

# Nurse-led exercise and cognitive-behavioral care against nurse-led usual care between and after chemotherapy cycles in Han Chinese women of ovarian cancer with moderate to severe levels of cancer-related fatigue

## A retrospective analysis of the effectiveness

Wei Yang, MS<sup>a</sup> , Jia Xi, PhD<sup>b</sup> , Lingxin Guo, MD<sup>c</sup> , Zhefei Cao, PhD<sup>b,\*</sup> 

### Abstract

Women with ovarian cancer are reported to fatigue over time. Moderate to severe levels of cancer-related fatigue is frequent in Han Chinese patients with cancer. Comprehensive Cancer Network guidelines are recommending exercise and cognitive behavioral therapy to reduce cancer-related fatigue. Exercise is an easy, cost-effective, and non-pharmacological approach. The objective of the study was to evaluate the effectiveness of nurse-led exercise and cognitive-behavioral care against nurse-led usual care in Han Chinese women of ovarian cancer regarding cancer-related fatigue, depressive symptoms, and sleep quality.

Han Chinese women with moderate to severe levels of cancer-related fatigue have received 30 minutes, 5 times/week nurse-led exercise and 60 min/week cognitive-behavioral care (EC cohort, n=118) or nurse-led usual care regarding educations and recommendations only (UC cohort, n=126) or have not received nurse-led exercise, cognitive-behavioral care, educations, and recommendations (NC cohort, n=145) between and after chemotherapy cycles. The Piper Fatigue Scale, the Zung Self-rating Depression Scale, and Pittsburgh Sleep Quality Index questionnaires were evaluated at the start and the end of non-pharmacological treatment.

At the end of treatment as compared to the start of treatment, only women of EC cohort had decrease Piper Fatigue Scale ( $5.40 \pm 1.49/\text{woman}$  vs  $6.06 \pm 1.49/\text{woman}$ ,  $P < .0001$ ,  $q = 4.973$ ) and Zung Self-rating Depression Scale score ( $48.67 \pm 4.24/\text{woman}$  vs  $49.93 \pm 4.29/\text{woman}$ ,  $P = .001$ ,  $q = 3.449$ ). Also, at the end of treatment, as compared to the start of treatment, only women of EC cohort have increased Pittsburgh Sleep Quality Index score ( $14.76 \pm 2.18/\text{woman}$  vs  $13.94 \pm 2.90/\text{woman}$ ,  $P = .045$ ,  $q = 3.523$ ). Only exercise and cognitive-behavioral care were successful in a decrease in the numbers of women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score  $> 53$ , 32 vs 16,  $P = .015$ ).

Nurse-led exercise and cognitive-behavioral care can help Han Chinese women with ovarian cancer to decrease cancer-related fatigue and depression. Also, it can improve the quality of sleep.

Evidence Level: 4.

Technical Efficacy: Stage 5.

**Abbreviations:** EC cohort = women have received nurse-led exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-led exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

**Keywords:** cancer-related fatigue, cognitive-behavioral care, depression, exercise, Han Chinese women, ovarian cancer, sleep

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

<sup>a</sup> Department of Obstetrics and Gynecology, Shanghai Fourth People's Hospital, No. 1279 Sanmen Road, Hongkou District, Shanghai, China, <sup>b</sup> Department of Nursing, Shanghai Fourth People's Hospital, No. 1279 Sanmen Road, Hongkou District, Shanghai, China, <sup>c</sup> Department of Gynecology, The International Peace Maternity and Child Health Hospital, School of Medicine, Shanghai Jiao Tong University, No. 910 Hengshan Road, Xuhui District, Shanghai, China.

\* Correspondence: Zhefei Cao, Department of Nursing, Shanghai Fourth People's Hospital, No. 1279 Sanmen Road, Hongkou District, Shanghai 200434, China (e-mail: chinling541@gmail.com).

