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Breast Cancer Survivors' Preferences for Technology-Supported Exercise Interventions

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Abstract

Purpose—To explore breast cancer survivors' interest in and preferences for technology-supported exercise interventions.

Methods—Post-treatment survivors [n=279; M_{age}=60.7(SD=9.7)] completed a battery of online questionnaires in August 2015. Descriptive statistics were calculated for all data. Logistic regression analyses were conducted to examine relationships between survivors' interest in a technology-supported exercise interventions and demographic, disease and behavioral factors. These same factors were examined in relation to perceived effectiveness of such interventions using multiple regression analyses.

Results—About half (53.4%) of survivors self-reported meeting public health recommendations for physical activity. Fewer than half reported using an exercise or diet mobile app (41.2%) or owning an activity tracker (40.5%). The majority were interested in receiving remotely-delivered exercise counseling (84.6%), participating in a remotely delivered exercise intervention (79.5%) and using an exercise app or website (68%). Survivors reported the most helpful technology-supported intervention components would be: an activity tracker (89.5%); personalized feedback (81.2%); and feedback on how exercise is influencing mood, fatigue, etc. (73.6%). Components rated as least helpful were social networking integration (31.2%), group competitions (33.9%) and ability to see others' progress (35.1%).

Conclusions—Preferences for technology-supported exercise interventions varied among breast cancer survivors. Nonetheless, data indicate that technology-supported interventions may be

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CONFLICT OF INTEREST

The authors have no conflicts of interest to report. The authors have full control of all primary data and will allow the journal to review the data if requested.

feasible and acceptable. Engaging stakeholders may be important in developing and testing potential intervention components.

Keywords

Physical activity; physical exercise; breast cancer survivors; interventions; technology

INTRODUCTION

Higher levels of moderate to vigorous intensity physical activity (MVPA) are associated with fewer negative treatment-related side effects, better quality of life, and improved disease-specific outcomes (i.e. survival, progression and mortality) among breast cancer survivors [1, 2]. However, survivors demonstrate decreases in MVPA that persist post-treatment [3, 4] and are at least as inactive, or more inactive, than the general population [5–7] and other populations with chronic conditions [8–10]. While evidence has established the efficacy of exercise interventions for increasing MVPA [11] and improving health outcomes [1, 12] in breast cancer survivors, this research often includes intensive, on-site interventions which have several limitations including: burden on participants to travel to intervention sites, high cost and resource utilization, and required access to exercise facilities and supervision by highly trained staff. Thus, many existing effective interventions cannot be sustainably implemented in real-world settings and have limited potential to be brought to scale [13].

A recent review suggests less resource-intensive interventions delivered using phone or email may be as effective as more resource-intensive interventions for increasing breast cancer survivors' MVPA [14]. However, the only technology used in these studies was email. As technology-supported exercise interventions have demonstrated efficacy for increasing MVPA in other populations [15–18] and cellphones are becoming increasingly ubiquitous [19, 20], they may be a scalable, less resource-intensive strategy to reach more survivors. Despite their promise, only a few pilot studies have tested technology-supported exercise interventions among cancer survivors [21–23]. Among these studies, none included breast cancer survivors, and only a small number of ongoing studies are using technology to promote MVPA in this population [24, 25]. Thus, developing and testing technology-supported MVPA interventions has been identified as a priority for physical activity research in cancer survivors by the National Cancer Institute [25]. While technology offers significant promise, it alone is likely not a panacea. Two recent reviews [15, 17] indicate that interventions using apps or text messaging have low to moderate effects on MVPA in other populations. In contrast, two recent studies found an activity tracker along with other technology-supported intervention components (i.e. website, online social support) increased MVPA among women [26, 27]. However, all of these studies had various design limitations (i.e. low quality, no control group, no theoretical framework) and were not developed in consultation with the end-user which may have impacted their success. Careful consideration needs to be taken to ensure technology-supported exercise interventions for breast cancers are not only safe, but theory-driven and designed from the outset with the user (i.e. survivors) in mind to increase their relevancy and effectiveness. Before designing and testing technology-supported exercise interventions for breast cancer survivors, it is

necessary to determine whether these interventions may be acceptable and representative of survivors' preferences regarding program design, delivery mode and specific intervention components.

