35.94 (107.15)		20	45.42 (138.02)		39.96 (86.65)	
Marital Status			0.957		0.738			0.464		0.866
Married	17	56.12 (98.56)		55.57 (72.71)		13	32.31 (84.65)		8.23 (74.81)	
Widowed/divorced	12	49.40 (64.90)		52.75 (51.77)		12	39.08 (40.08)		53.77 (54.23)	
Never married/unknown	14	48.41 (178.93)		49.71 (134.82)		8	75.00 (208.90)		115.00 (159.54)	
Employment status			0.122		0.058			0.175		0.253
Employed	17	74.85 (81.06)		70.63 (129.49)		10	78.88 (148.77)		62.81 (153.52)	
Unemployed	7	51.93 (245.78)		37.00 (129.13)		7	14.08 (146.85)		31.31 (219.31)	
Retired	20	34.44 (71.35)		30.39 (55.95)		17	25.38 (53.08)		29.54 (72.79)	
Education			0.841		0.818			0.796		0.784
High school or less	6	58.57 (149.51)		62.58 (146.88)		5	55.15 (234.35)		65.27 (134.31)	
Some college	15	58.13 (87.32)		54.85 (65.84)		11	30.46 (31.85)		32.08 (69.62)	
College graduate	23	51.93 (95.61)		50.64 (69.58)		18	48.65 (124.67)		23.38 (100.73)	
Number of people in household			0.181		0.546			0.217		0.434
1	10	31.98 (135.85)		39.98 (166.24)		7	22.46 (130.62)		60.77 (110.15)	
2–3	25	68.08 (66.55)		55.57 (58.17)		20	48.65 (101.23)		52.92 (74.00)	
4–5	9	25.26 (204.83)		9.54 (204.32)		7	2.77 (62.62)		8.23 (152.88)	
Number of conditions			0.232		0.212			0.12		0.474
0–2	20	84.79 (96.88)		69.42 (187.63)		12	55.46 (175.25)		57.27 (82.15)	
3–4	14	55.03 (38.43)		54.92 (61.14)		12	45.42 (96.37)		42.50 (100.08)	

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
≥5	10	27.89 (l08.04)		20.30 (60.86)		l0	8.69 (54.15)		8.65 (78.04)	
Charlson comorbidity			0.04		0.022			0.17		0.322
0	23	45.72 (95.56)		55.56 (2l7.72)		l6	48.65 (150.44)		57.27 (137.87)	
1	13	74.85 (103.19)		68.21 (69.44)		l0	58.23 (123.02)		52.92 (102.54)	
≥2	8	20.68 (55.99)		9.15 (27.97)		8	18.88 (35.21)		15.00 (57.69)	
Breast cancer stage			0.368		0.229			0.281		0.652
0 or I	16	69.75 (194.74)		69.18 (lll.77)		l3	94.46 (181.73)		60.00 (96.62)	
II	15	30.53 (70.73)		26.69 (75.98)		l0	30.50 (50.81)		27.00 (70.92)	
III	7	49.00 (l75.57)		37.00 (73.30)		7	14.08 (56.31)		6.00 (l88.27)	
Chemotherapy			0.294		0.932			0.807		0.224
No	16	42.04 (47.88)		55.28 (47.42)		l3	45.15 (108.54)		66.35 (136.38)	
Yes	28	64.78 (95.46)		45.92 (80.37)		2l	30.54 (94.50)		25.19c (76.40)	
Years since diagnosis			0.377		0.592			0.726		0.516
01–5	20	54.03 (140.07)		52.61 (74.24)		l5	32.31 (118.92)		66.73 (95.71)	
≥ 6	14	85.58 (86.83)		55.06 (228.75)		9	47.62 (103.38)		23.38 (52.04)	
Baseline BMI (kg/m^2)			0.034		0.07			0.078		0.606
25–29.9	7	56.12 (78.28)		68.21 (9l.7l)		6	78.88 (l3l.48)		39.96 (86.02)	
30–34.9	19	68.08 (94.87)		62.32 (62.l2)		ll	25.38 (105.69)		46.04 (99.71)	
35–39.9	7	120.87 (348.38)		150.95 (3l8.24)		7	152.00 (358.69)		53.77 (l66.77)	
40+	11	27.17 (47.89)		18.78 (49.28)		l0	26.23 (49.67)		15.00 (74.92)	
Smoking status			0.108		0.l5			0.146		0.411
never	31	58.47 (97.94)		55.57 (75.3l)		22	48.65 (123.40)		32.08 (100.42)	
current or former	13	38.36 (70.64)		35.94 (64.70)		l2	26.23 (55.2l)		52.92 (73.69)	
Baseline QOL category										
1 (best)	12	56.89 (90.90)	0.817	68.54 (168.80)	0.252	l0	52.42 (169.42)	0.253	40.38 (93.73)	0.604
2	11	56.12 (85.34)		54.85 (51.08)		8	28.85 (98.98)		72.69 (85.00)	
3	12	44.36 (70.58)		23.42 (62.54)		8	16.58 (56.94)		23.38 (59,3l)	
4 (worst)	9	58.46 (271.90)		63.47 (l05.50)		8	72.19 (l37.l5)		48.04 (l49.37)	
Fatigue			0.749		0.218			0.463		0.882
Never—sometimes	25	49.00 (93.74)		55.28 (131.86)		l8	51.46 (l48.94)		32.08 (99.23)	