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## 1. Introduction

Cancer-related fatigue is a general problem faced by patients suffering from cancer.<sup>[1]</sup> Multiple symptoms of distress can persist for a long time even after the curative treatment has ended.<sup>[2]</sup> Persistent subjective sense of physically, emotionally, and/or cognitive tiredness or exhaustion or a sensation of weakness due to cancer-related treatment is considered as cancer-related fatigue.<sup>[3]</sup> Women with ovarian cancer are reported to fatigue over time and it is also reported as a pre-diagnostic symptom.<sup>[4]</sup> Moderate to severe levels of cancer-related fatigue is fluent in Han Chinese patients with cancer.<sup>[1]</sup>

Treatment for cancer-related fatigue is either pharmacological,<sup>[5]</sup> psychostimulants, and non-pharmacological approach which includes cognitive behavioral therapy and exercises.<sup>[6,7]</sup> Exercise is an easy, cost-effective, and non-pharmacological approach.<sup>[8]</sup> Exercise has a significant effect on the reduction of cancer-related fatigue.<sup>[9]</sup> A Cochrane database systematic review,<sup>[10]</sup> randomized controlled trials,<sup>[1,11]</sup> meta-analyses,<sup>[8,12,13]</sup> and a pilot study<sup>[14]</sup> reported that exercise and cognitive behavioral therapy are effective to reduce cancer-related fatigue, improve mood, and sleep functions among cancer patients. However, a randomized controlled trial<sup>[15]</sup> is reported that home-based exercise intervention had no effect on fatigue and the other symptoms among women with breast, colorectal, or ovarian cancer. Comprehensive Cancer Network guidelines is recommending exercise and cognitive behavioral therapy to reduce cancer related fatigue.<sup>[16]</sup> Clinical nurses have adequate knowledge and skill for management of cancer related fatigue among cancer treated patients.<sup>[17]</sup>

The objective of the study was to evaluate the effectiveness of nurse-led exercise and cognitive-behavioral care against nurse-led usual care between and after chemotherapy cycles in Han Chinese women of ovarian cancer with moderate to severe levels of cancer-related fatigue regarding cancer-related fatigue, depressive symptoms, and sleep quality.

## 2. Materials and methods

### 2.1. Ethics approval and consent to participate

The designed protocol (SFPH\_141521 dated February 10, 2020) was approved by the Shanghai Fourth People's Hospital review board and the Chinese Nursing Association. The study adheres to the law of China and the v2008 Declarations of Helsinki. As being retrospective analysis, informed consent of women was not required.

### 2.2. Inclusion criteria

Han Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue (the Mandarin Chinese version of the Piper Fatigue Scale score  $\geq 4$ )<sup>[16]</sup> between and after chemotherapy cycles were included in the analysis.

### 2.3. Exclusion criteria

Non-Han Chinese women, women who had contraindications to exercise (suffering from osteoporosis, paralysis, spinal cord operations), history of cognitive disorders, and sleep disorders were excluded from the analysis.

### 2.4. Sample size calculation

The study assumed that nurse-led exercise and cognitive-behavioral care or usual care would decrease cancer-related fatigue at least 0.5 point.<sup>[18]</sup> Based on this assumption, 5% type-I error, and 10% type-II error, the sample size (minimum women required in each cohort) was 100.

### 2.5. Cohorts

A total of 118 Han Chinese women have received nurse-led exercise and cognitive-behavioral care between and after chemotherapy cycles (EC cohort). A total of 126 Han Chinese women have received nurse-led usual care between and after chemotherapy cycles (UC cohort). A total of 145 Han Chinese women have not received nurse-led exercise and cognitive-behavioral care or usual care between and after chemotherapy cycles (NC cohort). Session of nurse-led exercise and cognitive-behavioral care or usual care was taking place at the hospital when women arrived for their chemotherapy cycle. The last session was taken place at the women's home.

### 2.6. Nurse-led exercise

Muscle strength testing including aerobic and resistance activities were performed. The exercise was performed for 30 minutes and 5 times a week. Nursing staff (minimum postgraduate in nursing) were engaged in exercise.

### 2.7. Nurse-led cognitive-behavioral care

Women had received cognitive-behavioral care intervention 60 minutes per week. Cognitive-behavioral care specialist nurses with a minimum of 10 years of experience were engaged in cognitive-behavioral care intervention.

### 2.8. Usual care

Here women have received drug educations, diet recommendations, and education about ovarian cancer chemotherapy. Women have not received any type of intervention or exercise. Nursing staff (minimum postgraduate in nursing) were engaged in usual care.

### 2.9. Outcome measures

Questionnaires, cancer-related fatigue, depressive symptoms, and sleep quality measurements were evaluated between and after chemotherapy cycles.

