Randomized Pilot Test of a Simultaneous Stage-Matched Exercise and Diet Intervention for Breast Cancer Survivors

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Purpose/Objectives: To investigate the feasibility and preliminary effects of a simultaneous stage-matched exercise and diet (SSED) intervention in breast cancer survivors.

Design: Randomized, controlled trial.

Setting: Oncology outpatient treatment clinics at the National Cancer Center in South Korea.

Sample: 45 women with breast cancer who completed their cancer therapy.

Methods: Participants were assigned to the SSED intervention group (n = 23) or a control group (n = 22). Participants in the SSED group received a 12-week individualized intervention promoting prescribed exercise and a balanced diet through stage-matched telephone counseling and a workbook.

Main Research Variables: Program feasibility, behavioral outcomes (stage of motivational readiness for exercise and diet, physical activity, and diet quality), and quality-of-life (QOL) outcomes (functioning and global QOL, fatigue, anxiety, and depression).

Findings: Participant evaluations of the SSED intervention indicated that it was feasible and acceptable. All women felt that the overall intervention contents were appropriate, and 95% believed that the intervention helped to promote healthy behaviors. Objective data also supported the SSED intervention's feasibility (i.e., 91% completed the trial and 100% of intervention calls were received). When compared to control, the SSED intervention group showed significantly greater improvement in motivational readiness for exercise and diet, emotional functioning, fatigue, and depression.

Conclusions: Preliminary results suggest that the SSED intervention delivered via telephone counseling and workbook is feasible and beneficial for positive behavioral and QOL outcomes.

Implications for Nursing: Nurse-led lifestyle interventions may improve QOL for cancer survivors.

Breast cancer and its treatments often are associated with adverse effects that can persist for years and decrease health-related quality of life (QOL) (Ahn et al., 2007; Vallance, Courneya, Plotnikoff, Yasui, & Mackey, 2007). In addition, survivors are at increased risk for developing secondary cancers and other morbidities, including cardiovascular disease, diabetes, and osteoporosis (Aziz & Rowland, 2003; Brown, Brauner, & Minnotte, 1993; Hewitt, Rowland, & Yancik, 2003). Evidence suggests that lifestyle behaviors such as regular exercise and a healthy diet can improve health-related QOL and relieve symptom problems and mood disturbances (Basen-Engquist et al., 2006; Blanchard et al., 2003; Courneya, Mackey, et al., 2003; Daley et al., 2007; Darga et al., 2007; Demark-Wahnefried, Rock, Patrick, & Byers, 2008; McBride, Emmons, & Lipkus, 2003; Pinto, Frierson, Rabin, Trunzo, & Marcus, 2005; Tangney, Young, Murtaugh, Cobleigh, & Oleske, 2002; Vallance et al., 2007; Wayne et al., 2006). Healthful lifestyle behaviors also reduce comorbidities, the risk of recurrence, and cancer-specific mortality (Chlebowski et al., 2006; Demark-Wahnefried, Aziz, Rowland, & Pinto, 2005; Demark-Wahnefried, Pinto, & Gritz, 2006; Hewitt et al., 2003; Hewitt, Greenfield, & Stovall, 2005).

Few studies have tested theoretically based interventions that can alter lifestyle behaviors. One such model, the transtheoretical model of change (TTM), is based on the idea that people's readiness to change behavior progresses in stages. According to the TTM, individuals adopting a new behavior progress along the following continuum of five stages of change: precontemplation

(not intending to change), contemplation (intending to change in the foreseeable future), preparation (intending to change in the near future or making a small change), action (engaging in a new behavior), and maintenance (sustaining the behavior change) (Prochaska & Velicer, 1997). The TTM attempts to explain how, rather than why, behavior change occurs by taking a pragmatic approach and offering explicit suggestions for how people can be helped to change their behavior (Adams & White, 2003). Therefore, the TTM is well suited to developing individually tailored interventions. TTM stage-matched interventions can be effective in the enhancement of motivational readiness, adoption, and maintenance of new health behaviors (Adams & White, 2003; Prochaska & Velicer, 1997).

Most studies of TTM-based lifestyle interventions among cancer survivors focus only on exercise behavior (Carmack Taylor et al., 2006; Daley et al., 2007; Pinto et al., 2005) or sequential behaviors (i.e., exercise after diet intervention or vice versa) (Demark-Wahnefried, Clipp, et al., 2006; Demark-Wahnefried et al., 2007). However, simultaneous exercise and diet interventions may be more effective than either intervention alone (Agency for Healthcare Research and Quality, 2004; Blanchard et al., 2004).

Most studies of lifestyle interventions for cancer survivors have been conducted in Western countries (Basen-Engquist et al., 2006; Carmack Taylor et al., 2006; Chlebowski et al., 2006; Courneya, Friedenreich, et al., 2003; Courneya, Mackey, et al., 2003; Daley et al., 2007; Darga et al., 2007; Demark-Wahnefried, Clipp, et al., 2006; Demark-Wahnefried et al., 2007; Pierce et al., 2007; Pinto et al., 2005; Tangney et al., 2002; Vallance et al., 2007) and, therefore, may have limited applicability in an Asian setting. The limitation is particularly true for diet interventions, as most studies have focused on low-fat diets or high consumption of fruit and vegetables (Chlebowski et al., 2006; Darga et al., 2007; Pierce et al., 2007). The Korean diet is plant based, and Korean breast cancer survivors are at risk for consuming too little protein because they tend to avoid meat (Min et al., 2008). Therefore, development of a culturally appropriate intervention is needed for Koreans.

As a result, the authors developed a TTM-based program with a simultaneous stage-matched exercise and diet (SSED) intervention for Korean breast cancer survivors. This pilot study assessed the feasibility and preliminary effects of SSED intervention on behavioral and QOL outcomes.

