HHS Public Access

Author manuscript

Menopause. Author manuscript; available in PMC 2020 April 01.

Published in final edited form as:

Menopause. 2019 April ; 26(4): 373–382. doi:10.1097/GME.0000000000001249.

Decreasing Menopausal Symptoms of Asian American Breast Cancer Survivors Through a Technology-Based Information and Coaching/Support Program

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Abstract

Objective: One of the most prevalent and distressing symptoms following breast cancer treatment is menopausal symptoms. Asian American breast cancer survivors have lower quality of life and often receive inadequate management of menopausal symptoms compared to other racial/ethnic groups. Technology-based programs could be a solution to fill the gap in care. The purpose of this study was to test the efficacy of a technology-based information and coaching/support program on menopausal symptoms of Asian American breast cancer survivors.

Methods: This study adopted a randomized pretest/posttest group design among 91 Asian American breast cancer survivors (42 in an intervention group who used the program and the American Cancer Society [ACS] website and 49 in a control group who used only the ACS website). The intervention was a theory-driven and culturally tailored intervention program that aimed to provide information and coaching/support using computers and mobile devices. Multiple instruments were used to measure background characteristics and menopausal symptoms at pre-test, post 1-month, and post 3-months. An intent-to-treat linear mixed-model growth curve analysis was used to analyze the data.

Results: The intervention group showed a significant decrease in the distress scores of menopausal symptoms over time: physical ($\beta = -0.07$, $p = 0.08$), psychological ($\beta = -0.13$, $p = 0.05$), psychosomatic ($\beta = -0.17$, $p = 0.06$), and total symptoms ($\beta = -0.19$, $p = 0.01$). Theory-based variables including attitudes, social influences and self-efficacy partially mediated the impact of the intervention on the distress scores of menopausal symptoms ($p < 0.10$).

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conflicts of interest: The other authors have nothing to disclose.

Conclusions: The program was effective in alleviating menopausal symptoms of Asian American breast cancer survivors.

Keywords

technology-based intervention; menopause; symptoms; Asian American; breast cancer; survivors

Introduction

Due to advances in early detection and treatment, breast cancer survivors represent nearly 70% of the 5.6 million female cancer survivors in the U.S.[1–3] These women usually have combinations of surgery, radiation, chemotherapy, or endocrine therapy, all of which could result in clinically significant symptoms including menopausal symptoms. Indeed, about 60% to 100% of breast cancer survivors reportedly experience at least one menopausal symptom.[4]

Chemotherapy could result in temporary or permanent ovarian failure and subsequent premature menopause in pre-menopausal women, and endocrine therapy could worsen existing menopausal symptoms.[5] Also, menopausal symptoms could result from quitting hormone therapy (HT) during the breast cancer treatment process[5]; those taking HT at the time of diagnosis are usually advised to cease HT.[2,6–9] Furthermore, about 52% of breast cancer patients taking tamoxifen complained of night sweats, and 78% of them experienced hot flashes.[2,6–9] These symptoms reportedly decrease the women's quality of life and daily functioning, and increase their fatigue, depression, anxiety, and sleep disruption.[2,6–9] The symptoms could be acute or chronic and could increase distress, subsequently compromising the women's quality of life.[10]

Asian American breast cancer survivors have been frequently reported to have lower quality of life compared to other racial/ethnic groups.[11–14] A major reason for their lower quality of life was postulated as inadequate management of symptoms including menopausal symptoms.[11,12,15,16] Furthermore, the relationship between poor quality of life and fewer sources of information and coaching/support for symptom management was stronger for Asian Americans than for Whites.[11,12,15,16] In Tu et al.'s study,[17] Chinese Americans lacked information and coaching/support despite high family support. Ashing-Giwa et al.[18] pointed out that family support delayed care seeking and caused self-deprecation in Asian Americans. These demonstrate a definite need for information and coaching/support in this specific population.

Technology-based programs could be a solution to fill the gap in care. Mainly because of easy access (e.g., no transportation required, 24-hour access, etc.) without time or cost constraints on both sides (patients and health care providers), technology-based programs are effective in providing information and coaching/support compared to conventional programs.[19–22] Researchers have also indicated their effectiveness in approaching isolated/marginalized people with stigmatized conditions and underserved populations such as racial/ethnic minority groups.[23–24] Furthermore, socially marginalized groups reportedly indicate greater interests in e-health than those not marginalized, and the marginalized groups value technology-based programs.[25–30]

In this study, a technology-based information and coaching/support program was tested for its efficacy on menopausal symptoms of Asian American breast cancer survivors. The program was developed based on the findings from previous studies[31–43] that focused on racial/ethnic differences in cancer pain and symptom experience. Subsequently, the program was culturally tailored to Asian American midlife women by incorporating their unique cultural attitudes toward breast cancer and menopausal symptom management. The program was theoretically based on the Bandura's Theory of Behavioral Change[44] while focusing on changing the women's attitudes, self-efficacy, and barriers (see the below for more information on the program). The hypotheses that were tested included:

