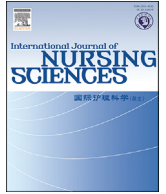


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## International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

## Original Article

## Effectiveness of Relaxation Breathing Exercise on fatigue in gynecological cancer patients undergoing chemotherapy

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## ARTICLE INFO

## Article history:

Received 17 January 2018

Received in revised form

26 May 2018

Accepted 11 September 2018

Available online 18 September 2018

## Keywords:

Relaxation breathing exercise

Gynaecologic cancer

Chemotherapy

Fatigue

## ABSTRACT

**Purpose:** This study aimed to determine the effectiveness of Relaxation Breathing Exercise (RBE) on fatigue in patients with gynaecological cancer undergoing chemotherapy.

**Methods:** We used a quasi-experiment with pre- and post-test design. Forty-two patients were consecutively sampled, 21 of whom were assigned to the group receiving RBE four times a day and 21 to the group receiving RBE twice a day. Fatigue scores were measured every day for 7 days for both groups using the Piper Fatigue Scale. Data obtained were analysed using repeated-ANOVA and independent *t*-test with a significant level of  $\alpha < 0.01$ .

**Results:** We found a significant decrease ( $P < 0.01$ ) in the mean fatigue scores of both groups (four times RBE in a day group =  $3.29 \pm 0.59$  and twice RBE in a day group =  $4.19 \pm 0.61$ ) after the completion of the intervention. However, the four times RBE a day group showed larger decrease on fatigue scores than the twice RBE a day group did (Mean Difference = 0.91; 99% CI = 0.41 to 1.41;  $P = 0.001$ ).

**Conclusion:** Conducting RBE four times a day effectively alleviated fatigue better than RBE twice a day on gynaecological cancer patients undergoing chemotherapy.

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## 1. Introduction

Patients with cancer undergoing chemotherapy experience adverse events such as pain, nausea, vomiting and fatigue [1–3], which is the most common symptom. Approximately 80%–100% of patients with gynaecological cancer experienced fatigue [4–6].

Fatigue is a subjective symptom that is uncomfortable and characterised by lack of energy and an increased need for rest [7]. Fatigue leads to cognitive impairment and physical, social and mood changes that affect the patients' quality of life [8,9]. Stone et al. [10] reported that approximately 56% of patients with cancer who experienced fatigue have a reduced quality of life in terms of their ability to work (37%), to enjoy life (30%) and affect their life (30%). Curt et al. [11] also found that fatigue in patients with cancer undergoing chemotherapy affects their physical (56% experiencing difficulty doing their jobs, 56% having difficulty climbing the stairs,

and 69% with difficulty walking long distances); psychosocial (59% stated that socializing with friends is difficult and 30% having impaired sexual intercourse); and economical aspects (71% loss of one or two working days a week, 31% loss all of their time doing their job and 28% resigned from job).

Fatigue among patients with cancer is rarely discussed with nurses because it is considered as part of the disease [5]. Meanwhile, some nurses still think that the fatigue experienced by the cancer patients is the same as ordinary fatigue and thus does not require intervention [5]. Therefore, a comprehensive assessment of fatigue is imperative to allow nurses to provide appropriate interventions to reduce fatigue and to improve the patients' quality of life [5,12].

Wanchai et al. [13] stated that pharmacological therapy is not sufficiently effective in managing fatigue in patients with cancer, and a combination of pharmacological and non-pharmacological therapy is necessary [14]. Many studies aimed to alleviate fatigue in patients with cancer by using physical exercise [15,16] and relaxation methods, including relaxation/breathing exercises (RBEs) [17–21].

RBE is a conscious act to deeply and slowly regulate breathing to

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Peer review under responsibility of Chinese Nursing Association.

achieve relaxation [22,23] and consists of physical exercise combined with breathing exercise that can be independently performed by patients [24,25]. RBE affects the stress response system and relaxes the mind and body when energy consumption is reduced or none is expended at all [26]. RBE also stimulates circulation, improves oxygen transfer to tissues and facilitates a relaxation response. Breathing exercise requires a relatively long time and hence should be done 3–4 times per day either throughout the day or before going to sleep at night [24,27]. Kim SD and Kim HS [28] studied patients with leukaemia who underwent haemopoietic transplantation and found that the fatigue of the intervention group who performed the breathing relaxation techniques was relieved better than that of the control group. The intervention was conducted for 6 weeks with RBE once a day for 30 min. According to Romito and Weinstock [29], although the implementation of relaxation exercises requires a relatively long time, exercises conducted repeatedly can provide maximum result in a short time. This result is in line with Pathak et al. [20] and Tobing's [30] finding that the implementation of routine and frequent relaxation could help patients overcome various problems, including stress, fatigue and pain due to cancer and the side effects of its treatment. To date, few studies have been found about the effectiveness of the RBE on patients with gynaecological cancer undergoing chemotherapy. Furthermore, no study has mentioned effective frequencies to achieve good results for fatigue alleviation. For these reasons, this study aimed to determine the effectiveness of RBE on fatigue in patients with gynaecological cancer undergoing chemotherapy.