Methods

Study Design

The authors randomly assigned cancer survivors who completed primary treatment to an SSED intervention group or a control group. Participants were assessed at baseline and at 12 weeks postintervention. The study was approved by the institutional review board of the National Cancer Center in Goyang, South Korea; all participants provided informed consent prior to the start.

Participants and Recruitment Strategy

Breast cancer survivors were identified within two years of diagnosis via case ascertainment (i.e., women who were diagnosed with stage 0–III breast cancer) from the Center for Breast Cancer at the National Cancer Center. An invitation for the study was mailed to possible participants by the principal investigator and each patient's oncologist or surgeon, who used hospital records to identify potentially eligible patients according to diagnosis, time since diagnosis, and treatment criteria. The mailing also included two consent forms (one for signature and return and one for the patients' records), a screening instrument for patients to complete and return with the consent form, and a preaddressed, postage-paid return envelope. Inclusion criteria were women aged 20 years or older with stage 0–III breast cancer, primary treatment completed, and unmet behavioral goals (i.e., not engaging in moderate-intensity exercise for a minimum of 30 minutes per day at least five days per week) (Doyle et al., 2006) or a poor diet as measured with a diet quality index (DQI) (Patterson, Haines, & Popkin, 1994) score of 6 or higher. Exclusion criteria were progressive disease, additional primary tumors, currently being treated for cancer, a condition that precluded unsupervised exercise (e.g., uncontrolled congestive heart failure, angina, or recent myocardial infarction; breathing difficulties requiring oxygen therapy), a condition that could interfere with a high vegetable and fruit diet (e.g., kidney failure, chronic warfarin use), or any of the following contraindications for exercise: serum platelets lower than 100,000/mm^3, serum hemoglobin lower than 10 g/dl, body temperature of 37.8°C or higher, or white blood cell count of 11,000/mm^3 or higher.

Procedures and Group Assignments

Eligible patients were invited to the trial center, where they were screened for contraindications to exercise via an interview, a physical examination by a physician, and serologic tests. The authors used a random numbers table to assign participants who met all criteria to either the intervention group or the control group in equal numbers.

Study Intervention

The TTM (Prochaska & DiClemente, 1983) provided the conceptual framework for the trial. The main constructs of the TTM included motivational readiness

for stage of change, process of change, decisional balance, and self-efficacy (Prochaska & Velicer, 1997). Table 1 presents goals and main strategies of SSED interventions based on the TTM. The 12-week SSED intervention consisted of the following components: stage-matched telephone counseling complemented with a workbook, individualized prescription for regular exercise, a balanced diet program based on guidelines for cancer survivors (Doyle et al., 2006; Jones & Demark-Wahnefried, 2006), and guidelines of the Korean Nutrition Society (2007).

The goal of the exercise program was moderate-intensity exercise (type to be selected by the participant) for a minimum of 30 minutes per day at least five days per week (Doyle et al., 2006). Participants were given a portable heart rate monitor (Polar® F4, Polar Electro) and told their target heart rate (40%–59% heart rate reserve) (Jones & Demark-Wahnefried, 2006). The dietary goal was to achieve a balanced diet, defined as a DQI score lower than 6 with 20% of energy or less from fat, 6% or less from saturated fat, and 65% or less from carbohydrates; cholesterol 300 mg per day or less; seven or more vegetable and fruit servings per day; 75%–125% of the recommended dietary allowance for protein; 75%–125% of the recommended dietary allowance for calcium; and 10 g of sodium or less per day (Korean Society of Lipidology and Atherosclerosis, 1996; Oh et al., 2003; Patterson et al., 1994). The diet prescription was based on food tables from the Korean Nutrition Society (1995, 2007) and on each participant's body mass index, ideal body weight, and daily calorie needs. Participants were asked to choose a prescribed number of portions from each of the six food groups (grains; meat, fish, eggs, and beans; vegetables; fruits; milk and dairy products; and fats and oils).

The exercise and diet prescriptions were customized to each participant's stage of change for each behavior. Participants were asked to keep an exercise and diet diary during the intervention period (i.e., for 12 weeks). The prescription was delivered weekly by two specially trained nurses during 30-minute telephone counseling sessions. The nurses, who had master's degrees in nursing and at least three years of experience in cancer care, used a systematic telephone counseling protocol approved by a panel of seven experts. The principal investigator confirmed that the two nurses conducted the telephone counseling of participants in a homogeneous fashion. The nurses assessed the stage of change for exercise and diet in each telephone counseling session. Participants also were sent a workbook of stage-matched exercise and diet information whenever they progressed to a new stage.

Measures

Intervention feasibility: Participants were asked about appropriateness of the intervention (overall contents, duration of the intervention, and frequency and time of telephone counseling) and helpfulness of the intervention (overall and telephone counseling and workbook). Responses were rated on a four-point Likert scale from "not at all" to "very much." In addition, the objective data collected on intervention feasibility

Table 1. Description of a Simultaneous Stage-Matched Exercise and Diet Intervention