To the best of our knowledge, no studies have specifically focused on preferences for technology-supported exercise interventions among breast cancer survivors, though several studies have examined general preferences for exercise interventions in this population [28–32]. The purpose of the present study was to determine breast cancer survivors' interest in participating in a technology-supported exercise intervention and preferences for potential intervention components. These data will help to inform the development of effective, patient-centered, technology-supported exercise interventions for this population.

METHODS

Participants and Procedures

Participants were part of a study to determine preferences for various lifestyle interventions. Full study details have been provided elsewhere [33]. Briefly, survivors were recruited from a convenience sample of women who had participated in a previous study and had agreed to be contacted regarding additional study opportunities. Women found eligible based on a web-based screening questionnaire were automatically redirected to an online informed consent. Those giving consent were redirected to study questionnaires. Inclusion criteria included: age ≥18 years, prior breast cancer history (no limitations on type or stage), post-primary treatment, English-speaking, and Internet access.

Measures

Demographics and health history—Participants reported current age, marital status, race/ethnicity, income, education, and height and weight to calculate body mass index (BMI). They rated their overall health status (from poor to excellent) and indicated whether they had been diagnosed with any of 18 chronic conditions (e.g. diabetes, heart disease, depression, etc.). Participants' self-reported information about breast cancer history including date of diagnosis, disease stage, dates and treatment received, and cancer recurrence. Finally, participants reported mobile phone, tablet, and computer ownership.

Godin Leisure Time Exercise Questionnaire [34]—Participants indicated the frequency and average time they spent engaging in strenuous (e.g., jogging), moderate (e.g., fast walking), and mild (e.g., easy walking) exercise for at least 15 minutes over the past seven days. Activity frequencies were multiplied by 9, 5, and 3 metabolic equivalents, respectively, and summed to create a total leisure time activity score. Values greater than 24 were consistent with engaging in enough activity to achieve substantial health benefits [34]. Additionally, total time spent in MVPA was calculated by multiplying the weekly frequency by duration for strenuous and moderate activities.

Physical Activity-Related Technology Ownership and Usage—Participants were asked to indicate whether they owned an activity tracker and, if yes, which type of tracker

and number of days per week they typically wore the device. Survivors were also asked to indicate whether they used any diet/exercise mobile apps.

General Exercise Intervention Beliefs and Preferences—Survivors responded to a questionnaire that was used in similar studies [28–30] and modified for the present study. Participants were asked whether they believed women diagnosed with breast cancer should exercise. Those who answered "yes" were asked to provide the activity types they believed survivors should engage in. Women also indicated the maximum number of days they would be willing to exercise and their preferences for length, location, format and level of supervision of exercise sessions.

Technology-Supported Exercise Intervention Interest and Preferences—Using a questionnaire designed for this study, participants indicated their overall interest in participating in a technology-supported exercise intervention (Yes/No), whether they believed such an intervention would be effective from 1 (not effective) to 5 (very effective), and how often and for how long they were willing to use an exercise app each time they opened it. Breast cancer survivors also reported their interest in remote exercise counseling and delivery preferences for such counseling (e.g. phone calls, texts, emails). Additionally, participants rated how helpful they believed 15 potential technology-supported exercise intervention components would be on a scale from 1 (not helpful) to 5 (very helpful). Participants also indicated whether they believed that wearing an activity tracker would increase their exercise, the tracker metric(s) (i.e. steps, distance, minutes, etc.) they wanted feedback on, and what additional data (i.e. blood pressure, body weight, etc.) they would want linked to their activity data. Finally, enrollees were asked if they would be willing to share activity tracker data with their healthcare team.