### 2.10. Cancer-related fatigue

The Mandarin Chinese version of the Piper Fatigue Scale was used for the measurement of cancer-related fatigue. It consists of a self-rated 24-items (6 behavioral items, 6 cognitive fatigue items, 5 sensory items, 5 affective items, and 2 were specific items for Chinese territory) numeric scale. All women were asked to rate their symptoms on a 0 to 10 scale. 0: no symptom of fatigue, 1 to 3: a mild symptom of fatigue, 4 to 6: a moderate symptom of fatigue, and 7 to 10: a severe symptom of fatigue. Where 0 indicated absence and 10 indicated severely. The Cronbach  $\alpha$  is 0.96 to 0.97.<sup>[19]</sup>

**2.11. Depressive symptoms**

The Mandarin Chinese version of the Zung Self-rating Depression Scale was used to identify presence of depressive disorders/symptoms. It consists of self-rated 20-items and the level of depression was analog by a 4-point Likert scale. The Cronbach  $\alpha$  is 0.94. The total score is 80 and a score greater than 53 was considered as depression.<sup>[20]</sup>

**2.12. Quality of sleep**

The Mandarin Chinese version of the Pittsburgh Sleep Quality Index questionnaires was used for the measurement of quality of sleep. It consists of self-rated 19-sleep-behavior questionnaires of 7 subdomains (sleep latency, subjective sleep quality, sleep duration, sleep efficiency, sleep dysfunction, sleeping medications, and daytime dysfunction). A 3-point Likert scale was used for the assessment of each question. The Cronbach  $\alpha$  is 0.81 to 0.85. The score range was 0 to 21. The higher the score the higher would be quality of sleep.<sup>[21]</sup>

**2.13. Adverse events**

Data regarding any adverse event due to exercise, cognitive-behavioral care, or usual care were collected and analyzed.

