

RESEARCH ARTICLE

Effects of Energy Conservation Strategies on Cancer Related Fatigue and Health Promotion Lifestyle in Breast Cancer Survivors: a Randomized Control Trial

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Abstract

Purpose: Cancer-related fatigue is frequently experienced by patients during and after therapy. The present study was conducted to assess the impact of energy conservation strategies and health promotion in breast cancer survivors. **Methods:** A randomized controlled trial was carried out to compare the intervention effect (n=69.0) with controls (n=66.0) based on routine oncology ward care. The intervention was five weekly sessions for groups of 6-8 breast cancer survivors. Data on fatigue and health promotion lifestyle were obtained before and after completion the intervention and then 8 weeks later for analysis of variance (ANOVA) with repeated measures. **Results:** Our findings showed cancer-related fatigue to be reduced in the intervention group from pre- to post-intervention, and this persisted over the 8-weeks follow-up period (F = 69.8, p<0.001). All subscales of the cancer fatigue scale demonstrated statistically significant effects with partial eta-squared values ranging from 0.15 (the smallest effect in cognitive fatigue) to 0.21 (the largest for affective fatigue). Changes in the health promotion life style indicated a significant promotion from pre- to post-intervention, and this again continued after 8-weeks follow-up (F = 41.6, p < 0.001). All six domains of a health promoting life style featured significantly elevated values, the largest effect being seen in the interpersonal relations subscale (F=57.7, partial η^2 =0.21, p<0.001) followed by physical activity (F=51.9, partial η^2 =0.18, p<0.001). **Conclusions:** The program was effective in decreasing cancer related fatigue and promoting a healthy lifestyle.

Keywords: Cancer-related Fatigue- health promotion behaviors- energy conservation strategies- breast cancer

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Introduction

Cancer-related fatigue (CRF) is a symptom frequently experienced by patients during the period of cancer and its cure (Wang and Woodruff 2015). It is described as a upsetting permanent feeling of tiredness or collapse in relation to cancer that is not proportional to recent activity and interferes with common functioning (Harris, Schmitz et al., 2012). It is experienced as an unavoidable result of disease and its cure that patients have to tolerate (Takeuchi, Keding et al., 2011; Tabrizi and Radfar, 2015). The prevalence of CRF differs from 4.0% to 91.0%, based on the population researches and the ways of evaluations (Lawrence, Kupelnick et al., 2004; Donovan, Stein et al., 2015; Husson, Mols et al., 2015). It is found that fatigue conflict with quality of life disregarding of detection, cure, or prediction (Stuifbergen and Becker, 2001; Tabrizi, Radfar et al., 2016). Since CRF is not because of over activity, it is implausible that people with cancer profited of decrease activity by itself. Nevertheless, it is attainable that rest as a way of preserving energy sources may capable an individual to pursue to participate invaluable attempts

(Peters, Goedendorp et al., 2014).

A further study has taken a cognitive behavioral approach to managing fatigue and associated symptoms (Given 2002). Many were pilot studies with small samples (Given 2002; Ream, Richardson et al., 2002). Intervention was provided in groups, (Holley and Borger 2001), one-to-one, (Ream, Richardson et al., 2002) over the telephone, (Barsevick, Dudley et al., 2004) or to patients together with their caregivers (Given, 2002).

The previous study (Tabrizi, 2014) has imperative and influential indication for health care professionals when recommending health promotion behaviors for Iranian women with breast cancer. The essential findings were the influence of social support, perceived health status, self-efficacy and fatigue on the health promoting behaviors of Iranian breast cancer survivors. Interventional programs regarding health promotion life styles such as fatigue management, appropriate physical activities and other projects could carry out in group sessions to foster social support.

Packer et al., (1995) developed an energy conservation course to guide occupational therapists who work

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with persons who experience fatigue due to a chronic illness. The principles include: (a) the value of rest; (b) budgeting and banking energy; (c) incorporating rest periods throughout the day; (d) learning to communicate personal needs to others; (e) using good body mechanics and posture; (f) using energy efficient appliances and organizing stations of activity; (g) separating fatiguing tasks into components; (h) prioritizing and setting standards for activities; (i) planning rest periods with self-care, productivity, and leisure activities so that a balance can be maintained; and (j) reviewing course principles and setting short-term and long-term goals (Brink and Sauriol 1995).