Baseline characteristics	N[a]	Months 1–3 Median (IQR)	p-value[b]	Months 4–6 Median (IQR)	p-value[b]	N[a,c]	Months 7–9 Median (IQR)	p-value[b]	Months 10–12 Median (IQR)	p-value[b]
More often—always	19	68.08 (69.13)		29.32 (58.40)		l6	3l.42) (79.52		52.92 (72.62)	
Poor physical health in past 30 days			0.421		0.17			0.2l6		0.65
0	22	86.77 (104.63)		78.31 (91.65)		l4	68.88 (84.7l)		53.28 (56.l2)	
1–5	13	168.91 (255.28)		105.91 (l2l.63)		l2	l23.35 (l44.93)		96.l8 (l49.00)	
> 5	9	60.79 (58.51)		51.11 (78.54)		8	33.06 (37.62)		42.82 (57.40)	
Poor mental health in past 30 days			0.498		0.243			0.595		0.939
0	17	58.13 (185.87)		76.34 (157.21)		l2	54.l9 (l50.98)		32.08 (ll0.3l)	
1–5	11	28.60 (l07.07)		37.00 (75.66)		8	26.50 (ll3.46)		40.38 (86.65)	
> 5	13	71.42 (81.15)		29.32 (51.23)		l2	36.73 (73.l2)		60.00 (59.46)	

Abbreviation: IQR, Interquartile range.

[a] Numbers may not add to total due to missing data.

[b] p-value using non-parametric Mann-Whitney U-Test or Kruskal-Wallis Test.

[c] N = 34 for Months 7–12 data (Spark Premium + Fitbit group was only in trial for 6 months).

[d] Fitbit only group started SparkPeople in Month 7.

Table 4.

Correlation of Fitbit Wear Adherence With Activity and Fitness.

Variables	Spearman's ρ	p-value
1–3 month adherence (N = 44)		
1–3 month steps	0.382	0.010
1–3 month active minutes	0.373	0.013
1–3 month steps		
1–3 month active minutes	0.924	<0.001
4–6 month adherence (N = 44)		
4–6 month steps	0.371	0.013
4–6 month active minutes	0.556	<0.001
4–6 month steps		
4–6 month active minutes	0.861	<0.001
7–9 month adherence (N = 34)		
7–9 month steps	0.458	0.006
7–9 month active minutes	0.504	0.002
7–9 month steps		
7–9 month active minutes	0.935	<0.001
10–12 month adherence (N = 34)		
10–12 month steps	0.271	0.134
10–12 month active minutes	0.350	0.050
10–12 month steps (N = 34)		
10–12 month active minutes	0.815	<0.001
6-min walk test at 3 months (N = 44)		
1–3 month steps	0.460	0.002
1–3 month active minutes	0.473	0.002
6-min walk test at 6 months (N = 44)		
4–6 month steps	0.309	0.047
4–6 month active minutes	0.305	0.050

Table 5.

Correlation of Steps Per Day With Self-Efficacy and Physical Activity Strategies.

Variables	Spearman's ρ	p-value
1–3 month steps (N = 44)		
Baseline Self-efficacy, increase PA[a]	.257	0.092
Basline Track walking[b]	.395	0.008
Baseline PA goal setting and planning[b]	.395	0.008
4–6 month steps (N = 44)		
3-month Self-efficacy, increase PA[a]	.316	0.041
3-month Track walking[b]	.395	0.008
3-month PA goal setting and planning[b]	.514	0.001
7–9 month steps (N = 34)		
6-month Self-efficacy, increase PA[a]	.300	0.090
6-month Track walking[b]	.500	0.003
6-month PA goal setting and planning[b]	.402	0.020
10–12 month steps (N = 34)		
9-month Self-efficacy, increase PA[a]	.476	0.062
9-month Track walking[b]	.656	0.006
9-month PA goal setting and planning[b]	.457	0.075

Abbreviation: PA, physical activity.

[a]Health Beliefs survey, scale range 0–100 (certain I cannot-certain I can).

[b]Health Beliefs survey, scale range 1–5 (never-repeatedly).