Data Analyses

Descriptive statistics (means and standard deviations for continuous variables; frequencies for categorical variables) were calculated for all data including demographic and disease characteristics, technology ownership, physical activity, technology usage, and interests and preferences in technology-supported exercise interventions. We used logistic regression to examine the relationship between breast cancer survivors' interest in participating in a technology-supported exercise intervention and demographic (age, education, income, BMI, number of chronic conditions, general health status) and disease (age at diagnosis, time since treatment, disease stage, treatment received, recurrence) characteristics, and meeting public health recommendations for MVPA (yes/no). We used multiple regression to examine these same demographic and disease factors and MVPA in relation to participants' perceptions of the effectiveness of such an intervention. The model examining interest controlled for perceived effectiveness and the model examining perceived effectiveness controlled for interest. Missing data ranged from 0% (majority of included variables) to 16.8% (household income). Preliminary analyses indicated data were missing completely at random. As such, we used mean imputation to handle missing values. All analyses were conducted in IBM Statistical Package for the Social Sciences (SPSS; Armonk, NY: IBM Corp, V.22) [35].

RESULTS

Participant Characteristics

Data regarding demographic, disease, and treatment characteristics have been reported elsewhere [33]. Briefly, 270 breast cancer survivors who were on average 60.7 (SD= 9.7) years of age participated in the present study. The majority were White (97.1%) and non-Hispanic/Latino (98.2%). Most (71.7%) had at least a college degree, and 54.4% had an annual household income ≥$80,000. Three quarters (75.3%) reported ≥1 chronic condition, 55% were overweight or obese, and 69.5% reported good or excellent health status. The majority of women were diagnosed with early stage disease (55.2% stage 0 or I), had received surgery (89.6%), radiation (72.0%) or chemotherapy (58.8%) and were on average 10.2 (SD=7.3) years since treatment. Most survivors owned a computer (98.6%), smartphone (84.8%) or tablet (64.5%).

Physical Activity

The average total leisure activity score was 35.8 (SD=29.6); 64.9% of participants had a score ≥ 24 indicative of engaging in enough activity for substantial health benefits. On average, survivors self-reported 187.0 (SD= 17.4) minutes per week of MVPA. About half (53.4%) reported meeting public health recommendations (i.e. 150 minutes/week MVPA); 22.8% reported no MVPA.

Physical Activity-Related Technology Ownership and Usage

Less than half of participants reported owning an activity tracker (40.9%) or using a diet or exercise app (41.2%). Of those with an activity tracker, 53.1% reported wearing it ≥5 days/week and 28.3% reported wearing it ≤1 day/week. Fitbit was the most commonly owned (55.6%) tracker.

General Exercise Intervention Beliefs and Preferences

Data on survivors' general exercise intervention beliefs and preferences are presented in Table 1. Almost all participants (96.8%) believed women with a breast cancer history should exercise. The majority believed survivors should do aerobic activity (89.2%), strength training (77.4%) and yoga or Pilates (69.5%). On average, participants were willing to exercise a maximum of 5.3 (SD= 1.3) days per week. Most (82.8%) were willing to exercise 30 to <60 minutes per session. Survivors most preferred to exercise outdoors (36.2%) followed by at home (25.1%) or at a health club (24.4%) and least preferred to exercise at a cancer center (1.8%). Over half preferred a flexible exercise session schedule (57.7%) and a combination of group and individual exercise sessions (57.2%). Approximately half preferred to have some level of supervision by an exercise specialist either initially (26.3%) or for program duration (25.5%). Survivors were most interested in strength training (68.5%), yoga/Pilates (58.8%) and moderate intensity aerobic (57.0%) exercise programs. Specifically, they expressed greatest interest in walking (69.5%), resistance training (68.1%), yoga (64.9%) and interval training (47.3%) and least interest in water activities/swimming (20.8%), barre/ballet (11.5%) and jogging/running (10.0%).