Shifting to a health-promoting lifestyle is vital to cancer survivors, not only for reconstructing their health status but also for avoiding diseases and improving prognosis and survival (Bantum, Albright et al., 2013). Previous studies demonstrated that CRF in patients is a barrier for health life style (Rogers, McAuley et al. 2008; Blaney, Lowe-Strong et al., 2013).

So it is critical that more researches be carried out to study, and then establish, the reliability and impact of fatigue treatments, such as energy conservation strategies. Previous studies suggested that more studies are necessary to assess the effect of these strategies in other societies. At the time of the study there is limited research describing the effect of an intervention programs based on energy conservation strategies and activity management for CRF symptoms and life style in breast cancer survivors in Iran.

Study Purpose

The purpose of this study was to evaluate the effects of the energy conservation strategies on cancer related fatigue and health related lifestyle in persons with breast cancer who experience fatigue. The present study hypothesized that energy conservation strategies decrease the cancer related fatigue and improve the health promotion behavior in breast cancer survivors.

Material and Methods

The current double-blind randomized controlled trial (IRCT2015012520778N1) was conducted during 2014 - 2015. All patients under the chemotherapy are invited to participate in the study. Based on eligibility participants randomly allocated in the intervention and control group. Intervention group patients received the energy conservation described below. Control group patients were received routine care.

As illustrated in the CONSORT flowchart, 189.0 women with breast cancer were invited into the study by oncology ward supervisor, of which 54.0 women did not meet inclusion criteria so a final sample size of 135 women were selected. Sample size was calculated based on the results of a study by Reif et al., (2013). Considering the mean differences in intervention and control groups (IG: 32.8 and CG: 36.6), type I error probability of 5.0%, power of 0.9, it was estimated that 66 subjects were needed in each group.

Participants were eligible if they were currently beginning treatment for breast cancer and were women

who met the following inclusion criteria: (1) diagnosis of primary, biopsy-proven breast cancer, stages I through IIIA; (2) normal blood pressure (BP less than 130/90mmHg) and their hemoglobin level was at least 11.6 g/mL. (3) not having any other major medical complications likely to limit life expectancy to less than 10 years; (4) without a history of major psychiatric illness for which the patient was hospitalized or medicated (5). No treatment for anemia or depression during the previous 3 weeks, because these modifiable causes of fatigue (Jones, Ludman et al. 2015) may have been confounded with the effect of present intervention. Participants were selected from a group of outpatients with breast cancer treated at the Omid Cancer Center affiliated to Urmia University of Medical Sciences located in North West of Iran.

Study Procedures

Participants were randomized to be in intervention group IG (n = 69.0) or in control group CG (n = 66.0). The study protocol was reviewed and approved by the institutional review board and the ethics committee of the Urmia University of Medical Sciences (UMSU. rec.1393.196) Participants were provided with detailed information about the study and were assured that confidentiality would be maintained at all times. After obtaining informed consent, nursing masters' Degree student conducted face-to-face interviews with patients to complete data collection, post-intervention and at a follow-up of 8 weeks. Baseline measures were attained prior to randomization.

Measures

General Health Questionnaire (GHQ 28) was used to screen the subjects' mental health. The GHQ 28 consists of four subscales including somatic symptoms (items 1.0-7.0), anxiety/insomnia (items 8.0-14.0), social dysfunction (items 15.0-21.0) and severe depression (items 22.0-28.0). All items are responded on a 4-point Likert scale of none, mild, moderate, and severe which are scored from zero to three. The score 23.0 or above was the cut-off point for probability of having a mental health disorder (Goldberg, 1992). Accordingly, women who obtained scores >23.0 were excluded from the study. The Farsi version of GHQ 28 questionnaire was validated by Yaghoubi, as cited in Ozgoli et al. and its sensitivity and specificity were calculated to be 86.5 and 82.0, respectively (Ozgoli, Selselei et al., 2009).