- *Hypothesis 1.* Those who use the program and the American Cancer Society (ACS) website show significantly greater improvements than those who use only the ACS website in self-reported menopausal symptoms (total distress scores and frequencies) from a pre-test (Time 0) to two follow-up time points (post 1 month [Time 1] and post 3 months [Time 2]).
- *Hypothesis 2.* Theory-based variables (attitudes, social influences, perceived barriers, and self-efficacy) mediate the effects of the intervention on self-reported menopausal symptoms (total distress scores and frequencies) from Time 0 to Time 2.

Methods

A randomized repeated measures pretest/posttest control group design was adopted in this study. This was a part of an ongoing intervention study to examine the efficacy of a theory-driven, culturally tailored technology-based program on enhancing survivorship of Asian American breast cancer survivors. The parent study was approved by the Institutional Review Board of the institution where the authors were associated with. The CONSORT guidelines were used to guide the research process and reporting.[45] The data for the study have been collected from January 2017 to May 2018.

Samples and Settings

The participants have been recruited through online and offline support/social groups for Asian Americans (e.g., churches, organizations, forums, healthcare centers, professional groups, etc.). Study announcements were made by sending messages to gatekeepers (e.g., website owners, pastors, etc.) and by posting study flyers in various groups (e.g., social media groups, community support groups, etc.).

The inclusion criteria were those who (a) identified themselves as Chinese, Korean, or Japanese; (b) were aged 21 years and older; (c) were diagnosed with breast cancer in the past 5 years; (d) could read and write English, Mandarin Chinese, Korean, or Japanese; and (e) could access the Internet. A total of 91 Asian American breast cancer survivors completed the pre-test questionnaire. In the control group, the retention rate was 85.7% at post 1-month (n = 36) and 76.2% at post 3-months (n = 32). In the intervention group, the retention rate was 79.6% at post 1-month (n = 39) and 69.4% at post 3-months (n = 34; Figure 1). Despite the dropouts, no one officially withdrew from the study.

The sample size was calculated using the G*Power 3.1.9.2 software.[46] With an assumed effect size of 0.80[47](the difference in the menopausal symptom scores), at least 21 participants per group were necessary to achieve 80% of power at an alpha level of 0.10. Thus, the current number of participants (n = 91) was adequate to detect actual differences between the control and intervention groups over time.

TICAA

The TICAA is a theory-driven and culturally tailored intervention program that aims to provide information and coaching/support for Asian American breast cancer survivors. Again, the program is theoretically based on the Bandura's Theory of Behavioral Change.[44] According to the theory, changing individuals' attitudes, self-efficacy, perceived barriers, and social influences results in changes in health behaviors, subsequently influencing health outcomes. The TICAA is composed of culture-specific educational modules (provided in English, simplified and traditional Chinese, Korean, and Japanese), culture-specific online resources, and group and individual coaching by culturally matched nurse interventionists (e.g., Chinese RN interventionists for Chinese participants). The information and coaching/support provided by the TICAA are expected to change the women's attitudes related to breast cancer and symptom management, self-efficacy, perceived barriers, and social influences. In general, coaching/support[48–50] and information[51–54] reportedly change health behaviors through changing attitudes, self-efficacy, perceived barriers, and social influences. More detailed information on the TICAA is available elsewhere (to be added).

Instruments

Questions on background characteristics.

Background characteristics were measured using questions on age (in years), sub-ethnicity (Chinese, Korean, or Japanese), marital status (married/partnered or nonmarried/unpartnered), yearly family income (totally insufficient, somewhat insufficient, sufficient, or more than sufficient), perceived health status (1 = "not healthy at all" to 6 = "very healthy"), breast cancer type (invasive or non-invasive), breast cancer stage (stage 1 to 4 or unsure), symptom management (yes or no), and the use of medicine (yes or no). Initially, the participants' marital status was grouped into 5 categories, but it was later collapsed into two categories because less than 8% of the participants belonged to the 'single/never had partner/widowed' category.

Questions on Attitudes and Social Influences.

The sub-scales on attitudes and social influences from the Questions on Attitudes, Subjective Norm, Perceived Behavioral Control, and Behavioral Intention (QASPB)[55] were used to measure the participants' attitudes and social influences related to survivorship management. The sub-scale on attitudes included six items, and each item was assessed on a 6-point Likert scale (−3 = "dull" to 3 = "interesting"). The sub-scale on social influences consisted of three items, and each item was assessed on a 7-point Likert scale (1= "disagree" to 7 = "agree"). The attitudes and social influences scores were calculated by averaging the

items in each sub-scale. In this study, Cronbach's alpha of the attitudes sub-scale was 0.96 and that of the social influence sub-scale was 0.85.