Stage of Change	Goal	Main Strategies	Contents of Counseling
Precontemplation	Increase awareness of the need to change.	Consciousness raising Dramatic relief Environmental reevaluation Increase pros.	Effects of exercise and balanced diet on health Specific reasons for not considering exercise or balanced diet Risks of sedentary lifestyle or imbalanced diet Effects of sedentary lifestyle or imbalanced diet on family or medical cost
Contemplation	Motivate and increase confidence in ability for change, building on motivation for change.	Self-reevaluation Increase pros and decrease cons. Build self-efficacy	Specific benefits of and barriers to physical activity and exercise or balanced diet Solutions to overcome specific barriers to exercise or balanced diet Imagination of improved health following exercise or balanced diet
Preparation	Develop and negotiate a plan for exercise and diet.	Self-liberation Remember pros. Increase self-efficacy.	Individualized exercise and diet prescription and specific aims of exercise Keeping and monitoring a daily exercise or diet log Remembering the effects of exercise and balanced diet on heath
Action and maintenance	Reaffirm the commitment to exercise and diet.	Reinforcement management Helping relationship Counter conditioning Stimulus control Manage temptation	Evaluation of current exercise and diet pattern Self-reward of regular exercise and balanced diet Remembering specific aims or reasons for doing regular exercise and balanced diet Substitution of exercise for sedentary behavior and imbalanced diet Social or family support to help maintain exercise and balanced diet Avoidance of stimuli and other causes that provoke inactivity and imbalanced diet

included the rate of participant retention, percentage of intervention calls delivered, and adherence to the final exercise and diet goals.

Behavioral outcomes: *Stage of motivational readiness for exercise and diet:* The staging items were made by researchers based on the established TTM stages of precontemplation, contemplation, preparation, action, and maintenance (Prochaska & Velicer, 1997). They were domain specific, and participants were queried regarding goal behavior.

Physical activity: Physical activity was assessed by the subscale of leisure-time physical activity from the **International Physical Activity Questionnaire** (Craig et al., 2003). A 12-country, 14-center study judged the questionnaire to be reliable and valid (Craig et al., 2003).

Diet quality: The authors assessed participants' initial food intake based on a three-day diet recall and used the DQI revised for the Korean population (Oh et al., 2003) to measure diet quality. The revision involved the translation of the instrument, as well as incorporation of Korean dietary guidelines (Korean Nutrition Society, 1995; Korean Society of Lipidology and Atherosclerosis, 1996). The eight components included percentage of energy from fat, saturated fat, and carbohydrate; daily intake of cholesterol; vegetables and fruits; recommended dietary allowance for protein and calcium; and daily sodium intake. Each of the eight components had a score ranging from 0–2, allowing for a total score of 0–16, with lower scores indicating better diet quality. The authors categorized the scores as excellent (0–5), good (6–7), fair (8–10), or poor (11–16) (Wayne et al., 2006).

Quality-of-life outcomes: *Functioning and global quality of life:* The **European Organisation for the Research and Treatment of Cancer Quality-of-Life Questionnaire–Core 30 (EORTC QLQ-C30)** was used to measure functional status and global QOL. The questionnaire incorporates five functioning scales (physical, role, emotional, cognitive, and social functioning) and a global QOL scale (Aaronson et al., 1993).

Fatigue: The **Brief Fatigue Inventory** was used to assess fatigue. The inventory is a one-page assessment tool that contains nine items, each rating the severity of fatigue on a 0–10 scale. The Brief Fatigue Inventory includes subscales of severity of fatigue and interference with different aspects of the patient's life over the past 24 hours (Mendoza et al., 1999).

Anxiety and depression: The **Hospital Anxiety and Depression Scale** is a self-report measurement tool designed for use in medical settings that consists of 14 items: seven for anxiety and seven for depression (Zigmond & Snaith, 1983). Each subscale is scored from 0–21, with higher scores indicating greater distress.

Instrument validation: The Korean versions of the EORTC QLQ-C30 (Yun et al., 2004), Brief Fatigue Inventory (Yun et al., 2005), and Hospital Anxiety and Depression Scale (Oh, Min & Park, 1999) have been validated.