Most breast cancer survivors (84.6%) were interested in remotely-delivered exercise counseling. The most preferred formats were an interactive website (52.5%), personalized emails (51.7%) and a mobile app (39.0%) while the least preferred were video (14.4%), telephone (8.1%) and an audio tape or podcast (8.1%). Women were most interested in receiving remotely-delivered exercise counseling from an exercise specialist affiliated with a cancer center (30.2%) or personal trainer (25.8%); and 23.3% had no preference. Survivors mostly preferred a combination of one-on-one and group exercise counseling sessions (49.8%).

Technology-Supported Exercise Intervention Interest and Preferences

Table 2 displays data relative to technology-supported exercise intervention interest and preferences. Most survivors (79.5%) were interested in participating in a remotely-delivered exercise intervention. About two-thirds agreed/strongly agreed that an app (66.0%) or interactive website (69.5%) designed to help breast cancer survivors increase exercise would be effective and they would use such an app (63.1%) or website (64.8%). Of those who indicating they would use an exercise app or website, about half were willing to use it 2–3 times/day, 6 to 7 days/week. These women were split almost evenly between those willing to spend 3 to <5 (35.7%) and 5 to 10+ (34.9%) minutes using the app or website each time. Less than half (42.5%) of survivors agreed/strongly agreed exercise DVDs would be effective or that they would use them (42.3%). Finally, survivors indicated a technology-supported exercise intervention would be somewhat/very helpful at each of these time points: before treatment (69.6%); during treatment (82.1%) and immediately (89.6%), 6 months (94.3%) and 6 months to 1 year (92.5%) post-treatment.

Preferences for Specific Intervention Components—Data on survivors' perceptions of specific technology-supported exercise intervention components are displayed in Table 3. Components rated as most helpful were activity trackers (89.5%), personalized feedback on exercise accomplishments (81.2%) and feedback on how exercise is influencing mood, fatigue, etc. (73.6%). Components rated as least helpful were integration with social networking sites (31.2%), group competitions (33.9%), and information about others' progress (35.1%).

About two-thirds (63.0%) of survivors believed wearing an activity tracker would increase exercise somewhat/a lot. The most popular tracker metrics survivors wanted feedback on were distance traveled (85.7%), steps taken (76.7%), and calories burned (75.3%). The least popular metrics were activity compared to others (19.7%), floors climbed (29.0%) and time in different activity types (40.9%). Survivors were most interested in having blood pressure (72.4%) or body weight (68.1%) data linked to tracker data and less interested in linking blood glucose and well-being data (30.5% for both). Finally, 74.4% specified willingness to share activity tracker data with their healthcare provider.

Factors Associated with Interest and Perceived Effectiveness of Technology-Supported Exercise Interventions

None of the demographic and disease characteristics examined were independently significantly associated with interest in participating in a technology supported exercise

intervention (χ^2= 20.8, df= 14, p= 0.11) or beliefs about the effectiveness of an exercise app (F(14, 264)=2.1, p= 0.01, R^2=0.05). However, meeting physical activity recommendations was associated with reduced interest in participating in a technology-supported exercise intervention (OR=0.33 95% CI= 0.13–0.87; p= 0.02) such that individuals who met recommendations were 67% less likely to indicate they were interested in such an intervention. Survivors who believed an exercise app would be effective were significantly (OR=1.9; 95% CI= 1.2–3.1; p= 0.01) more likely to indicate they were interested in participating in a technology-supported exercise intervention, and individuals who were interested in participating in such an intervention were more likely (β= 0.42; p=0.002) to believe it would be effective.