Questions on perceived barriers.

To measure the participants' perceived barriers, the modified Barriers to Health Activities Scale[56] was used. The scale was comprised of sixteen items that asked the participants to rate the frequencies of interferences in managing issues/concerns related to breast cancer due to specific problems listed in individual items. Each item was assessed on a 4-point Likert scale (1 = "never" to 4 = "always"), and the average of all items was calculated as the perceived barrier scores. The scale had a high internal consistency (Cronbach's alpha = 0.91).

The Cancer Behavior Inventory (CBI-B).

Self-efficacy was measured with six items that were adopted from the CBI-B. The CBI-B assessed if the participants accepted cancer and maintained positive attitudes and confidence in seeking and understanding medical information and seeking social support.[57] Each item used a 9-point Likert scale (1 = "not at all confident" to 9 = "total confident"). The average of all items was calculated as the efficacy score. In this study, the scale showed a high internal consistency (Cronbach's alpha=0.90).

The Memorial Symptom Assessment Scale-Short Form (MSAS-SF).

Items on menopausal symptoms were extracted from the MSAS-SF. The MSAS-SF is a well-validated tool for assessing the distress and frequency of symptoms in cancer patients during the past seven days.[58] The distress subscale measures the distress associated with 28 prevalent physical and psychological symptoms (particularly where symptom frequency is not important, such as hair loss), whereas the frequency subscale measures four prevalent psychologic symptoms. For the current study, only the items related to menopausal symptoms were selected from the MSAS-SF.

The items on menopausal symptoms were divided into three categories based on the Midlife Women's Symptom Index (MSI)[59]: physical, psychological, and psychosomatic symptoms. The symptom distress subscale included 15 physical symptoms, two psychological symptoms, and two psychosomatic symptoms. Physical symptoms included "nausea," "vomiting," "shortness of breath," "night sweats," "feeling bloated," "problems with urination," "diarrhea," "weight loss," "itching," "changes in skin," "constipation," "swelling of arms or legs," "numbness/tingling in hands/feet," "lack of appetite," and "pain." Psychological symptoms included "difficulty concentrating" and "problems with sexual interest or activity." Psychosomatic symptoms include "difficulty sleeping" and "dizziness." The symptom distress was scored on a 5-point Likert scale (0.8 = "not at all" to 4.0 = "very much"). The total distress scores were calculated as the average of the three symptom sub-scores (physical, psychological and psychosomatic symptoms); each sub-score was the average of the items in each symptom category. In this study, Cronbach's alpha of the symptom distress subscale was 0.84.

The symptom frequency was assessed only for four psychological symptoms (“feeling sad,” “worrying,” “feeling irritable,” and “feeling nervous”). The symptom frequency was rated on a 4-point Likert scale (1 = “rarely” to 4 = “almost constantly”). The total frequency score was calculated as the average of the item ratings. In this study, Cronbach’s alpha of the symptom frequency subscale was 0.86.

Data Collection Procedures

The participants could select one of the five language versions of the project website (English, Mandarin Chinese [traditional and simplified], Korean, and Japanese). When potential participants visited the project website and clicked the ‘I agree to participate’ button (after reviewing the electronic informed consent form in their selected languages), they were screened against the inclusion criteria. Only those who met the inclusion criteria were linked to the pre-test questionnaire. At the completion of the pre-test questionnaire, the participants were enrolled into the project website by research staff. During the enrollment process, the participants were automatically randomized into two groups (control vs. intervention groups) using an automated random number generator on the project website. They were allowed to change their IDs and passwords once they logged in the project website. Then, an electronic instruction sheet was given to the participants (e.g., information on when they need to re-visit, when to complete the next questionnaires, how to use the program, etc.).

Both groups were provided with a link to the American Cancer Society (ACS) websites on breast cancer survivorship including menopausal symptom management and asked to use the website whenever they wanted. For three months, the intervention group was required to use both the TICCA program and the ACS websites while the control group was required to use only the ACS website. The intervention group was provided with weekly group or individual coaching sessions by culturally-matched nurse interventionists. They were also encouraged to utilize culture-specific online resources that were available on the project website. At the end of the first and the third months, the participants were asked to fill out the second and third questionnaires. Both groups were also asked to maintain their usual information searches through their usual resources. Biweekly reminders and thank you emails were sent to the participants.

Data Analysis

All analyses were performed using the SAS, version 9.4. (SAS Institute, Cary, NC). Statistical significances were determined at an alpha level of 0.10 due to the relatively small sample size. To retain the maximum number of cases, mean substitutions were used for continuous variables when there were less than 20% missing data while missing data were kept for the categorical variables. All the continuous and categorical variables had less than 20% missing fields in the intervention and control groups (no significant differences in missing information). All outcome variables were examined for normality, and the data with non-normal distributions were log-transformed before the analyses. The data were analyzed using an intention-to-treat approach.