## 2. Methods

### 2.1. Research design and setting

This study used a quasi-experimental with pre- and post-test control trial design and was conducted in the Cancer Center Hospital in Indonesia from February to June 2013.

### 2.2. Subjects

According to the study of Kim SD and Kim HS [28], sample calculation was conducted, and 48 participants should be included to achieve 90% power, with a 1-sided  $\alpha$  level of 0.01 and a 10%–15% anticipated drop-out rate [31]. Patients with gynaecological cancer undergoing chemotherapy were consecutively sampled, and 25 participants were allocated to the four times RBE group and 23 participants to the twice RBE group. For the final outcome analysis, we excluded six participants on the basis of participants' request ( $n=4$ ) and incomplete returned instruments ( $n=2$ ), thereby leaving 21 participants for both groups (Fig. 1). The inclusion criteria were patients who had undergone chemotherapy at least once, experienced fatigue after chemotherapy and those who were fully alert and capable of reading and writing. Patients with diabetes mellitus, heart diseases and chronic kidney disease (CKD) were excluded because these conditions can aggravate fatigue.

### 2.3. Data collection tools

#### 2.3.1. Participant characteristic questionnaire

The respondent characteristic data served as instrument for obtaining an overview of factors related to fatigue in cancer patients undergoing chemotherapy. Data, which includes age and phone number, were collected using participant characteristic questionnaire. The medical history of participants was also recorded, including the type of cancer, stage, chemotherapy cycle and regimen.

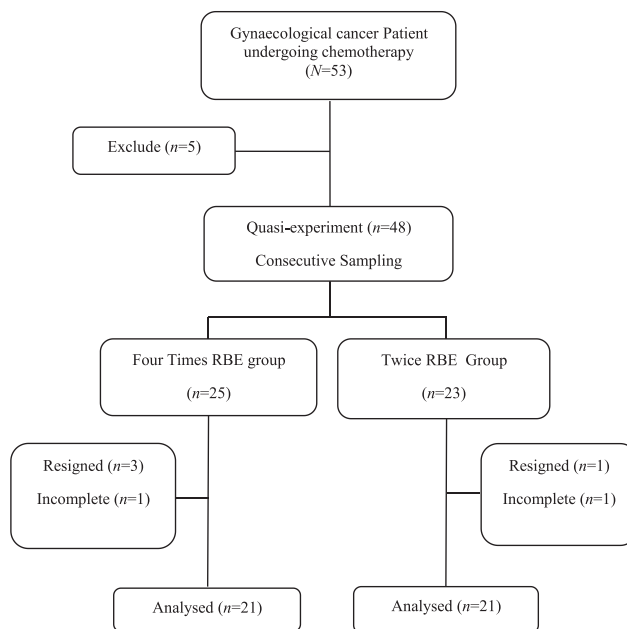


Fig. 1. Study flow.

### 2.3.2. Piper Fatigue Scale

The Piper Fatigue Scale (PFS) is a self-administrated questionnaire developed by Piper et al. [32] to measure the fatigue levels of cancer patients. PFS is a subjective measurement that includes four fatigue domains, which are, behaviour/severity, affective, sensory and cognitive. PFS consists of 22 items of questions in the numerical scale with a range of 0–10 and 5 open questions. A high score indicates high level of fatigue. Cronbach's  $\alpha$  coefficient for the original instrument was 0.97. These tools were also translated into Bahasa Indonesia with Cronbach's  $\alpha$  coefficient of 0.98, which indicates an excellent internal consistency [33].

### 2.3.3. Patients' diary/daily notes

These notes were used to determine the daily activities of participants, including implementation of RBE, activities and symptoms experienced or response of participants.