The Cancer Fatigue Scale: Subjects' fatigue was assessed using the Cancer Fatigue Scale (CFS), a brief self-rating scale for assessing cancer-related fatigue, which was constructed particularly to reflect the nature of the fatigue. The scale includes 15 items and three subscales - physical, affective, and cognitive. Physical aspect of fatigue consists of being easily tired, an urge to lie down, exhaustion, a heavy and tired feeling, being fed up, reluctance, and not knowing what to do with oneself. Affective aspects of fatigue are lack of energy, lack of interests, lack of concentration, and not encouraging oneself to do anything. Cognitive aspects of fatigue are forgetfulness, errors while speaking, slower thinking, and carelessness. Each item is rated on a scale of 1.0 (not

at all) to 5.0 (very much), and individuals are asked to circle the one number that explains their current state. The desirable answers for each subscale range from 0.0 to 28.0 for physical, 0.0 to 16.0 for affective, and 0.0 to 16.0 for cognitive. The maximum total score is 60.0. Higher scores announce more severe fatigue (Okuyama, Akechi et al., 2000). The Cancer had good Fatigue Scale stability (average test-retest reliability $r=0.69$, $p<0.001$) and good internal consistency (Cronbach's alpha coefficient for all 15.0 items=0.9) (Okuyama, Akechi et al., 2000). In the present study alpha reliability coefficient in three dimensions - physical, affective, and cognitive and total were 0.92, 0.89, 0.85 and 0.95 respectively.

Health promoting lifestyle Scale: The Health-Promoting Lifestyle Profile II developed by Walker et al., (1987) was used to measure health-promoting lifestyle. It is an instrument with a 52 item summated behavior rating scale. It employs a four-point response format to measure frequency of self reported health-promoting behaviors with 1 = never, 2=sometimes, 3 =often, and 4=routinely. It consists of the domains of health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management (Walker, Sechrist et al., 1987). Thus, health responsibility has 8.0 items, physical activity 8.0, nutrition 9.0, spiritual growth 9.0, interpersonal relations 8.0, and stress management 8.0. The total scores of the HPLP II range from 50.0 to 200.0 with a higher score indicating a better health-promoting lifestyle. For the present study alpha reliability coefficient for the total scale is 0.9. The alpha coefficients for the subscales range from 0.7 to 0.9.

Intervention

The intervention was small group discussion consisting of five weekly sessions a 90.0 min for groups of 6.0-8.0 breast cancer survivors. The topics and methods of each session are presented in Table 1. The intervention guided the participant to have formation of an accurate representation of the symptom of fatigue, lead the development and implementation of a plan to conserve energy, and evaluate the effectiveness of the new efforts. Patients learned to have energy conservation skills, review their daily routines, structure their activities according to their energy levels and utilize a patient diary. Patients discuss the use of resources to overcome barriers that may occur when implementing new strategies into everyday life. Patients share their experiences with the program in everyday life. For homework between sessions, participants monitored their fatigue, sleep, rest, activity, and other symptoms. They assessed their activity patterns by making a list prioritizing their usual activities for one week. Patients in the control group were put on a waiting-list. They participated in the program after the intervention group had completed their follow-up.

Analysis: Because three fatigue and health promotion behaviors measures were used to examine different dimensions of the subjective experience of them, each measure was examined in separate repeated-measures ANOVA. A group-by-time two-way analysis of variance

(ANOVA) statistics with time as the repeated factor is used. Group-by-time effects on changes in patients 'outcomes and partial eta-squared (η^2) values were calculated. The outcomes measures were cancer related fatigue and health promotion behavior. We considered results to be statistically significant if the two-sided p-values were less than 0.05. All patients who completed the questionnaires were included in the analyses regardless of their participation in the all sessions (intention-to-treat analysis). All statistical analyses were carried out using SPSS for Windows Release 18.0.