DISCUSSION

The purpose of the present study was to examine breast cancer survivors' interest in and preferences for remotely-delivered, technology-supported exercise interventions. Overall, the majority of participants believed breast cancer survivors should be physically active. Most were interested in participating in a technology-supported exercise intervention, believed an app or website designed to help breast cancer survivors increase exercise would be effective and indicated they would use such an app or website. These data suggest technology-supported exercise interventions would be acceptable to survivors. They also provide insight into survivors' preferences for program components, which should be taken into consideration when designing these interventions for breast cancer survivors.

Overall, our findings regarding general exercise program preferences were similar to those in previous studies [28–30, 32]. Most participants were willing to exercise at least 4 times per week for 30 to 60 minutes and wanted a flexible program with some combination of alone and group sessions. About half wanted at least some level of supervision, even if only at the beginning. Our sample was almost evenly divided among those wanting to exercise outdoors, at home or in a health club. Finally, the largest proportion of women were interested in participating in a strength training program, followed by yoga/Pilates, followed by moderate intensity aerobic exercise, which was consistent with the specific activities in which they expressed most interest. These data suggest there may not be a "one-size fits all" exercise intervention for survivors. Multi-modal interventions targeting more than one aspect of fitness (i.e. strength and aerobic) and offering a "menu" of choices for delivery mode may be necessary. Future research should explore the feasibility and effectiveness for increasing activity and improving health outcomes of an exercise intervention which permitted such a range of choices.

Although less than half of participants reported currently using an activity tracker or diet/exercise app, the majority (79.5%), regardless of demographic or disease characteristics, expressed an interest in participating in a technology-supported exercise intervention. This proportion was much greater than the 33.0–48.8% [28–30, 32] of breast cancer survivors who have reported general interest in an exercise program that did not explicitly incorporate technology [28–30, 32]. These data suggest that even older survivors, who comprise the majority of survivor population [36], may be interested in technology-supported interventions to increase physical activity. On the other hand, survivors who already met

physical activity guidelines expressed less interest, which could indicate they did not feel they needed such an intervention because they were already engaging in adequate activity. Although the majority of survivors were interested in participating in a technology-supported exercise intervention, about 15% fewer survivors thought an exercise app or website would be effective for increasing activity and that they would actually use it. Further, about 50% still wanted supervision by an exercise specialist. These discrepancies could suggest survivors: a) may be willing to try a exercise app or website, even if they are unsure of its effectiveness, b) don't think an app or website, alone, would be effective or c) may not be confident in their abilities to use such technology and may still want some level of supervision. Future research should explore these discrepancies and determine whether a tapered intervention where participants start with an app and supervised exercise and gradually "wean" to app only or a stepped care where those who don't respond to an app get "stepped up" to receive supervised exercise may be necessary for some individuals. Additionally, of survivors who indicated they would use an exercise app, the majority were willing to use it 2–3 times per day for at least 3–5 minutes at least 4–5 days per week, suggesting intervention content may need to be brief. Future research should investigate what technology-supported intervention components and combinations of components survivors are most effective and how to design these components to maximize adherence and engagement [37]. Finally, survivors believed a technology-supported exercise intervention would be helpful at almost all points on the treatment and early survivorship phases of the cancer control continuum from pre-treatment to 1 year post-treatment. Exercise interventions may need to be tailored based on time since diagnosis as barriers (e.g., symptom burden) and benefits (e.g., reducing fatigue, improving physical function) associated with increased MVPA may change. The adaptable algorithms programmable into mobile technologies may meet this need well. Future research should explore the feasibility/acceptability and effect on health outcomes of tailoring technology-supported exercise interventions to place on the treatment and early survivorship phase of the cancer control continuum (i.e. during treatment, 6 months post-treatment).