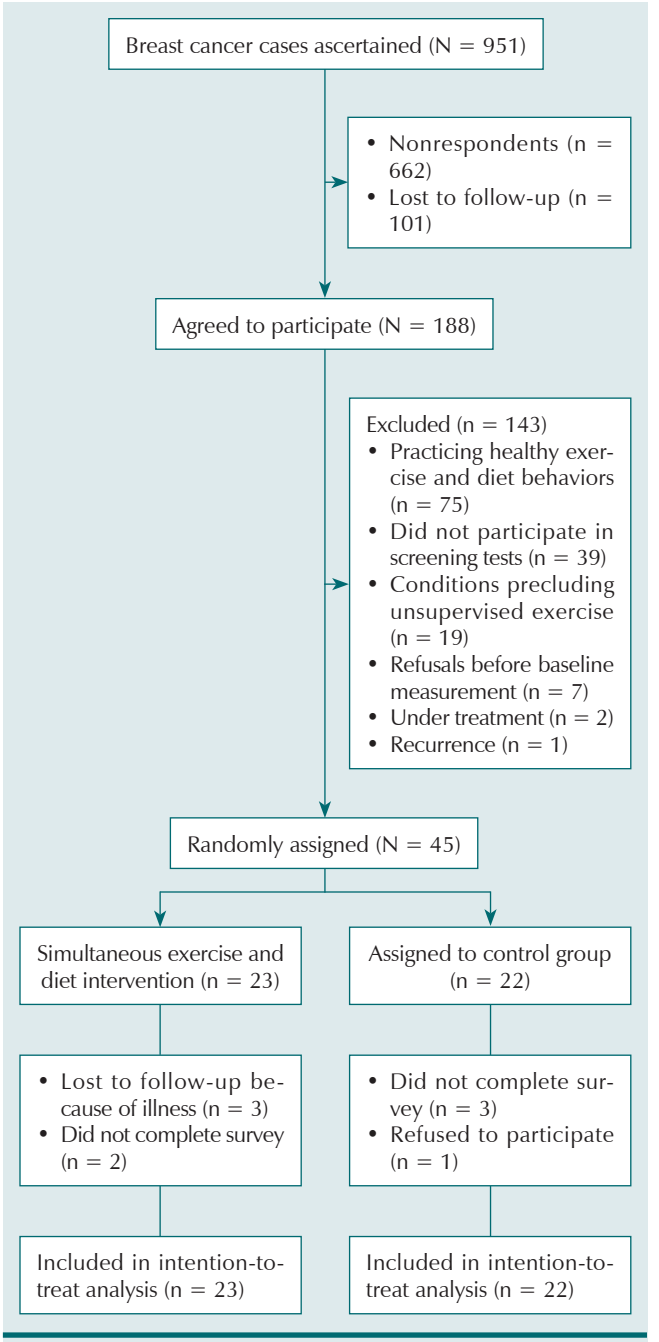

Figure 1. Flow of Participants Through the Trial

Statistical Analyses

Descriptive statistics (mean, standard deviation, and percentage) were calculated on feasibility data and on each outcome variable at baseline and postintervention. The authors used the chi-square test to compare advancement between the two groups in stages of motivational readiness for exercise and diet. For the continuous variables, generalized estimating equation analysis was used to compare the differences between

the SSED intervention group and the control group over time, controlling for baseline values and general characteristics. Analyses were performed on intention-to-treat principles. Intention-to-treat analyses seek to determine whether one arm outperforms the other at a specific trial endpoint, regardless of intervention dose and attrition. Therefore, given similar participants under similar conditions, intention-to-treat analysis suggests how the intervention under testing might perform in the "real world" (Cleeland, 2007; Montori & Guyatt, 2001). For participants with missing data, the authors treated available data under the missing-at-random assumption of the generalized estimating equation analysis. SPSS®, version 15.0, was used to analyze data; a two-sided $p < 0.05$ was considered statistically significant.

Results

Participant Characteristics

Of the 951 patients identified, 188 (20%) expressed an interest in participating and submitted consent forms along with the first screening survey. Of those, the authors excluded 143 (76%). The leading reasons for exclusion were healthy exercise and diet behaviors or failure to complete the second screening survey (see Figure 1). The remaining 45 women were randomly assigned to either the intervention (n = 23) or control (n = 22) group. During the study, nine women (20%) dropped out. Reasons for drop out included car accident (n = 1), aggravated health condition after colonoscopy (n = 1), recurrence of breast cancer (n = 1), lack of interest (n = 1), and loss to follow-up (n = 5). Reasons for drop-out were not related to the intervention. No differences in attrition were observed between the two groups, and the groups were balanced in terms of demographic and clinical variables (see Table 2).

Feasibility of the Intervention

All participants gave either the highest or the second highest rating for overall appropriateness of the intervention contents; 96% perceived that the duration of the intervention (i.e., 12 weeks) and time per session were appropriate, and 91% felt that the frequency of the intervention was appropriate. Some women reported that twice per week would be better. Ninety-five percent perceived that the SSED was very helpful or helpful for the overall intervention. All participants reported that the workbook was helpful; 95% reported telephone counseling was helpful. Objective data also suggested that the intervention was feasible. The rate of participant retention in the SSED group was high. Three of the five women who dropped out did so because of unexpected illness. Therefore, 91% of those enrolled completed the trial. All participants received telephone counseling every week.

Program adherence was calculated from the level of achievement of goals for prescribed exercise and diet at the end of the trial. The authors determined that women achieved the goals if they participated in moderate-intensity exercise for a minimum of 30 minutes per day at least five days per week, and if they ate a prescribed number of portions from each of the six food groups more than five days per week. The adherence rate of the intervention group was 94% for exercise and 91% for diet.

Table 2. Baseline Sample Characteristics

	Intervention (N = 23)			Control (N = 22)		
Characteristic	**$\bar{X}$**	**SD**	**Range**	**$\bar{X}$**	**SD**	**Range**
Age (years)	44.6	9.9	26–69	47.1	7.3	35–69
Body mass index (kg/m²)	22.4	3.2	16.2–29.5	22.7	2.5	18.6–26.5
Time since diagnosis (months)	12.5	5.4	4.3–23.3	12.9	6	3.8–23.3
Characteristic	**n**	**%**		**n**	**%**	
Marital status						
Married	18	78		20	91	
Unmarried or widowed	5	22		2	9	
Education						
High school or less	15	65		14	64	
Completed university	8	35		8	36	
Monthly income (U.S. $)						
Less than 3,000	11	48		11	50	
3,000 or more	11	48		9	41	
Unknown	1	4		2	9	
Employed	9	39		6	27	
Religious	17	74		17	77	
Menopausal	10	43		5	23	
Cancer stage						
0	3	13		2	9	
I	9	39		10	45	
II	8	35		7	32	
III	3	13		3	14	
Estrogen positive	14	61		16	73	
Progesterone positive	16	70		20	91	
Type of surgery						
Mastectomy	1	4		5	23	
Breast-conserving surgery	22	96		17	77	
Treatment						
Received radiation therapy	18	78		17	77	
Received chemotherapy	18	78		19	86	
Receiving hormone therapy	18	78		18	82	
Have comorbid conditions	7	30		8	38	

Effects on Behavioral Outcomes

Stages of motivational readiness for exercise and diet: The two groups differed significantly in motivational readiness. Sixty-seven percent of the intervention group versus 17% of the control group progressed in stage of change for exercise, and 78% of the intervention group versus 6% of the control group progressed in stage of change for diet (see Table 3).

Physical activity and diet quality: No significant group-by-time interaction on physical activity existed between the two groups (see Table 4). However, women in the intervention group reported a greater increase in physical activity than women in the control group. Significant group-by-time interactions on diet quality existed between the two groups (see Table 4). Specifically, protein ($p = 0.003$) and calcium ($p = 0.013$) intake increased in the intervention group but decreased in the control group. However, the increased protein intake exceeded the recommended daily allowance and, therefore, did not contribute to the improvement of overall diet quality. A significant group-by-time interaction on cholesterol consumption ($p = 0.002$) also was observed which, contrary to expectation, increased in the intervention group and decreased in the control group. For those reasons, the DQI score worsened significantly in the intervention group compared with the control group ($p = 0.005$).