Results

One hundred and thirty five were randomized, 69.0 allocated to the IG and 66.0 to the CG (consort). All of the samples were analyzed at follow-up. Monitoring the attendance of the subjects indicated that no patient discontinued the intervention, but some missed at least one session for different reasons (e.g. illness or scheduling conflicts). Table 2 displays the baseline characteristics of the patients. All characteristics were similar between groups. As it is clear in Table 3, our findings suggest that the study population was highly fatigued at baseline, with mean (SD) scoring of 41.5 (10.2) in the IG and 40.9 (9.8) in the CG on the cancer related fatigue scale (CFS) ranging from 0 to 60.0.

In the IG, CRF was reduced from pre- to post-intervention, and then continued to reduce over the 8-weeks follow-up period ($F = 69.8$, $p<0.001$) and the partial eta-squared of 0.2 indicates a large effect. All subscales of the CFS achieved statistically significant effects with partial etasquared ranging from 0.2 (the smallest effect in cognitive fatigue) to 0.2 (the largest effect in affective fatigue). The CG showed slight increase but not significant in CFS levels over time. The changes in the health promotion life style questionnaire indicate a significant promotion from pre- to post-intervention, and then continued to rise over the 8-weeks follow-up period

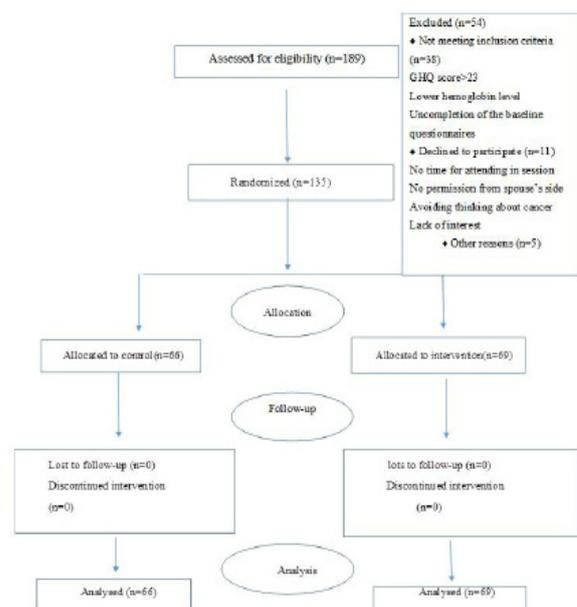


Figure 1. Flow Diagram of the Study

Table 1. Topics and Methods of Energy Conservation Strategies Sessions

Session	Title of session	Topics	Duration	Methods
1	Distraction	Adjusting work and lifestyle with personal rhythm Including time during the day for rest to maintain a good balance between work and rest In very tired situation, taking a break by listening to music, meditating, etc. Doing activities that create fun Sometimes escaping from everyday life and enjoy nature (walks, hiking, traveling, etc.).	90.0 Min	Short lectures, Moderated group Discussions Patients discuss the use of resources to Overcome barriers that may occur when implementing new strategies into everyday life Patients share their experiences with the program in everyday life Negative experiences in everyday life are reviewed and new strategies to activate effective practices are trained
2 (1 week after session 1)	Comfort	Live the life with a relaxed attitude Adjusting posture to do something more efficiently and comfortably. Using a chair with a backrest and armrest Wearing clothes and shoes that are easy to put on and comfortable to wear Using good body mechanics and posture	90.0 Min	
3 (1 week after session 2)	Burden Reducing	Doing things one at a time Trying to avoid crowded times when doing something Reducing the amount of attention to pay to things that do not concern Before doing something, making plans regarding the process, the steps, and the amount of time will spend on it Setting priorities on the things have to do Making a shopping list before making a purchase Following regular pattern everyday activities (such as eating, sleeping, etc.) Patients learn to review their daily routines and structure their activities according to their energy levels, utilizing a patient diary	90.0 Min	
4 (1 week after session 3)			90.0 Min	
5 (1 Week after session4)	Labor Saving	Taking just enough naps so that they do not disturb nighttime sleep Try to avoid activities that consume a lot of energy Trying to skip activities or procedures that are not absolutely necessary Avoiding lifting or moving heavy objects	90.0 Min	