Emerging data from the general population indicates simply providing individuals with an app or text messages may not be enough to elicit significant changes in MVPA [15–17]. Our study adopted a patient-centered approach to try to understand what specific technology-supported exercise intervention components may be most salient to breast cancer survivors. The component survivors believed to be most helpful was an activity tracker. Commercially available activity trackers (e.g. Fitbit) are becoming increasingly popular. While these devices demonstrate significant promise as self-monitoring intervention tools, little is known about their effectiveness for increasing MVPA, alone, or in combination with other intervention components in breast cancer survivors. Studies in the general population and other chronic diseases indicate activity trackers may be effective tools in the context of multicomponent interventions [27], but may not be effective, alone, at creating meaningful *long-term* changes in MVPA [38–40]. Future research should examine their effectiveness among breast cancer survivors. In addition to an activity tracker, survivors believed personalized feedback on exercise accomplishments, feedback on how exercise influences mood, fatigue, etc. and encouraging text messages or e-mails would be helpful components for increasing MVPA.

The greatest variability in perceived helpfulness occurred for social support intervention components. The fewest survivors thought competitions (group or one-on-one), information on others' progress and integration with social networking sites would be helpful. However, approximately 40–60% of survivors thought individual support calls with an exercise counselor, ability to e-message other survivors, and telephone or online group sessions with an exercise counselor would be somewhat/very helpful. These data indicate that social components within technology-supported interventions may need to be carefully vetted with survivors before implementation or different options may need to be offered, so survivors can choose the ones that fit them best. Future research should engage breast cancer survivors using a mixed-methods approach to identify new, potential intervention components and implementation logistics for these components. For example, if the intervention engages a large and nationwide sample, the ability to execute some components, especially any virtual group sessions, may prove difficult because of conflicting schedules and time zones.

This study is not without limitations. First, our sample consisted of mostly White, high income, long-term breast cancer survivors. Additionally, sample recruitment and data collection were conducted using the Internet. As such, our findings may not be representative of individuals who are less technologically sophisticated. Examining preferences for technology-supported exercise interventions in more diverse breast cancer survivor groups (i.e. African American, Hispanic, younger) who vary in stage since diagnosis, technology usage, and technology experience is warranted. Further, this study is a cross-sectional observational study that used self-reported, multiple choice assessments. Future research should utilize focus groups or intensive longitudinal data collection in real-time (i.e. ecological momentary assessment) to gain further insight into the determinants and outcomes of MVPA participation and how these factors may change throughout the cancer experience to optimize technology-supported exercise interventions. Existing data of technology-supported interventions in other populations suggest there are many characteristics of the technology-supported features (i.e. text message content, appearance, real time feedback, ease of use) that may influence long-term engagement with, and adherence to, technology supported interventions [17]. We did not assess these factors in the present study. However, they should be examined in future research before deciding not only what features to implement, but how to implement them. Finally, future research should systematically and efficiently optimize interventions by testing potential intervention components and decision rules using A-B quasi experimental [41], multiphase optimization strategy (MOST) factorial experiments [42], sequential multiple assignment (SMART) designs [42], and microrandomized trials (MRT) [43]. These rigorous trial designs allow for rapid studies to identify and adapt the most effective technology-supported exercise intervention components, or component sequence, to answer the questions of what works for whom, in what contexts, and for what outcomes [44].

Despite these limitations, our study also has several strengths. To the best of our knowledge, this is the first study to examine breast cancer survivors' interest in and preferences for technology-supported exercise interventions. This is an important first step as engaging stakeholders prior to designing such an intervention may help increase its relevance and effectiveness [45]. These data can be used as a starting point to help identify the most promising technology-supported intervention features to further explore, develop and test.

Finally, the study sample was a relatively large, nationwide sample that included a wide range of disease and treatment characteristics indicating findings may be relevant to many breast cancer survivors.

In conclusion, many breast cancer survivors expressed an interest in participating in a technology-supported exercise intervention. These findings indicate such interventions may be feasible and acceptable to this population and highlight the: a) importance of engaging survivors in designing technology-supported exercise interventions and b) need for future research in this area to further understand what specific intervention components may be most feasible, acceptable and effective for increasing MVPA and improving associated health outcomes.