Effects on Quality-of-Life Outcomes

Functioning and global quality of life: Group-by-time interactions were significant only for emotional functioning ($p = 0.004$). Women in the intervention group tended to show more clinically meaningful improvements (EORTC QLQ-C30 score changes of 10 or higher) in physical functioning and global QOL than women in the control group, but the difference was not statistically significant.

Fatigue: The authors observed significant group-by-time interactions for fatigue total score ($p = 0.001$), severity ($p = 0.003$), and interference on daily activities ($p = 0.003$).

Anxiety and depression: The authors observed significant group-by-time interactions for depression ($p = 0.035$). The intervention group showed a greater decrease in anxiety level, but the between-group difference was not significant.

Table 3. Stage Changes for Exercise and Diet Before and After Intervention

	Before (N = 36)			After (N = 36)				
Behavior	**PCC**	**P**	**AM**	**PCC**	**P**	**AM**	χ^2	**p**
Exercise							8.58	0.006
Intervention	2	9	7	–	1	17		
Control	3	7	8	3	5	10		
Diet							18.62	< 0.001
Intervention	5	9	4	–	2	16		
Control	5	9	4	4	11	3		

AM—action and maintenance; P—preparation; PCC—precontemplation and contemplation

Discussion

To the authors' knowledge, the current study is the first to assess the feasibility and effects of a TTM stage-matched lifestyle intervention among breast cancer survivors in Asia. In contrast to other lifestyle intervention studies (Basen-Engquist et al., 2006; Demark-Wahnefried, Clipp, et al., 2006; Demark-Wahnefried et al., 2007; Pinto et al., 2005), the authors examined two interventions concurrently. Although the sample size was small, the preliminary results show that receiving a 12-week SSED interventions delivered via telephone improved participants' readiness to change health behaviors compared to a control group, and emotional functioning, fatigue, and depression improved as well. The success might be attributable to the TTM-based nature of the intervention strategy, which used concepts such as processes of change, decisional balance, and self-efficacy (Prochaska & Velicer, 1997).

The simultaneous exercise and diet program was feasible and acceptable among breast cancer survivors. Participants received 100% of the intervention calls; the majority (94% for exercise and 91% for diet) achieved behavioral goals. Participants also provided positive evaluations of contents, materials, and delivery methods of the SSED intervention. Therefore, this pilot study suggests the feasibility of delivering simultaneous health behavior interventions to cancer survivors via healthcare institutions or community organizations so that the greatest number of survivors can benefit.

The SSED intervention was successful in improving readiness for exercise and diet; however, the authors did not observe significantly positive results with regard to physical activity or diet quality. The finding was not consistent with previous studies (Courneya, Mackey, et al., 2003; Demark-Wahnefried, Clipp, et al., 2006; Demark-Wahnefried et al., 2007; Pinto et al., 2005; Vallance et al., 2007). The major reason could be selection bias. The study population was recruited through an invitation letter; therefore, study participants were already highly motivated. For example, most study participants were in preparation, action, or maintenance stages for exercise at baseline. A more plausible explanation is that some women in the control group also made positive changes in their behaviors after joining the study, as has been previously

reported (Courneya, Friedenreich, et al., 2003). The factors might attenuate the pure effect of regular exercise and balanced diet on outcomes. Second, the inclusion criteria should be reconsidered; initial levels of exercise and diet quality were relatively good compared with previous studies (Carmack Taylor et al., 2006; Demark-Wahnefried et al., 2007; Pinto et al., 2005). A need exists to reset the eligibility criteria to those who are sedentary and with poor diet quality rather than women who had unmet behavior goals. This study also may have had ceiling effects; for example, improving participants' physical activity and diet quality levels may have been difficult because they were already good.

The fact that the SSED intervention did not significantly improve physical functioning could be understood using the same reasoning. If participants were sedentary and showed poor diet quality, they could have significant differences in physical functioning after intervention. Therefore, future studies should recruit participants who exhibit more unhealthy behaviors in the outpatient setting.

Improvements in QOL in the intervention group were greater than those in the control group. Specifically, an approximate 10-point difference was observed between the two groups in physical functioning and global QOL. The finding indicates a clinically meaningful difference (Fayers, 2001). Randomized trials with large sample sizes are needed to further examine this finding.

Contrary to the authors' expectation, diet quality did not improve given the intervention for a balanced diet. When investigating the basis of that finding, the authors found that women in the intervention group increased their protein intake by consuming high-cholesterol protein sources, such as eggs and seafood (e.g., cuttlefish, octopus). Therefore, a need exists to provide more detailed nutritional information during counseling (e.g., consuming fewer than three eggs per week). The unexpected result for diet quality also could be instrument related. The Korean version of the DQI has not been validated for cancer survivors to date, and it does not reflect the most recent recommended daily allowances (Korean Nutrition Society, 2007). Contrasting findings (Demark-Wahnefried, Clipp, et al., 2006) of a significant improvement in diet quality after a six-month tailored lifestyle intervention delivered via telephone counseling can be explained by the longer duration of the intervention. Twelve weeks may be adequate for changing diet behavior (i.e., advancement in stage of motivational readiness) but may be too short a time period to test the improvement in diet quality. A balanced diet might be a proper prescription for dietary goals for breast cancer survivors in Korea. The diet pattern of the participants reflected that the Western diet goal of high intake of vegetables and fruits and low fat was not applicable. For example, consumption of vegetables and fruits was high ($\bar{X}$ daily serving = 12), and mean percentage of energy from fat was relatively low (24%). Therefore, an Asian setting requires a culturally appropriate diet guideline.