First, the data were analyzed using descriptive statistics (e.g., frequencies, percentages, means, or standard deviations) to describe the participants' background characteristics. Also, these characteristics were compared between the control and intervention groups using chi-square tests, Fisher's exact tests, and two-sample independent *t*-tests. No significant differences were found in the characteristics between the Intervention and control groups.

To test the intervention effects, a linear mixed-model growth cure analysis was adopted with both fixed and random effects in the model, using the SAS PROC MIXED.[60] A separate mixed model was built for each outcome, and the analysis included the effects of time (pre-test, post-1-month, and post-3-months), treatment groups (control and intervention), and time x treatment group interactions. In addition, a random intercept and a random slope (only with a significant time fixed effect) were modeled to account for individual variations in the changes in the menopausal symptom scores over time. Further, theory-based variables (attitudes, social influences, perceived barriers, and self-efficacy) were included as additional predictors in each linear mixed-model in order to examine their potential mediating effects. The analysis used the maximum likelihood estimation, the unstructured covariance structure, and the Kenward-Roger degree of freedom method. The degree of freedom method is ideal for this study because it could be used in models with unbalanced designs, could handle complex covariance structures, and could adjust for the bias due to a small sample size.[61] With nested models, the Akaike information criterion (AIC) was compared to select the best fitting model.

Results

Characteristics of the Participants

Table 1 presents the participants' background characteristics; the control and intervention groups did not significantly differ in their background characteristics. The average age was 51.3 years (SD=11.31). About 57%, 23%, and 20% of the participants were Chinese, Korean, and Japanese, respectively. Approximately two-thirds of the participants were married or partnered. The participants were almost equally divided into the insufficient and sufficient income groups. The participants tended to perceive their health as "fair" (the total mean score = 3.46 on a 6-point scale [1~6], SD = 1.07). Over two-thirds of the participants had an invasive form of breast cancer (Stage I or II). About 64% were managing their symptoms, and a majority of them (80.9%) were taking medications. In particular, almost all the participants were taking estrogen antagonists such as tamoxifen, letrozole, or anastrozole for treatment of their hormonally-responsive breast cancer.

Table 2 compares the outcome and theory-based variables by group at pre-test. There were no statistically significant group differences in the distress scores of physical, psychosomatic, and psychological symptoms as well as in the frequencies of psychological symptoms. In addition, no statistically significant differences were found between the groups in the women's attitudes, social influences, perceived barriers, and self-efficacy.

The Effects on Menopausal Symptoms (Hypothesis 1)

Table 3 shows the fixed effects of time, study arms, and time x study arm interactions after controlling for the random intercept/slope. The intervention group showed a significant decrease in the distress scores of menopausal symptoms over time: physical ($\beta = -0.07$, $p = 0.08$), psychological ($\beta = -0.13$, $p = 0.05$), psychosomatic ($\beta = -0.17$, $p = 0.06$), and total symptoms ($\beta = -0.19$, $p = 0.01$). The distress scores of menopausal symptoms (in each domain and in total) were not significantly different between the groups at pre-test when individual variations were taken into account. The time effect was not statistically significant since the directions of the time-related changes in the distress scores of menopausal symptoms were opposite between the groups. In addition, the frequencies of psychological symptoms significantly decreased over time for both groups ($\beta = -0.11$, $p = 0.01$) although the time x study arm interaction was not statistically significant.

The Mediation of the Theory-Based Variables (Hypothesis 2)

Table 4 shows the changes in the time x study arm interaction coefficients for the distress scores and frequencies before and after adjusting for each of the theory-based variables. Notably, a percent difference in the magnitudes of the regression coefficients was calculated between the unadjusted and adjusted models in order to determine the extent of mediation of each theory-based variable. The values were calculated by $100*(\beta_0-\beta_1)/\beta_{0,}$ where (β_0) is the coefficient in an initial baseline model and (β_1) is the coefficient in a model, adjusted for each theory-based variable.