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Table 1

General Exercise Intervention Beliefs and Preferences

Women with breast should exercise (Yes)	96.8%
Type of Exercise Breast Cancer Survivors Should Engage in	
Aerobic (Yes)	89.2
Strength training (Yes)	77.4
Yoga/Pilates (Yes)	69.5
Maximum Number of Days Willing to Exercise per Week	5.25
2–3	11.2
4–5	49.1
6–7	38.4
Time Willing to Exercise per Session	
<30 minutes	9.7
30 to <60 minutes	82.8
>60 minutes	6.9
Preferred Exercise Location	
Outdoors	36.2
At Home	25.1
Health Club	24.4
No Preference	10.8
Cancer Center	1.8
Other	1.8
Preferred Structure of Exercise Sessions	
Flexible	57.7
Scheduled	36.2
No Preference	6.1
Exercise Session Group Preferences	
Combination of alone and group sessions	57.2
Alone	27.7
Group	15.1
Exercise Session Supervision Preferences	
Supervised by an exercise specialist initially, then unsupervised	26.3
Supervised by an exercise specialist	25.5
Completely unsupervised	13.7
Unsupervised but guided by DVDs, videos or specific instructions	12.6
Unsupervised but monitored by exercise specialist via app/website	9.4%
If you were to participate in an exercise program, which would you prefer? (Check all that apply)	
Strength training (Yes)	68.5
Yoga/Pilates (Yes)	58.8
Moderate intensity aerobic exercise (Yes)	57.0

Light intensity aerobic exercise	28.0
Vigorous intensity aerobic exercise	14.0
Other	3.6
What specific types of exercise would you be interested in doing? (Check all that apply.)	
Walking	69.5
Resistance training	68.1
Yoga	64.9
Interval training	47.3
Pilates	35.8
Dance	31.2
Aerobics	27.6
Bicycling	24.4
Water activities/swimming	20.8
Barre/Ballet	11.5
Jogging/running	10.0
Other	3.2
Interest and Preferences for Remotely-delivered Exercise Counseling	
Interested in Remotely Delivered Exercise Counseling	84.6
Type of Remotely Delivered Counseling Interested In	
Interactive website	52.5
Personalized emails	51.7
Mobile app	39.0
Pre-recorded online videos	36.4
Written material	34.7
Personalized text messages (Yes)	26.7
Pre-recorded DVD or Blu-Ray (Yes)	20.8
On-line video conferencing	14.4
Telephone counseling (Yes)	14.0
Audio tape or podcast	8.1
Missing	2.1
Who Should Deliver Remote Exercise Counseling	
Exercise specialist affiliated with cancer center	30.2
Personal trainer	25.8
No Preference	23.3
Exercise specialist at community center/health club	11.6
Other	9.1
Structure of Exercise Counseling Sessions	
Combination of one-on-one and group	49.8
One-on-one	42.0
Group	8.2

Table 2

Technology-Supported Exercise Intervention Interest and Preferences

Factor	Frequency (%)
Interested in an exercise intervention delivered via mobile phone, tablet or website	79.5 %
Technology Preference Format/Effectiveness	
Would use PA MOBILE APP for breast cancer survivors	
Agree/Strongly	63.1
Neutral	23.9
Strongly Disagree/Disagree	12.2
PA MOBILE APP for breast cancer survivors would be effective	
Agree/Strongly	66.0
Neutral	30.5
Strongly Disagree/Disagree	2.6
Would use interactive PA WEBSITE for breast cancer survivors	
Agree/Strongly	69.5
Neutral	23.0
Strongly Disagree/Disagree	7.2
Interactive PA WEBSITE for breast cancer survivors would be effective	
Agree/Strongly	64.8
Neutral	33.1
Strongly Disagree/Disagree	2.1
Would use PA DVD for breast cancer survivors	
Agree/Strongly	42.3
Neutral	34.1
Strongly Disagree/Disagree	23.6
PA DVD for breast cancer survivors would be effective	
Agree/Strongly	42.5
Neutral	47.8
Strongly Disagree/Disagree	9.7
Frequency and Duration of Exercise App/Website Usage	
Days per week would use app or website	
≤ 3 days	23.5
4–5 days	28.1
6–7 days	47.9
Times per day willing to use app	
1 time/day	26.0
2–3 times/day	49.2
4–5+ times/day	24.8
Minutes willing to spend using app each time	
0-<3 min	29.3