Table 2. Demographic and Clinical Characteristics of Patients in Intervention Group

Characteristics	Categories	Control group n(%)	Intervention group n(%)	T and X2 Values
Age	Mean (SD)	55.6 (13.7)	55.7 (10.2)	0.99
Marital status	Unmarried	5.0 (8.6%)	6.0 (8.2%)	0.89
	Married	47.0 (71.3%)	48.0 (69.8%)	
	Widowed/Divorced/separated	14.0 (20.5%)	15.0 (22.0%)	
Education status	Primary	5.0 (7.9%)	6.0 (8.2%)	0.93
	High school	47.0 (70.7%)	48.0 (69.8%)	
	College certificate	(21.2%)14.0	15.0 (22.0%)	
Current occupation	Housewife	45.0(68.1%)	47.0 (68.2%)	0.88
	Employed	15.0 (21.9%)	14.0 (20.9%)	
	Retired	6.0 (10.0%)	8.0 (10.9%)	
Co morbidities	yes	47.0 (71.1%)	48.0 (70.2%)	0.96
	no	19.0 (28.9%)	21.0 (29.8%)	
Most prevalent co morbidities	Hypertension	9.0 (13.8%)	9.0 (13.1%)	0.87
	Diabetes	7.0 (10.6%)	7.0 (10.2%)	
	Other	50.0 (75.6%)	53.0 (76.7%)	
Duration of fatigue	<6.0 months	7.0 (11.1%)	7.0 (10.1%)	0.96
	>6.0 months			
	59.0 (88.9%)			
	62.0 (89.9%)			
Known clinical stage	1	13.0 (19.0)	13.0 (20.0)	0.86
	2	28.0 (43.0)	31.0 (44.0)	
	3	25.0 (38.0)	25.0 (36.0)	

There were no significant differences between groups on any of the demographic/clinical variables at baseline

Table 3. Changes in Cancer related Fatigue Scale (CRF)

	Pre-intervention	Post-intervention	Follow-up at 8 weeks	F	Partial eta- squared(η^2)
Total scale (range: 0-60)	Mean (SD)	Mean (SD)	Mean (SD)		
IG	41.5 (10.2)	27.7 (14.1)	22.8 (18.2)	69.8*	0.2
CG	40.9 (9.8)	40.7 (10.7)	40.4 (11.6)		
Physical subscale (0.0-28.0)					
IG	20.4 (4.3)	13.8 (6.9)	11.3 (7.8)	63.9*	0.2
CG	20.8 (8.3)	20.9 (7.9)	20.9 (7.4)		
Cognitive subscale (0.0-16.0)					
IG	10.7 (3.5)	7.2 (4.5)	5.9 (4.7)	40.6*	0.1
CG	10.4 (5.1)	10.7 (4.3)	10.4 (6.3)		
Affective subscale (0.0-16.0)					
IG	9.7 (3.5)	6.5 (4.2)	5.2 (4.4)	64.9*	0.2
CG	9.8 (5.4)	9.9 (7.4)	9.9 (4.8)		

IG, Intervention Group(n=69); CG, Control Group(n=66); *, p<0.001

(F = 41.6, p < 0.001), while scores of control participants did not show this pattern of improvement over time. (Table4). All six domains of a health promoting lifestyle evaluates increased significantly. The largest effect was seen in the interpersonal relations subscale (F=57.7, partial η^2 =0.2, p<0.001) followed by physical activity (F=51.9, partial η^2 =0.18, p<0.001).