### 2.4. Intervention and procedures

Researchers recruited patients with gynaecological cancer according to the inclusion criteria and then allocated them either to the four times RBE group or the twice RBE group. Recruitment and intervention for the four times RBE group were conducted first until the desirable sample quote was achieved, followed by the recruitment and intervention of participants for the twice RBE group. This sampling method was applied to avoid data contamination and to ensure that the sample size was appropriate for power analysis. The aim and procedure of the study were explained to the patients, and those who agreed to participate signed an informed consent form. The researcher then explained to the participants how to fill the PFS and make daily notes before pre-test was conducted. Furthermore, both groups were taught RBE before the intervention and were given the RBE guideline. RBE consists of three components: (1) preliminary exercise: participants lie down comfortably on the bed and concentrate their attention on the lower abdomen; (2) relaxation breathing: participants relax by taking deep breaths and letting them out slowly; (3) closing exercise: participants keep their mind clear and stretch their arms and legs. The four times RBE group performed RBE for 30 min, four times a day (morning/7 am,

**Table 1**  
Socio-demographic and medical characteristic bases (n = 42).

Variables	Four Times RBE		Twice RBE		P value
	n	%	n	%	
<b>Age in years (Mean, SD)</b>	46.00	5.68	42.52	8.07	0.108
<b>Cancer Type</b>					1.000
Cervical	13	31.0	14	11.1	
Ovarian	8	19.0	7	16.6	
<b>Cancer Stage</b>					1.000
Early	9	21.4	10	23.8	
Advanced	12	28.6	11	26.2	
<b>Chemo Cycle</b>					0.326
≤ 3	12	28.6	16	38.1	
> 3	9	21.4	4	11.9	
<b>Regimen</b>					1.000
Platinum	16	38.1	16	38.1	
Non-Platinum	5	11.9	5	11.9	

Note: Statistically significant at  $\alpha \leq 0.05$  with independent *t*-test & Chi-square test.

midday/12 pm, afternoon/4 pm and night/8 pm) for 7 days during hospitalisation under researcher supervision and at home independently. The twice RBE group performed RBE for 30 min, twice a day (morning/7 am and night/8 pm) for 7 days. At home, the participants were followed up by telephone daily. Measurement of fatigue level using PFS was performed daily in the morning at the same time. The participants also recorded their activities and perceived complaints, such as nausea, vomiting and dizziness every day.

2.5. Ethical considerations

This study was approved by the University of Indonesia Nursing Ethics Committee (Permit number 22/H2.F12.D/HKP.02.04/2013) and research permit was obtained from the Research and Development Department of Cancer Hospital Jakarta. The researchers considered matters relating to the participants' informed consent, freedom, privacy, confidentiality and the right to resign from participating in this study.

2.6. Statistical analysis

Data entry and statistical analysis were performed using the SPSS 20.0 statistical software package. Data were presented with descriptive and analytical statistics. Chi-square and independent *t*-test were used for homogeneity test of the participants'

characteristics between groups [34] in which a *P* value > 0.05 was considered similar between the group characteristics. Repeated ANOVA was conducted to determine the significance level within group, whereas independent *t*-test was applied to compare between groups [34].  $\alpha \leq 0.01$  was considered as statistically significant for these hypothesis testing.

3. Results

3.1. Participant characteristics

Characteristics of the participants at baseline are presented in Table 1, showing that the two arms were balanced and similar statistically.

3.2. Effectiveness of RBE

Fig. 2 shows the main outcome of this study and the difference in the fatigue mean score within groups before and after RBE. A statistically significant decrease was found on the fatigue score for both groups after the 7th day of intervention ( $P < 0.01$ ). Analysis of post-hoc paired wise comparison was conducted to determine the differences in the score decrease in fatigue from the 1st day until the 7th day either in the four times RBE group or the twice RBE group. The mean reduction in the fatigue score in the four times RBE group and the twice RBE group were 0.36 and 0.15 score per day, respectively (Fig. 2).

Table 2 shows the difference of the fatigue mean score between groups before and after RBE. A significant difference was found between the four times RBE group and the twice RBE group with mean difference of 0.91 (99% CI: 0.41–1.41;  $P = 0.001$ ).

Table 3 shows the measurement of the fatigue score based on the PFS domains. Scores of sensory and behaviour domains were the highest before the intervention in both groups. After the 7th day of intervention, behaviour domain score decreased most significantly within the four times RBE group, whereas sensory domain score within the twice RBE group.