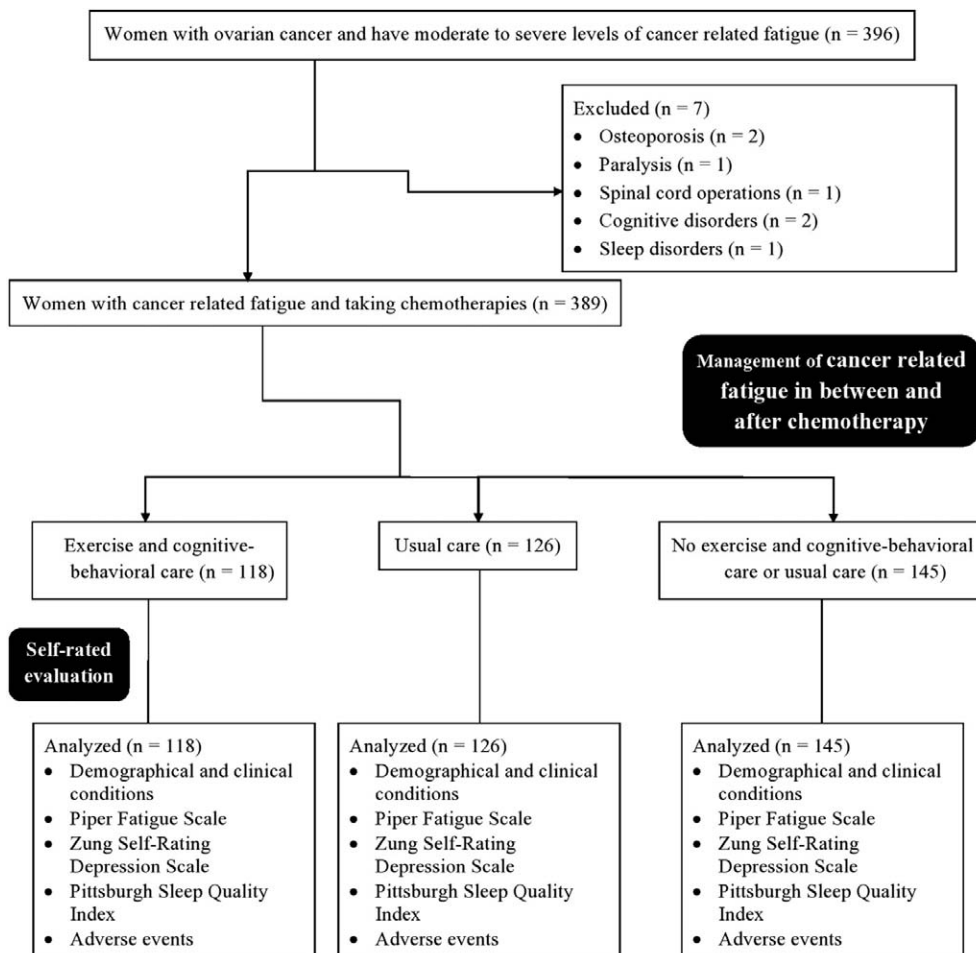
**2.14. Statistical analysis**

SPSS 26.0 (IBM Corporation, Armonk, NY) was used for statistical analysis purposes. One-way analysis of variance between cohorts and repeated measures of analysis of variance within the cohort was performed for statistical analysis.<sup>[1]</sup> Tukey test (considering critical value ( $q$ ) >3.327 as significant between cohorts and >3.330 as significant within the cohort) was performed for *post hoc* analysis. Fischer exact test or chi-square test of independence was used for categorical data. All results were considered significant if  $P$  was less than .05.

**3. Results**

**3.1. Study population**

From October 15, 2017 to July 1, 2019, a total of 396 Han Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue, were taking chemotherapies at the department of oncology of the Shanghai Fourth People’s Hospital, Shanghai, China and the International Peace Maternity and Child Health Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China. Among them, 2 women were suffering from osteoporosis, 1 woman had paralysis, 1 woman had spinal cord operations, 2 women had a history of cognitive



**Figure 1.** The flow diagram for management of cancer-related fatigue between and after chemotherapy cycles of Han Chinese women with ovarian cancer.

**Table 1**  
**Demographical, social, and clinical conditions of Han Chinese women at the start of non-pharmacological treatment for cancer-related fatigue.**

Parameters	Cohorts			Comparisons
	EC	UC	NC	
Non-pharmacological treatment	Exercise and cognitive-behavioral care	Usual care	Nothing	
Numbers of women	118	126	145	<i>P</i> value
Age (yrs)				
Minimum	30	31	30	.178
Maximum	66	66	65	
Mean ± SD	44.21 ± 8.12	45.22 ± 9.23	46.18 ± 8.24	
Educational level				
Very primitive	23 (19)	16 (13)	21 (15)	.537
School level	75 (64)	81 (64)	93 (64)	
Graduate or more	20 (17)	29 (23)	31 (21)	
Family caregivers				
Husband	85 (72)	91 (72)	97 (67)	.551
Other	33 (28)	35 (28)	48 (33)	
Marital status				
Married	107 (91)	111 (88)	131 (90)	.764
Single	11 (9)	15 (12)	14 (10)	
Occupation status				
Working women	73 (62)	75 (60)	88 (61)	.932
House-wife	45 (38)	51 (40)	57 (39)	
Menopausal status				
Pre-menopausal	49 (42)	54 (43)	64 (44)	.913
Postmenopausal	69 (58)	72 (57)	81 (56)	
Smoking status				
No smoker	103 (87)	108 (86)	125 (86)	.962
Previous smoker	10 (9)	11 (9)	11 (8)	
Current smoker	5 (4)	7 (5)	9 (6)	
Cancer stage				.172
I	14 (12)	14 (11)	15 (10)	
II	33 (28)	32 (25)	42 (29)	
III	46 (39)	42 (34)	65 (45)	
IV	25 (21)	38 (30)	23 (16)	
Presence of 1 or more comorbidity				
Yes	93 (79)	95 (75)	113 (78)	.799
No	25 (21)	31 (25)	32 (22)	

Continuous variables are demonstrated as mean ± standard deviation (SD) and constant variables are demonstrated as frequency (percentages).

One-way ANOVA (for continuous variables) and chi-square test of independence (for constant variables) were used for statistical analyses.

A *P* < .05 considered significant.

ANOVA = analysis of variance, EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, *P* value = measure of the probability, UC cohort = women have received usual care in between and after chemotherapy cycles.

disorders, and 1 woman had sleep disorders. Therefore, data of a total of 7 women were excluded from the analysis. Data regarding questionnaires, cancer-related fatigue, depressive symptoms, and sleep quality between and after chemotherapy cycles of the total of 389 Han Chinese women were collected and analyzed. The flow diagram for management of cancer-related fatigue between and after chemotherapy cycles of Han Chinese women with ovarian cancer is reported in Figure 1.