Model 1 included the fixed effects (time, study arm, and time x study arm) and random intercept or slope. Models 2 to 5 were controlled for the women's attitudes, social influences, perceived barriers, and self-efficacy, respectively. After adjusting for the attitudes in Model 2, there were decreases (ranged from 6.00% to 48.30%) in the time x study arm interaction coefficients across the outcome variables (the symptom distress scores and frequencies). The attitudes in Model 2 fully mediated the intervention effect on the distress scores of physical symptoms ($\beta = -0.07$ [$p<0.10$] to -0.06 [not significant]) while the attitudes partially mediated its effect on the distress scores of psychological ($\beta = -0.13$ to -0.12, $p < 0.10$), psychosomatic ($\beta = -0.17$ to -0.16, $p < 0.10$]), and total symptoms ($\beta = -0.12$ to -0.06, $p < .05$]). The inclusion of social influences in Model 3 also decreased the interaction coefficients from 7.80% to 36.40% across the outcome variables. The social influences in Model 3 partially mediated the intervention effect on the distress scores of all types of symptoms ($\beta = -0.07 \sim -0.06$, $p < 0.10$ for physical symptoms; $\beta = -0.13 \sim -0.12$, $p < 0.05$ for psychological symptoms; $\beta = -0.17 \sim -0.15$, $p < 0.10$ for psychosomatic symptoms; and $\beta = -0.12 \sim -0.11$, $p < 0.05$ for total symptoms). Yet, the perceived barriers in Model 4 barely mediated the intervention effect on the distress scores of all types of symptoms according to the percent differences in the magnitudes of coefficients that were almost zero (range: 0.00–0.08). Finally, the self-efficacy in Model 5 partially mediated the intervention effect on the distress scores of all symptoms ($\beta = -0.069 \sim -0.068$, $p < 0.10$ for physical symptoms; $\beta = -0.133 \sim -0.130$, $p < 0.05$ for psychological symptoms; and $\beta = -0.167 \sim -0.160$, $p < 0.10$ for psychosomatic symptoms; and $\beta = -0.118 \sim -0.111$, $p < 0.05$ for total symptoms). After adjusting for the self-efficacy in Model 5, there were decreases (ranged from 1.5% to 9.1%) in the interaction coefficients across the outcome variables.

Based on the percent differences in the magnitudes of coefficients between the unadjusted and adjusted models, the extent of mediation was the strongest for the women's attitudes and social influences, followed by self-efficacy and perceived barriers. Yet, no theory-based variables mediated the intervention effects on the symptom frequencies.

Discussion

The findings supported the beneficial effects of the TICAA on alleviating menopausal symptoms of Asian American breast cancer survivors by changing the women's attitudes, self-efficacy, and social influences. This finding is consistent with those in the literature on technology-based programs; technology-based programs in general effectively provide information and coaching/support, change health behaviors, and improve health outcomes.[19_22]

Usually, 3 months are considered to be adequate to observe significant effects of a technology-based intervention on decreasing menopausal symptoms.[62] In a systematic literature review, the average intervention period of technology-based interventions related to menopause was 52 days (range = 1–90 days).[62] The findings of this study certainly agrees with the literature; the 3-month intervention period of the TICAA was adequate to decrease menopausal symptoms by changing the women's attitudes, self-efficacy, and social influences.

The 3-month period of the intervention, yet, was not enough to change the women's perceived barriers related to symptom management in this study. The literature supports that dividing a person's assessment on the barriers to a specific behavior (perceived barriers) from the assessed difficulty of the behavior (self-efficacy) is infeasible.[63] Thus, some researchers suggest merging the two concepts so that research participants could be asked for their confidence to deal with specific barriers ("barriers-based self-efficacy").[63] Since the two concepts were measured using different scales in this study, the different findings in the two concepts (significant changes in self-efficacy, but no significant changes in perceived barriers) may be due to differences in the instruments (e.g., validity, reliability, etc.).

Because researchers usually do not have the controllability of users' behaviors in technology-based interventions using computers and mobile devices,[64] the reliability of the data that are collected through the technology-based interventions totally depends on the users' willingness and acceptance of the intervention.[65] Subsequently, high dropout rates have been reported as a major weakness of the technology-based interventions.[65] Indeed, research participants could not feel pressured to complete the intervention or questionnaires,[66] could easily stop participating in the study by leaving the Website,[67] and/or could feel uncomfortable about using technology.[68] However, this study indicated relatively high retention rates (about or over 80% across the groups and time points), which is much higher than the retention rates that have been reported in the current literature.[62] Maybe, this is due to the fact that the intervention was culturally tailored to this specific population by incorporating culture-specific components with several culture-specific features (e.g., the use of culturally matched interventionists, ethnic-specific educational sessions, etc.). Also, the high retention rates might reflect Asian Americans' tendency in their research participation;

they wanted to be a good research participant.[69] The literature also supports the characteristics of Asian culture that emphasizes a balance and harmony in interactions.[70]

The findings, yet, need to be carefully interpreted due to the following limitations. First of all, this study tended to include a wide range of menopausal symptoms in order to reflect diverse menopausal symptoms of ethnically different populations, which could confound the findings. Furthermore, menopausal symptoms were measured using a non-menopause specific instrument and the items were pre-determined by the parent study, which might cause the underestimation or overestimation of the women's actual menopausal symptoms. In addition, there could possibly exist selection biases because the participants had to have access to the Internet (using computers or mobile devices). Moreover, all the data were self-reported, which could be a source of bias as well. Because the study was a technology-based intervention study targeting a hidden underserved population in the communities, it was essential to ensure participants' anonymity. Subsequently, it was virtually impossible to obtain the participants' medical records to confirm their self-reported data (e.g., their diagnosis of breast cancer). Finally, there was no control of the sample selection process and the sample size because this was a part of the ongoing parent study.