4. Discussion

This study aimed to determine the effectiveness of RBE on fatigue in patients with gynaecological cancer undergoing chemotherapy. We found a decrease in the mean difference between the four times RBE group with 0.36 score in the PFS and the twice RBE group with decreased score of 0.15 per day on the average. Based on

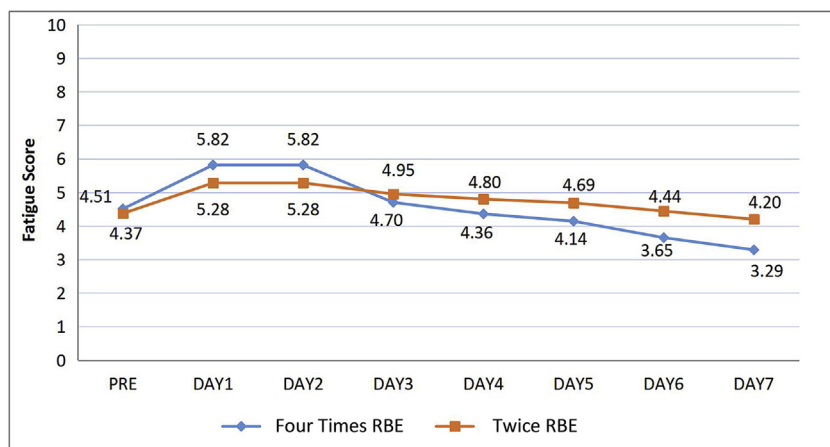


Fig. 2. Fatigue score in four times RBE group and twice RBE group from the 1st day to the 7th day.

**Table 2**Fatigue score differences before and after RBE completion between the four times RBE group and twice RBE group (Mean  $\pm$  SD).

Time	Four Times RBE (n = 21)	Twice RBE (n = 21)	Mean Difference (95% CI)	t value	P value
Pre-test	4.51 $\pm$ 0.85	4.37 $\pm$ 0.81	0.14 (-0.55–0.84)	0.558	0.580
Post-test	3.28 $\pm$ 0.59	4.19 $\pm$ 0.61	0.91 (0.41–1.41)	4.913	0.001

Note: Statistically significant at  $\alpha \leq 0.01$  with Independent t-test.

**Table 3**Fatigue score differences based on the PFS domains before and after the completion of RBE (Mean  $\pm$  SD).

Fatigue Domain	Time	Four Times RBE (n = 21)	Twice RBE (n = 21)	t value	P value
Behaviour	Day 1	6.33 $\pm$ 1.07	5.35 $\pm$ 0.97	3.125	0.003
	Day 7	3.53 $\pm$ 0.49	4.57 $\pm$ 0.66	5.786	0.001
Affective	Day 1	5.70 $\pm$ 1.32	4.39 $\pm$ 1.05	3.545	0.001
	Day 7	3.26 $\pm$ 0.68	3.93 $\pm$ 0.84	2.875	0.006
Sensory	Day 1	6.29 $\pm$ 1.78	5.60 $\pm$ 1.15	1.481	0.147
	Day 7	3.38 $\pm$ 0.88	4.48 $\pm$ 0.88	4.098	0.001
Cognitive	Day 1	5.01 $\pm$ 1.67	4.29 $\pm$ 0.82	1.758	0.086
	Day 7	3.00 $\pm$ 0.85	3.80 $\pm$ 0.58	3.581	0.001

Note: Statistically significant at  $\alpha \leq 0.01$  with Independent t-test.

the results, the RBE is more effective in alleviating fatigue in the group that received it four times a day than in those who conducted it only twice a day for 7 days as indicated in the 0.91 difference in mean between the two groups. Therefore, the researchers concluded that the four times RBE significantly alleviates fatigue in patients with gynaecological cancer undergoing chemotherapy. Devi [25] also reported that programmed deep breathing exercises reduced the level of fatigue in patients with cancer during external radiation therapy. This finding is also similar to that in the research conducted by Kim SD and Kim HS [28] on the effects of RBE on fatigue in patients with leukaemia undergoing hematopoietic transplant, although the intervention was conducted for 6 weeks once a day for 30 min.