### 3.2. Demographical and clinical conditions

At the start of non-pharmacological treatment for cancer-related fatigue, there were no significant differences for demographical characters, social parameters, clinical conditions, cancer-related fatigue, depressive symptoms, and quality of sleep of Han Chinese women among cohorts (*P* > .05 for all). The details of demographical, social, and clinical conditions of Han Chinese

women at the start of non-pharmacological treatment for cancer-related fatigue are reported in Table 1.

At the start of non-pharmacological treatment, the numbers of Han Chinese women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score >53) were 32 (27%), 25 (20%), and 28 (19%) among EC, UC, and NC cohorts, respectively. Cancer-related fatigue, depressive symptoms, and quality of sleep of Han Chinese women at the start of non-pharmacological treatment are reported in Table 2.

### 3.3. Piper Fatigue Scale

At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort had decrease Piper Fatigue Scale (5.40 ± 1.49/woman vs 6.06 ± 1.49/woman, *P* < .0001, *q* = 4.973). However, women of UC (*P* = .128), and NC (*P* = .071) cohorts

**Table 2** Cancer-related fatigue, depressive symptoms, and quality of sleep of Han Chinese women at the start and at the end of non-pharmacological treatment.

Parameters	Cohorts												Comparisons					
	EC				UC				NC				At BL		At EL			
	Exercise and cognitive-behavioral care		Usual care		Nothing		Nothing		Nothing		Nothing		P value		q value			
<b>Non-pharmacological treatment</b>	BL	EL	P value	q value	BL	EL	P value	q value	BL	EL	P value	q value	BL	EL	P value	q value	EC vs UC	EC vs NC
<b>Numbers of women</b>	118	118			126	126			145	145			145	145				
The Mandarin Chinese version of the Piper Fatigue Scale score																		
Minimum	4	4			4	4			4	4			4	4				
Maximum	9	8	<.0001	4.973	9	8	.128	N/A	9	8	.071	N/A	9	8	<.0001	3.642	9.219	5.554
Mean ± SD	6.06 ± 1.49	5.40 ± 1.49			6.17 ± 1.64	5.80 ± 1.23			6.43 ± 1.42	6.39 ± 1.27			6.43 ± 1.42	6.39 ± 1.27				
The Mandarin Chinese version of the Zung Self-rating Depression Scale score																		
Minimum	40	39			39	39			40	40			40	40				
Maximum	57	56	.001	3.449	56	55	.371	N/A	56	56	.979	N/A	56	56	.002	4.852	3.875	1.159
Mean ± SD	49.93 ± 4.29	48.67 ± 4.24			50.60 ± 3.37	50.30 ± 3.32			50.01 ± 3.68	49.93 ± 3.57			50.01 ± 3.68	49.93 ± 3.57				
Numbers of women with depression (score >53)	32 (27)	16 (14)	.015	N/A	25 (20)	22 (17)	.746	N/A	28 (19)	28 (19)	1.000	N/A	28 (19)	28 (19)	.459	N/A	N/A	N/A
The Mandarin Chinese version of the Pittsburgh Sleep Quality Index score																		
Minimum	8	10			8	9			8	9			8	9				
Maximum	18	9	.045	3.523	18	18	.381	N/A	19	19	.743	N/A	19	19	.002	1.764	4.889	3.122
Mean ± SD	13.94 ± 2.90	14.76 ± 2.18			14.29 ± 2.48	14.37 ± 2.33			13.70 ± 2.75	13.71 ± 2.72			13.70 ± 2.75	13.71 ± 2.72				