Table 4. Sample Scores Pre- and Postintervention

Variable	Intervention (N = 23) $\bar{X}$	Intervention (N = 23) SE	Control (N = 22) $\bar{X}$	Control (N = 22) SE	p[a]
Behavioral Outcomes					
Physical activity[b]					0.086
Before	28.53	3.51	28.19	3.73	
After	32.16	7.05	11.09	6.67	
DQI score[c]					0.005
Before	4.82	0.1	4.8	0.11	
After	6.09	0.35	4.57	0.34	
EORTC QLQ-C30					
Physical					0.154
Before	76.57	0.46	76.43	0.47	
After	85.66	1.25	82.38	1.47	
Role					0.761
Before	80.01	0.93	77.59	1.07	
After	84.69	3.65	80.66	3.06	
Emotional					0.004
Before	70.42	1.27	71.45	0.87	
After	84.01	2.05	72.17	2.97	
Cognitive					0.323
Before	79.23	1.04	81.22	0.99	
After	83.44	1.85	81.05	3.07	
Social					0.583
Before	78.27	1.29	77.58	1.02	
After	86.18	3.85	81.91	4.52	
Global quality of life					0.223
Before	61.64	1.34	63.68	1.3	
After	73.33	3.69	68.02	3.45	
Brief Fatigue Inventory					
Total score					0.001
Before	37.49	1.3	35.87	1.2	
After	18.1	2.38	32.68	3.52	
Severity					0.003
Before	4.96	0.12	4.68	0.1	
After	2.79	0.41	4.44	0.43	
Interference					0.003
Before	3.73	0.19	3.58	0.14	
After	1.64	0.32	3.48	0.44	
Hospital Anxiety and Depression Scale					
Anxiety					0.123
Before	6.1	0.18	6.27	0.15	
After	3.97	0.48	5.46	0.59	
Depression					0.035
Before	5.8	0.37	5.95	0.25	
After	3.32	0.54	5.85	0.78	

[a] Group x time interaction

[b] Metabolic equivalent task hours per week

[c] Lower scores indicate better diet quality.

DQI—diet quality index; EORTC QLQ-C30—European Organisation for the Research and Treatment of Cancer Quality-of-Life Questionnaire–Core 30; SE—standard error

The SSED was found to be effective in psychosocial variables (i.e., emotional functioning, fatigue, and depression) in line with previous studies (Basen-Engquist et al., 2006; Carmack Taylor et al., 2006; Courneya, Friedenreich, et al., 2003; Courneya, Mackey, et al., 2003; Daley et al., 2007; Pinto et al., 2005). The finding indicates that nurse-delivered telephone counseling might contribute to providing emotional support or enhanced self-efficacy as well as improvements in exercise and diet behavior. Further studies should examine whether a mediation effect of social support or self-efficacy could exist regarding enhancement of QOL outcomes in lifestyle intervention research.

Limitations

The small sample size may limit the current study's power for detecting between-group differences. In addition, the possibility of selection bias resulting from a low level of enrollment cannot be excluded. The SSED intervention (particularly diet) may be unique to Korean samples, limiting applicability to other populations. Finally, follow-up assessment is needed to examine sustained long-term effects.

Nonetheless, the current study has important practical implications. The findings suggest that behavioral and QOL outcomes can be improved effectively via brief weekly telephone counseling and that time- and resource-intensive onsite interventions may not be necessary. Simultaneous health behavior interventions hold promise for cancer survivors who are faced with challenges to their health and QOL. Knowledge of feasibility and preliminary outcomes of the SSED intervention may be attractive to healthcare providers working to improve QOL among cancer survivors.

Implications for Nursing

As the number of survivors and the time length of their survival has expanded, cancer survivorship has received tremendous emphasis and increased awareness. Major areas of health concerns for survivors are recurrence, secondary malignancies, and long-term treatment sequelae that affect QOL (Morgan, 2009). The adverse health problems in this population may be ameliorated via health-promotion interventions. Results from the current study support the idea that exercise and diet interventions are effective in the improvement of some behavioral and QOL outcomes.

Oncology nurses are optimally positioned to deliver support and guidance for promoting behavior change in cancer survivors. For more effective implementation of behavioral change, oncology nurses should consider the following. First, any program for behavioral change should be culturally appropriate, because cultural or ethnic differences for application of behavioral guidance may exist. Second, tailored intervention can maximize behavioral change; therefore, the TTM stage-matched intervention is well suited to deliver individually tailored interventions. Finally, a hospital-based program has limited application for a geographically dispersed population, whereas home-based interventions using telephone counseling appear to be feasible and effective. Lifestyle intervention could be an important area of opportunity for oncology nurses to contribute to health promotion for cancer survivors.

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References

Aaronson, N.K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N.J., . . . De Haes, J.C. (1993). The European Organization for Research and Treatment of Cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute, 85,* 365–376.

Adams, J., & White, M. (2003). Are activity promotion interventions based on the transtheoretical model effective? A critical review. *British Journal of Sports Medicine, 37,* 106–114. doi: 10.1136/bjsm.37.2.106

Agency for Healthcare Research and Quality. (2004). *Effectiveness of behavioral interventions to modify physical activity behaviors in general populations and cancer patients and survivors.* Rockville, MD: U.S. Department of Health and Human Services.