We found that the average fatigue score before RBE intervention was in the moderate level in both RBE groups. The average scores obtained were 4.51 and 4.37 in four times RBE group and twice RBE group, respectively, when converted to PFS (0–10). A study conducted by Demiralp, Oflaz and Komurcu [35] in Turkey about the relaxing effect on the quality of sleep and fatigue in breast cancer patients undergoing adjuvant chemotherapy also found a moderate fatigue level in the initial measurement before intervention. Fatigue occurs immediately after the patient was diagnosed with breast cancer and before chemotherapy begins as a result of the stress that cause sleep disorders. Berger et al. [36] and Liu et al. [37] also reported that fatigue, sleep disorders and depressive symptoms occurred prior to chemotherapy.

This study found on the 1st day after chemotherapy that the fatigue score increased in both the four times RBE group and twice RBE group. Furthermore, on the 2nd day, the fatigue score in both groups remained and then declined until the 7th day. These results are consistent with those of Wu, Dodd and Cho [38], who studied the effects of exercise on patients with breast cancer undergoing chemotherapy and found that fatigue increased on the 1st and 2nd day after chemotherapy and gradually decreased over time. The results of this study were supported by data from the open question of questionnaire about other symptoms experienced by the participants. On average, the patients experienced nausea, vomiting and insomnia on the 1st and 2nd day, especially in four times RBE group who experienced aggravated fatigue. This finding is in line with that found by Wang et al. [39], who reported that many factors are related to fatigue, and more than half of patients experience nausea, vomiting, pain, lack of appetite and sleep disorder.

By contrast, de Jong et al. [40] found that the average degree of

fatigue began to increase on the 2nd day until the 3rd day before the next chemotherapy session. Fatigue was influenced by the psychological state of patients undergoing chemotherapy because most patients have activities; hence, they are busy completing their job or arranging further preparation before undergoing chemotherapy.

The highest score in the fatigue level based on the dimensions in this study before RBE intervention was observed for behavioural dimension, followed by sensory, affective and cognitive dimensions. This finding is in line with the study of Danismaya [33] on the relaxation effects of yoga in cancer patients after chemotherapy. Hasanah and Biswal [41] also found that the behavioural dimension mean score was highest in patients undergoing external radiotherapy. The high behaviour dimension score indicated life activity disorder. This condition occurs due to the side effects of diseases or therapy that causes patients to feel tired, depressed and unable to complete their activities [32].

However, sensory dimension, which refers to the participants' feeling about energy possessed when experiencing fatigue, showed the most significant decline after the completion of RBE intervention in this study. This result was consistent with those found by Kim SD and Kim HS [28] regarding RBE influenced sensory dimension but was in contrast to the study of Demiralp, Oflaz and Komurcu [35], who found that affective dimension has the highest score before intervention and the most significant decline after the intervention as compared with behavioural dimension. Differences in the study results may occur due to the time difference of measurements and interventions.

This study has several limitations and shortcomings, such as the implementation of RBE, which cannot be observed directly by the researchers because the chemotherapy program was conducted at the Cancer Hospital with one day care service so that patients would come home after a session of chemotherapy. The measuring instrument was used subjectively requiring a correct understanding by the participants for filling out the questionnaire at home and thus was difficult to control. In anticipation of these limitations, researchers provide RBE implementation guides and taught RBE implementation directly to assist the participants and their family in filling out PFS questionnaires in the hospital when the participants are still undergoing chemotherapy. Furthermore, the implementation of RBE at home was evaluated using a daily checklist sheet and telephone interviews. Additionally, the participants were encouraged to remain accompanied by a family member whilst filling out the questionnaire at home.

## 5. Conclusion and recommendation

RBE is more effective in alleviating fatigue in patients with gynaecological cancer undergoing chemotherapy if it was conducted four times a day than only twice. Results of this research can be used as a reference in the treatment of fatigue in patients with cancer because RBE is a non-pharmacological treatment that is non-invasive and is easily performed by nurses and patients. Therefore, RBE can be used as a preferable standard procedure for gynaecological cancer patients undergoing chemotherapy.

The results of this study can be used as bases for further research and the consecutive development of science. This research can be continued with larger sample and longer period of time than in the present study. Additionally, other research can consider other factors, such as anxiety and nutrition, which contribute to the incidence of fatigue in patients with cancer undergoing chemotherapy.

## Conflicts of interest

None declared.

## Funding

This study was funded by the International Fellowship Program (IFP), Ford Foundation, USA.

## Acknowledgements

The authors would like to gratitude to Prof. Barbara F. Piper for permitting me to use the PFS instrument in this research. We also thank to all my respondents and nurses who have participated during this study.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2018.09.004>.

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