Discussion

Our study showed that the administering of energy conservation strategies had effectiveness in reducing the status of cancer related fatigue and health promotion lifestyle in persons with breast cancer following intervention fulfillment compared to patients receiving only routine care in oncology ward. Also it is found

Table 4. Changes in Health-Promoting Lifestyle

Variable (actual range of scores)	Pre-intervention	Post-intervention	Follow-up at 8 weeks	F	Partial eta-squared
Health-promoting lifestyle (71-190)	Mean(SD)	Mean(SD)	Mean(SD)		
IG	130.9 (66.2)	146.7 (45.3)	151.9 (70.1)	41.6*	0.1
CG	131.7 (76.1)	132.5 (61.2)	131.5 (34.0)	8.2	
Health responsibility (9-31)					
IG	20.2 (11.3)	24.2 (12.2)	25.1±10.2	48.6*	0.2
CG	21.2 (14.4)	20.7 (21.4)	21.4±21.5	6.0	
Physical activity(8-32)					
IG	19.3 (22.3)	24.2 (30.0)	26.4 (40.1)	51.9*	0.2
CG	18.9 (32.2)	19.0 (12.1)	18.8 (22.4)	5.9	
Nutrition(15-35)					
IG	24.2 (16.1)	28.3 (21.2)	29.2 (19.1)	47.9*	0.2
CG	25.0 (10.0)	24.8 (14.2)	24.3 (17.2)	6.0	
Spiritual growth(12-36)					
IG	28.1 (13.6)	32.2 (13.8)	33.3 (13.5)	48.0*	0.1
CG	28.2 (14.3)	28.1 (12.3)	28.3 (15.2)	5.8	
Interpersonal relations (8-32)					
IG	21.12 (15.3)	27.3 (18.3)	28.3 (17.1)	57.7*	0.2
CG	20.9 (16.8)	21.0 (15.6)	20.4 (15.3)	4.2	
Stress management (11-32)					
IG	19.3 (17.2)	24.2 (16.3)	25.3 (18.1)	51.7*	0.2
CG	19.4 (16.2)	19.5 (18.1)	18.9 (12.4)	4.8	

IG, Intervention Group(n=69); CG, Control Group(n=66);*,p<0.001

no significant difference in fatigue impact as well as health promotion lifestyle scores reported 8.0 weeks post-energy conservation program comparing to immediate post-energy conservation intervention scores.

The pattern of scores was congruent with that goal, demonstrating a mean decrease in all fatigue measures for the intervention group and improve in all domains of health promotion lifestyle scores between the first and second follow-up data points compared with a slight increase in fatigue and deteriorate for lifestyle in the control group. In the other word all fatigue scores were significantly reduced after completion of the energy conservation strategies intervention and promoted their health promotion lifestyle. These data support the aim of the present study which was to determine whether energy conservation strategies could affect the fatigue related cancer and health promotion lifestyle as well as in scores of all their domains.

Studies evaluating energy conservation strategies as an intervention in cancer survivors are rare and often utilize a general approach for reducing fatigue, not including health promotion life style as an outcome variable (Dolbeault, Cayrou et al., 2009). All mentioned interventions differed significantly from our study as they focused on different techniques. Our study adds a group education in a structured program which was implementing in a small group discussion for cancer survivors in order to reduce the cancer related fatigue and consequently the effect of reduced fatigue on health promotion lifestyle.

It is interesting that Reif et al., (2013) reported similar reductions in fatigue in their study investigating the impact of patient education in managing cancer-related fatigue. Confirming the results of the current study, our group sessions provided a sharing and support component. These preliminary findings suggest that group intervention with providing supportive role, incorporating education in managing cancer-related fatigue alongside sharing, interaction and social support, serves particularly to diminish the impact of this symptom.

Since the greatest reduction in fatigue score was shown in affective domain and the largest effect size was shown in affective fatigue compared to other domains, in the same way regarding health promotion life style, the largest effect was seen in the interpersonal relation subscale, it seems group dynamics may have contributed to the positive outcome of this study and the significant reduction in this domain of fatigue. Group members knew each other reasonably well because they regularly attended in the sessions weekly. They seemed to feel comfortable and enjoy the interaction with each other, and eagerly participated in group discussions, especially as the intervention progressed. Designing intervention in group caused supportive group environment, fostered a feeling of group unity and acceptance. Perhaps the positive social environment, in addition to reducing psychosocial fatigue impact, provided the foundation and catalyst for changes in fatigue management behavior and the ultimate significant reduction in overall fatigue impact promotion

in interpersonal relations. It seems that fostering a supportive group environment was an important factor to the success of this program. The patients were reporting that they wish had attended in this group discussion from cancer detection, the period that they feel loneliness and helplessness.