Conclusions

The findings of this study strongly supported the efficacy of a 3-month technology-based intervention on alleviating menopausal symptoms among Asian American breast cancer survivors. Also, the findings supported that the TICAA could change the women's attitudes, self-efficacy, and social influences, and subsequently decrease the women's menopausal symptoms. Based on the findings, this paper concludes with the following implications for future research and practice. First, a 3-month intervention period would be sufficient for future technology-based interventions that aim to decrease menopausal symptoms of Asian American breast cancer survivors. Second, possible response biases (e.g., social desirability bias) need to be carefully monitored and controlled during the intervention process. Third, further studies with diverse groups of women are needed to confirm the findings reported in this paper. Also, objective measures confirming self-reported data need to be incorporated into future research and practice in order to avoid possible biases that may result from self-reported data. Finally, more studies are needed to determine the best ways to deliver an intervention to racial/ethnic minority breast cancer survivors.

Acknowledgments

Source of Funding: The study was funded by the National Cancer Institute (NIH/NCI; 1R01CA203719).

Financial disclosures: Dr. Mao is supported by a grant from the National Institutes of Health/National Cancer Institute Cancer Center (P30 CA008748).

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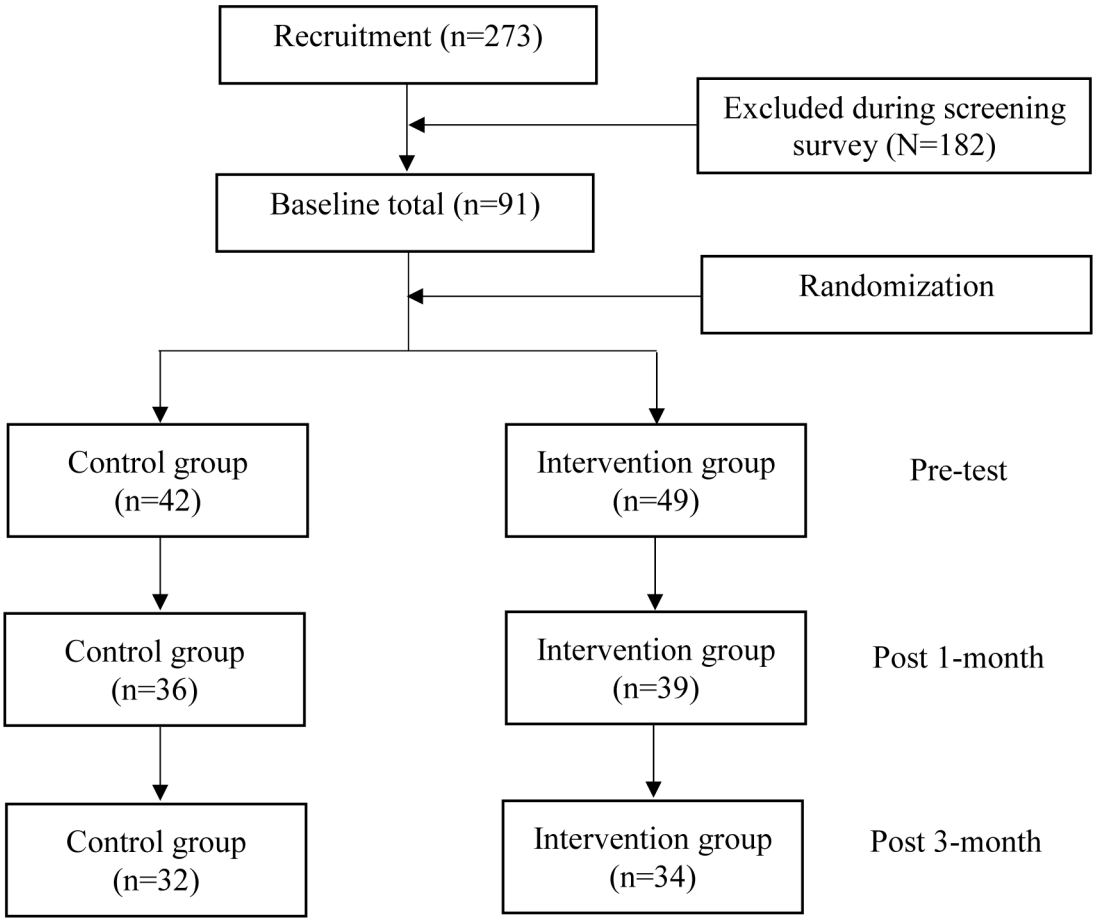

Figure 1.
The participant flow diagram.