Ahn, S.H., Park, B.W., Noh, D.Y., Nam, S.J., Lee, E.S., Lee, M.K., . . . Yun, Y.H. (2007). Health-related quality of life in disease-free survivors of breast cancer with the general population. *Annals of Oncology, 18,* 173–182. doi: 10.1093/annonc/mdl333

Aziz, N.M., & Rowland, J.H. (2003). Trends and advances in cancer survivorship research: Challenge and opportunity. *Seminars in Radiation Oncology, 13,* 248–266. doi: 10.1016/S1053-4296(03)00024-9

Basen-Engquist, K., Taylor, C.L., Rosenblum, C., Smith, M.A., Shinn, E.H., Greisinger, A., . . . Rivera, E. (2006). Randomized pilot test of a lifestyle physical activity intervention for breast cancer survivors. *Patient Education and Counseling, 64,* 225–234. doi: 10.1016/j.pec.2006.02.006

Blanchard, C.M., Denniston, M.M., Baker, F., Ainsworth, S.R., Courneya, K.S., Hann, D.M., . . . Kennedy, J.S. (2003). Do adults change their lifestyle behaviors after a cancer diagnosis? *American Journal of Health Behavior, 27,* 246–256.

Blanchard, C.M., Stein, K.D., Baker, F., Dent, M.F., Denniston, M.M., Courneya, K.S., & Nehl, E. (2004). Association between current lifestyle behaviors and health-related quality of life in breast, colorectal, and prostate cancer survivors. *Psychology and Health, 19,* 1–13. doi: 10.1080/08870440310001606507

Brown, B.W., Brauner, C., & Minnotte, M.C. (1993). Noncancer deaths in white adult cancer patients. *Journal of the National Cancer Institute, 85,* 979–987.

Carmack Taylor, C.L., Demoor, C., Smith, M.A., Dunn, A.L., Basen-Engquist, K., Nielsen, I., . . . Gritz, E.R. (2006). Active for life after cancer: A randomized trial examining a lifestyle physical activity program for prostate cancer patients. *Psycho-Oncology, 15,* 847–862. doi: 10.1002/pon.1023

Chlebowski, R.T., Blackburn, G.L., Thomson, C.A., Nixon, D.W., Shapiro, A., Hoy, M.K., . . . Elashoff, R.M. (2006). Dietary fat reduction and breast cancer outcome: Interim efficacy results from the Women's Intervention Nutrition Study. *Journal of the National Cancer Institute, 98,* 1767–1776.

Cleeland, C.S. (2007). Symptom burden: Multiple symptoms and their impact as patient-reported outcomes. *Journal of the National Cancer Institute. Monographs, 37,* 16–21. doi: 10.1093/jncimonographs/lgm005

Courneya, K.S., Friedenreich, C.M., Quinney, H.A., Fields, A.L., Jones, L.W., & Fairey, A.S. (2003). A randomized trial of exercise and quality of life in colorectal cancer survivors. *European Journal of Cancer Care, 12,* 347–357. doi: 10.1046/j.1365-2354.2003.00437.x

Courneya, K.S., Mackey, J.R., Bell, G.J., Jones, L.W., Field, C.J., & Fairey, A.S. (2003). Randomized controlled trial of exercise training in postmenopausal breast cancer survivors: Cardiopulmonary and quality of life outcomes. *Journal of Clinical Oncology, 21,* 1660–1668. doi: 10.1200/JCO.2003.04.093

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., . . . Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35,* 1381–1395. doi: 10.1249/01.MSS.0000078924.61453.FB

Daley, A.J., Crank, H., Saxton, J.M., Mutrie, N., Coleman, R., & Roalfe, A. (2007). Randomized trial of exercise therapy in women treated for breast cancer. *Journal of Clinical Oncology, 25,* 1713–1721. doi: 10.1200/JCO.2006.09.5083

Darga, L.L., Magnan, M., Mood, D., Hryniuk, W., DiLaura, N.M., & Djuric, Z. (2007). Quality of life as a predictor of weight loss in obese, early-stage breast cancer survivors. *Oncology Nursing Forum, 34,* 86–92. doi: 10.1188/07.ONF.86-92

Demark-Wahnefried, W., Aziz, N.M., Rowland, J.H., & Pinto, B.M. (2005). Riding the crest of the teachable moment: Promoting long-term health after the diagnosis of cancer. *Journal of Clinical Oncology, 23,* 5814–5830. doi: 10.1200/JCO.2005.01.230

Demark-Wahnefried, W., Clipp, E.C., Lipkus, I.M., Lobach, D., Snyder, D.C., Sloane, R., . . . Kraus, W.E. (2007). Main outcomes of the FRESH START trial: A sequentially tailored diet and exercise mailed print intervention among breast and prostate cancer survivors. *Journal of Clinical Oncology, 25,* 2709–2718. doi: 10.1200/JCO.2007.10.7094

Demark-Wahnefried, W., Clipp, E.C., Morey, M.C., Pieper, C.F., Sloane, R., Snyder, D.C., . . . Cohen, H.J. (2006). Lifestyle intervention development study to improve physical function in older adults with cancer: Outcomes from Project LEAD. *Journal of Clinical Oncology, 24,* 3465–3473. doi: 10.1200/JCO.2006.05.7224

Demark-Wahnefried, W., Pinto, B.M., & Gritz, E.R. (2006). Promoting health and physical function among cancer survivors: Potential for prevention and questions that remain. *Journal of Clinical Oncology, 24,* 5125–5131. doi: 10.1200/JCO.2006.06.6175

Demark-Wahnefried, W., Rock, C.L., Patrick, K., & Byers, T. (2008). Lifestyle interventions to reduce cancer risk and improve outcomes. *American Family Physician, 77,* 1573–1578.