As mentioned above, we observed that scores of affective fatigue are reduced after implementing the conservation strategies. The results of our study are in consist with other study (Reif, de Vries et al., 2013). Since emotional turmoil and stress bring on and/or worsen fatigue (Lisman and Dougherty, 2011), avoiding unnecessary worry, irritation, frustration, and situations that increase stress is important (Blow, Swiecicki et al., 2011). In group women had opportunity to encourage themselves to maintain a pleasant environment as often as possible so they created affective atmosphere to improve their moral. It means they learned to set priorities about necessary stressful situations versus some battles that are not worth fighting. They received the truth that irritation, frustration, worry, and competitive feelings can also waste energy.

The results of present study showed that the second largest effect was seen in the domain of physical activity in health promotion lifestyle. It is concluded that group interaction encouraged patients to have synergetic effects to follow physical activity practices. Finally through intervention they found out what is most peaceful for them, especially during the most stressful times. On the other hand, they were attending in the group and the same time they were receiving advice and emotional support from other patients and this social support could be helpful component of effective interventions for their fatigue in affection domain (Fors, Bertheussen et al., 2011) and inter personal relation domain of health promotion life style. Therefore it is suggested that including interventions in group to manage fatigue in patients are essential in the health policy program.

The current results demonstrate that applying energy conservation strategies significantly decreased the cognitive fatigue in the breast cancer survivors. It seems that the implementation of a plan for energy conservation with prioritizing the tasks and managing the activities caused to reduce the cognitive fatigue. Sandry et al., (2014) revealed that cognitive fatigue in multiple sclerosis depends on task length (Sandry, Genova et al., 2014). Agreement with mentioned research, in our study individuals encouraged to learn how to schedule their tasks around their energy levels, doing hardest tasks when they were most alert and in maximize concentration and also they learnt to take short breaks. These short breaks allowed their mind to rest before focusing again. Then their minds could struggle to focus intensely on tasks.

Similar to other study (Silver, Baima et al., 2013) in the present study applying the strategies in group intervention helped the patients to manage physical domain in fatigue, patients tried on balancing activity and rest; planning ahead; setting priorities; understanding activity tolerance and work simplification. Simplification can be further divided into concepts of good body mechanics, elimination

of unnecessary motions, efficient use and organization of work space, and so forth.

This study also suggests that energy conservation strategies for managing fatigue may have benefits other than reducing fatigue. It appeared that there was no significant difference in fatigue impact between immediate post-energy conservation course and 8.0-week post-energy conservation intervention. It means that the effects of the energy conservation course were maintained 8.0 weeks after the course was completed. This critical finding indicates that behavioral changes made as a result of the intervention became incorporated into daily routines and had an ongoing effect on the impact of fatigue in daily functioning and healthy life style. A follow-up study is needed to determine whether these positive effects are maintained long term as well.

The major strengths of this study were the well-balanced distribution of demographic and clinical characteristics at baseline in both groups and the low dropout/withdrawal rate. All patients who attended the sessions completed the questionnaires. Moreover, patients with a wide range of educational backgrounds participated in the study.

Based on the results of this study, the modified energy conservation strategies should be recommended as an effective therapeutic intervention for breast cancer survivors. Furthermore for any management program for fatigue in this patient group, irrespective of whether pharmacological interventions are introduced, supportive care especially in group could facilitate patients' coping with fatigue, reduce its burden on their lives, and allow them to lead lives of far better quality.

Overall, the energy conservation strategies intervention was acceptable and well tolerated; satisfaction, indicated that most participants found that the intervention was credible and helpful to reduce the fatigue and promote the healthy life. Strategies topics that seemed particularly relevant and interesting to group members included the importance of rest and planning rest periods into each day, communication with others regarding fatigue and its effects, design of work stations, and incorporation of proper life styles.

It seems a multifaceted intervention focusing on both fatigue and sleep disturbance may be indicated for this population. In addition, future research should address questions related to the perceived clinical usefulness of the intervention.

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