Factor	Frequency (%)
3-<5 min	35.7
5–10+ min	34.9

Table 3

Preferences for Specific Potential Technology-Supported Intervention Components and Activity Trackers

Factor	Rating (%)
Potential Intervention Feature	
Use of activity tracker (i.e. FitBit, JawBone, pedometer)	
Very/Somewhat Helpful	89.5
Not sure	7.2
Not very/Not Helpful	3.2
Personalized feedback on exercise accomplishments	
Very/Somewhat Helpful	81.2
Not sure	11.9
Not very/Not Helpful	6.8
Feedback on how exercise is influencing mood, fatigue, etc.	
Very/Somewhat Helpful	73.6
Not sure	16.6
Not very/Not Helpful	9.7
Encouraging text messages or emails	
Very/Somewhat Helpful	65.0
Not sure	20.6
Not very/Not Helpful	14.5
Exercise “buddy” to keep you accountable	
Very/Somewhat Helpful	59.5
Not sure	23.5
Not very/Not Helpful	16.9
Having activity information shared with your doctor	
Very/Somewhat Helpful	59.5
Not sure	27.1
Not very/Not Helpful	13.4
Individual support calls with an exercise counselor	
Very/Somewhat Helpful	59.1
Not sure	21.0
Not very/Not Helpful	19.9
Exercise DVDs or online videos/classes	
Very/Somewhat Helpful	54.5
Not sure	24.5
Not very/Not Helpful	20.9
Ability to e-chat with other women in the intervention	
Very/Somewhat Helpful	50.6
Not sure	23.8
Not very/Not Helpful	25.6

Factor	Rating (%)
Motivational stories/videos about similar women	
Very/Somewhat Helpful	40.8
Not sure	27.4
Not very/Not Helpful	31.7
Telephone or online group sessions with an exercise counselor	
Very/Somewhat Helpful	38.4
Not sure	28.6
Not very/Not Helpful	32.2
Individual, one-on-one, competitions with others in the program	
Very/Somewhat Helpful	35.7
Not sure	24.9
Not very/Not Helpful	39.4
Information about how others in the program are progressing	
Very/Somewhat Helpful	35.1
Not sure	34.7
Not very/Not Helpful	30.3
Group competitions with others in the program	
Very/Somewhat Helpful	33.9
Not sure	26.0
Not very/Not Helpful	40.1
Integration with social networking sites (e.g. Facebook, Twitter)	
Very/Somewhat Helpful	31.2
Not sure	29.3
Not very/Not Helpful	39.5
Activity Tracker Beliefs and Preferences	
Believe would help increase physical activity	
Somewhat/A lot	63.0
Not sure	33.7
Not much/Not much at all	3.2
Desired Feedback Metrics	
Distance traveled	85.7
Steps taken	76.7
Calorie burned	75.3
Heart rate	72.8
Time in different physical activity intensities	66.3
Sleep patterns	65.6
Time in different physical activity types	40.9
Floors climbed	29.0
Physical activity compared to others	19.7

Factor	Rating (%)
Potential Data to Link to Activity Tracker Data	
Blood pressure	72.4
Body weight	68.1
Well-being	30.5
Blood glucose	30.5
Willing to share activity tracker data with healthcare team	74.4
Willing to wear during adjuvant cancer treatment	91.8