Table 1.

Characteristics of the control and intervention groups at the pre-test.

Characteristics	Range	Control (N=42)	Intervention (N=49)	Total (N=91)	*p*
Age (y) (Mean±SD)	21–79	51.91±10.01	50.63±12.75	51.32±11.31	.59
Subethnicity, N (%)					.22
Chinese		28 (66.67)	24 (48.98)	52 (57.14)	
Korean		7 (16.67)	14 (28.57)	21 (23.08)	
Japanese		7 (16.67)	11 (22.45)	18 (19.78)	
Marital status, N (%)					.23
Married or partnered		32 (76.19)	31 (64.58)	63 (70.00)	
Nonmarried or unpartnered		10 (23.81)	17 (35.42)	27 (30.00)	
Yearly family income, N (%)					.11
Totally insufficient		4 (9.76)	12 (25.00)	16 (17.98)	
Somewhat insufficient		2 (41.46)	13 (27.08)	30 (33.71)	
Sufficient		13 (31.71)	19 (39.58)	32 (35.96)	
More than sufficient		7 (17.07)	4 (8.33)	11 (12.36)	
Perceived health status (Mean±SD)	1.0–5.8	3.57±0.96	3.34±1.16	3.46±1.07	.30
Breast cancer: types, N (%)					.56
Invasive		27 (75.00)	37 (80.43)	64 (78.05)	
Non-invasive (in situ)		9 (25.00)	9 (19.57)	18 (21.95)	
Breast cancer: stages, N (%)					.99[a]
Stage1		13 (32.50)	17 (35.42)	30 (34.09)	
Stage2		17 (42.50)	20 (41.67)	37 (42.05)	
Stage3		4 (10.00)	5 (10.42)	9 (10.23)	
Stage4		2 (5.00)	3 (6.25)	5 (5.68)	
Unsure		4 (10.00)	3 (6.25)	7 (7.95)	
Symptom management, N (%)					.65
Yes		22 (61.11)	31 (65.96)	53 (63.86)	
No		14 (38.89)	16 (34.04)	30 (36.14)	
The use of medication, N (%)					.32
Yes		35(85.37)	37 (77.08)	72 (80.90)	
No		6 (14.63)	11 (22.92)	17 (19.10)	

SD = standard deviation

[a]Fisher's exact test

Table 2.

Outcome and theory-based variables by group at the pre-test.

Outcome variables (Mean±SD)	Range	Control (N=42)	Intervention (N=49)	Total (N=91)	*p*
Symptom Distress					
Physical symptoms[a]	0.8–2.4	1.40±0.38	1.42±0.50	1.41±0.45	.82
Psycho logical symptoms[b]	0.8–2.9	1.67±0.50	1.72±0.70	1.70±0.61	.66
Psychosomatic symptoms[c]	0.8–3.5	1.67±0.63	1.89±0.84	1.75±0.75	.35
Total	0.8–2.6	1.58±0.39	1.65±0.58	1.62±0.50	.66
Symptom Frequency					
Psychological symptoms[d] (log transformed)	0.9–3.6	1.93±0.67	1.84±0.73	1.89±0.70	.57
Theory-based variables					
Attitudes	1.2–5.9	3.49 (2.03)	4.06 (1.89)	3.80 (1.96)	.17
Social influences	1.1–6.8	5.72 (1.45)	5.61 (1.28)	5.67 (1.36)	.71
Perceived barriers	1.0–3.9	3.12 (0.55)	2.98 (0.61)	3.05 (0.59)	.27
Self-efficacy	1.1–8.8	5.96 (1.56)	6.16 (1.77)	6.06 (1.67)	.55

SD = standard deviation/ All categories of symptoms were measured using the MSAS-SF.

[a]Physical symptoms included ‘nausea,’ ‘vomiting,’ ‘shortness of breath,’ ‘sweats,’ ‘feeling bloated,’ ‘problems with urination,’ ‘diarrhea,’ ‘weight loss,’ ‘itching,’ ‘changes in skin,’ ‘constipation,’ ‘swelling of arms or legs,’ ‘numbness/tingling in hands/feet,’ ‘lack of appetite,’ and ‘pain.’

[b]Psychological symptoms included ‘difficulty concentrating’ and ‘problems with sexual interest or activity.’

[c]Psychosomatic symptoms included ‘difficulty sleeping’ and ‘dizziness.’

[d]Psychological symptoms included ‘feeling sad,’ ‘worrying,’ ‘feeling irritable,’ and ‘feeling nervous.’

Table 3.

Menopausal symptoms at pre-test, post-1-month, and post-3-months by group.