Doyle, C., Kushi, L.H., Byers, T., Courneya, K.S., Demark-Wahnefried, W., Grant, B., . . . American Cancer Society. (2006). Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices. *CA: A Cancer Journal for Clinicians, 56,* 323–353. doi: 10.3322/canjclin.56.6.323

Fayers, P.M. (2001). Interpreting quality of life data: Population-based reference data for the EORTC QLQ C-30. *European Journal of Cancer, 37,* 1331–1334. doi: 10.1016/S0959-8049(01)00127-7

Hewitt, M., Greenfield, S., & Stovall, E. (2005). *From cancer patient to cancer survivor: Lost in transition*. Washington, DC: National Academies Press.

Hewitt, M., Rowland, J.H., & Yancik, R. (2003). Cancer survivors in the United States: Age, health, and disability. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 58,* 82–91.

Jones, L.W., & Demark-Wahnefried, W. (2006). Diet, exercise, and complementary therapies after primary treatment for cancer. *Lancet Oncology, 7,* 1017–1026. doi: 10.1016/S1470-2045(06)70976-7

Korean Nutrition Society. (1995). *Recommended dietary allowances for Koreans* (6th ed.). Seoul, South Korea: Author.

Korean Nutrition Society. (2007). Korean dietery reference intakes resources. Retrieved from http://www.kns.or.kr/board.asp?catalogid=kns2008&language=ko&boardcode=sub07_01

Korean Society of Lipidology and Atherosclerosis. (1996). *Guidelines for treatment of hyperlipidemia* (1st ed.). Seoul, South Korea: Author.

McBride, C.M., Emmons, K.M., & Lipkus, I.M. (2003). Understanding the potential of teachable moments: The case of smoking cessation. *Health Education Research, 18,* 156–170. doi: 10.1093/her/18.2.156

Mendoza, T.R., Wang, X.S., Cleeland, C.S., Morrissey, M., Johnson, B.A., Wendt, J.K., & Huber, S.L. (1999). The rapid assessment of fatigue severity in cancer patients: Use of the Brief Fatigue Inventory. *Cancer, 85,* 1186–1196.

Min, H.S., Park, S.Y., Lim, J.S., Park, M.O., Won, H.J., & Kim, J.I. (2008). A study on behaviors for preventing recurrence and quality of life in breast cancer survivors. *Journal of Korean Academy of Nursing, 38,* 187–194. doi: 10.4040/jkan.2008.38.2.187

Montori, V.M., & Guyatt, G.H. (2001). Intention-to-treat principle. *Canadian Medical Association Journal, 165,* 1339–1341.

Morgan, M.A. (2009). Cancer survivorship: History, quality-of-life issues, and the evolving multidisciplinary approach to implementation of cancer survivorship care plans. *Oncology Nursing Forum, 36,* 429–436. doi: 10.1188/09.ONF.429-436

Oh, K.W., Nam, C.M., Park, J.H., Yoon, J.Y., Sim, J.S., Lee, K.H., & Suh, I. (2003). A case-control study on diet quality and risk for coronary heart disease in Korean men. *Korean Journal of Nutrition, 36,* 613–621.

Oh, S.M., Min, K.J., & Park, D.B. (1999). A study on the standardization of the Hospital Anxiety and Depression Scale for Koreans. *Journal of the Korean Neuropsychiatric Association, 38,* 289–296.

Patterson, R.E., Haines, P.S., & Popkin, B.M. (1994). Diet quality index: Capturing a multidimensional behavior. *Journal of the American Dietary Association, 94,* 57–64.

Pierce, J.P., Natarajan, L., Caan, B.J., Parker, B.A., Greenberg, E.R., Flatt, S.W., . . . Stefanick, M.L. (2007). Influence of a diet very high in vegetables, fruit, and fiber, and low in fat on prognosis following treatment for breast cancer: The Women's Healthy Eating and Living (WHEL) randomized trial. *JAMA, 298,* 289–298.

Pinto, B.M., Frierson, G.M., Rabin, C., Trunzo, J.J., & Marcus, B.H. (2005). Home-based physical activity intervention for breast cancer patients. *Journal of Clinical Oncology, 23,* 3577–3587.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51,* 390–395.

Prochaska, J.O., & Velicer, W.F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12,* 38–48.

Tangney, C.C., Young, J.A., Murtaugh, M.A., Cobleigh, M.A., & Oleske, D.M. (2002). Self-reported dietary habits, overall dietary quality, and symptomatology of breast cancer survivors: A cross-sectional examination. *Breast Cancer Research and Treatment, 71,* 113–123.

Vallance, J.K., Courneya, K.S., Plotnikoff, R.C., Yasui, Y., & Mackey, J.R. (2007). Randomized controlled trial of the effects of print materials and step pedometers on physical activity and quality of life in breast cancer survivors. *Journal of Clinical Oncology, 25,* 2352–2359. doi: 10.1200/JCO.2006.07.9988

Wayne, S.J., Baumgartner, K., Baumgartner, R.N., Bernstein, L., Bowen, D.J., & Ballard-Barbash, R. (2006). Diet quality is directly associated with quality of life in breast cancer survivors. *Breast Cancer Research and Treatment, 96,* 227–232. doi: 10.1007/s10549-005-9018-6

Yun, Y.H., Park, Y.S., Lee, E.S., Bang, S.M., Heo, D.S., Park, S.Y., . . . West, K. (2004). Validation of the Korean version of the EORTC QLQ-C30. *Quality of Life Research, 13,* 863–868.

Yun, Y.H., Wang, X.S., Lee, J.S., Roh, J.W., Lee, C.G., Lee, W.S., . . . Cleeland, C.S. (2005). Validation study of the Korean version of the Brief Fatigue Inventory. *Journal of Pain and Symptom Management, 29,* 165–172. doi: 10.1016/j.jpainsymman.2004.04.013

Zigmond, A.S., & Snaith, R.P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67,* 361–370.