	Control (N=42)		Intervention (N=49)		*p*		
Outcome variables	**Mean**[+]	**SD**	**Mean**	**SD**	**Group**	**Time**	**Group*Time**
Symptom Distress							
Physical symptoms[a]							
Pre-test	1.40	0.32	1.42	0.37	.76	.21	.08*
Post 1 month	1.41	0.29	1.36	0.34			
Post 3 months	1.42	0.27	1.31	0.32			
Psychological symptoms[b]							
Pre-test	1.64	0.37	1.76	0.47	.39	.28	.05**
Post 1 month	1.67	0.33	1.65	0.43			
Post 3 months	1.71	0.29	1.55	0.38			
Psychosomatic symptoms[c]							
Pre-test	1.67	0.47	1.82	0.66	.34	.13	.06*
Post 1 month	1.69	0.42	1.67	0.56			
Post 3 months	1.70	0.42	1.52	0.49			
Total							
Pre-test	1.57	0.33	1.66	0.45	.36	.098*	.01**
Post 1 month	1.59	0.31	1.57	0.41			
Post 3 months	1.61	0.30	1.47	0.37			
Symptom Frequency							
Psychological symptoms[d] (log transformed)							
Pre-test	1.94	0.54	1.82	0.54	.40	.008***	.89
Post 1 month	1.84	0.42	1.71	0.45			
Post 3 months	1.73	0.37	1.59	0.43			

SD = standard deviation/ All categories of symptoms were measured using the MSAS-SF.

[+]Predicted means for individual outcomes by group and time.

[a]Physical symptoms included ‘nausea,’ ‘vomiting,’ ‘shortness of breath,’ ‘sweats,’ ‘feeling bloated,’ ‘problems with urination,’ ‘diarrhea,’ ‘weight loss,’ ‘itching,’ ‘changes in skin,’ ‘constipation,’ ‘swelling of arms or legs,’ ‘numbness/tingling in hands/feet,’ ‘lack of appetite,’ and ‘pain.’

[b]Psychological symptoms included ‘difficulty concentrating’ and ‘problems with sexual interest or activity.’

[c]Psychosomatic symptoms included ‘difficulty sleeping’ and ‘dizziness.’

[d]Psychological symptoms included ‘feeling sad,’ ‘worrying,’ ‘feeling irritable,’ and ‘feeling nervous.’

*$p < .10$

**$p < .05$

*** $p < .01$

Table 4.

Regression coefficients of menopausal symptom distress scores and frequencies (unadjusted and adjusted for theory-based variables).

Outcome variables	Group x Time interaction								
	Model 1[e]	*Model 2*[f]	% difference in magnitude of β (Model 1 vs 2)	*Model 3*[g]	% difference in magnitude of β (Model 1 vs 3)	*Model 4*[h]	% difference in magnitude of β (Model 1 vs 4)	*Model 5*[i]	% difference in magnitude of β (Model 1 vs 5)
Symptom distress									
Physical[a]	−0.069*	−0.061	−11.60	−0.058*	−15.94	−0.069*	0.00	−0.068*	−1.45
Psychological[b]	−0.133**	−0.120*	−9.77	−0.122**	−8.27	−0.133**	0.00	−0.130**	−2.26
Psychosomatic[c]	−0.167*	−0.157*	−6.00	−0.154*	−7.78	−0.166*	−0.06	−0.160*	−4.19
Total	−0.118**	−0.061**	−48.30	−0.108**	−8.47	−0.119**	0.08	−0.111**	−5.93
Symptom frequency									
Psychological[d] (log transformed)	−0.011	−0.008	−27.27	−0.007	−36.36	−0.011	0.00	−0.010	−9.09

Note. The group x time interactions were estimated for the intervention group, relative to the control group as a reference/ / All categories of symptoms were measured using the MSAS-SF.

[a]Physical symptoms included ‘nausea,’ ‘vomiting,’ ‘shortness of breath,’ ‘sweats,’ ‘feeling bloated,’ ‘problems with urination,’ ‘diarrhea,’ ‘weight loss,’ ‘itching,’ ‘changes in skin,’ ‘constipation,’ ‘swelling of arms or legs,’ ‘numbness/tingling in hands/feet,’ ‘lack of appetite,’ and ‘pain.’

[b]Psychological symptoms included ‘difficulty concentrating’ and ‘problems with sexual interest or activity.’

[c]Psychosomatic symptoms included ‘difficulty sleeping’ and ‘dizziness.’

[d]Psychological symptoms included ‘feeling sad,’ ‘worrying,’ ‘feeling irritable,’ and ‘feeling nervous.’

[e]Model 1 = group + time + group x time + random intercept/slope

[f]Model 2 = Model 1 + attitudes

[g]Model 3 = Model 1 + social influences

[h]Model 4 = Model 1 + perceived barriers

[i]Model 5 = Model 1 + self-efficacy

*$p < .10$

**$p < .05$