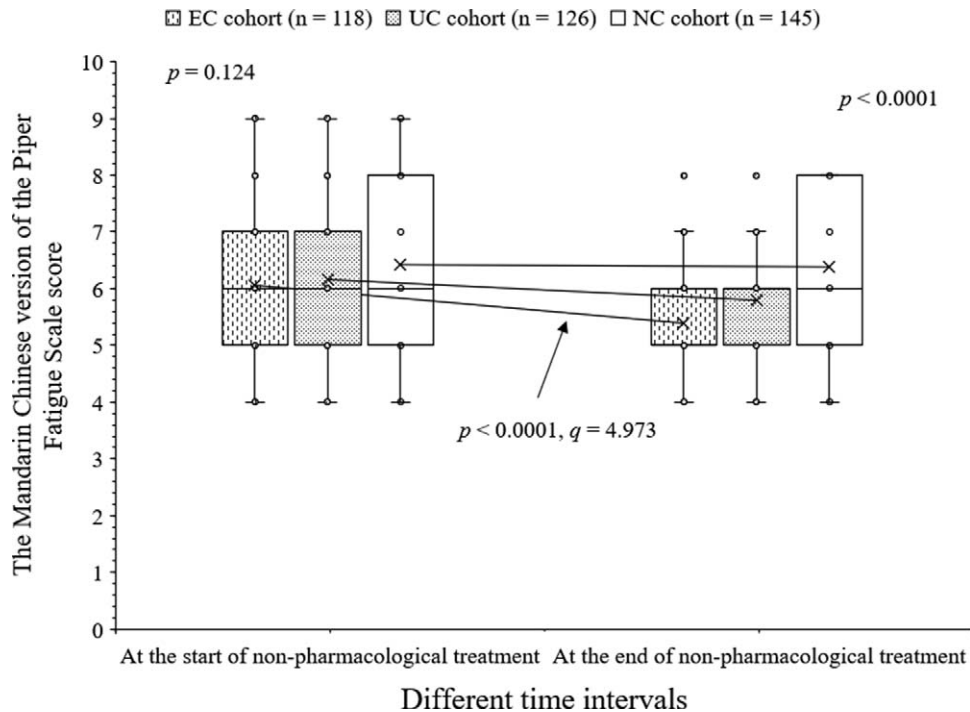
Continuous variables are demonstrated as mean ± standard deviation (SD) and constant variables are demonstrated as frequency (percentages).

One-way ANOVA (for continuous variables) and chi-square test (for constant variables) were used for statistical analyses.

Tukey test was used for *post hoc* analysis.

A  $P < .05$  and  $q > 3.327$  (between cohorts) and  $> 3.330$  (within the cohort) considered significant.

ANOVA = analysis of variance, BL = at the start of non-pharmacological treatment, EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, EL = at the end of non-pharmacological treatment, N/A = not applicable, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, P value = measure of the probability, q = critical value for Tukey test, UC cohort = women have received usual care in between and after chemotherapy cycles.



**Figure 2.** Cancer-related fatigue evaluation at different time points. The Mandarin Chinese version of the Piper Fatigue Scale score. 0: no symptom of fatigue, 1 to 3: a mild symptom of fatigue, 4 to 6: a moderate symptom of fatigue, and 7 to 10: a severe symptom of fatigue. Where 0 indicated absence and 10 indicated severely. EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

have not decreased Piper Fatigue Scale. At the end of non-pharmacological treatment Piper Fatigue Scale of women of EC cohort had fewer than those of UC ( $P < .0001$ ,  $q = 3.642$ ) and NC ( $P < .0001$ ,  $q = 9.219$ ) cohorts. Also, at the end of non-pharmacological treatment, the Piper Fatigue Scale of women of the UC cohort was fewer than those of the NC cohort ( $P < .0001$ ,  $q = 5.554$ ). The details of the Piper Fatigue Scale of women are reported in Figure 2.

### 3.4. Zung Self-rating Depression Scale

At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort had decrease Zung Self-rating Depression Scale score ( $48.67 \pm 4.24$ /woman vs  $49.93 \pm 4.29$ /woman,  $P = .001$ ,  $q = 3.449$ ). However, women of UC ( $P = .371$ ) and NC ( $P = .979$ ) cohorts have not decreased Zung Self-rating Depression Scale score. At the end of non-pharmacological treatment Zung Self-rating Depression Scale score of women of EC cohort had fewer than those of UC ( $P = .002$ ,  $q = 4.852$ ) and NC ( $P = .002$ ,  $q = 3.875$ ) cohorts. At the end of non-pharmacological treatment, the numbers of women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score  $> 53$ ) were 16 (14%), 22 (17%), and 28 (19%) among EC, UC, and NC cohorts, respectively. Only exercise and cognitive-behavioral care were successful in a decrease in the numbers of women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score  $> 53$ , 32 vs 16,  $P = .015$ , Fig. 3). The details Zung Self-rating Depression Scale score are presented in Figure 4.

### 3.5. Pittsburgh Sleep Quality Index

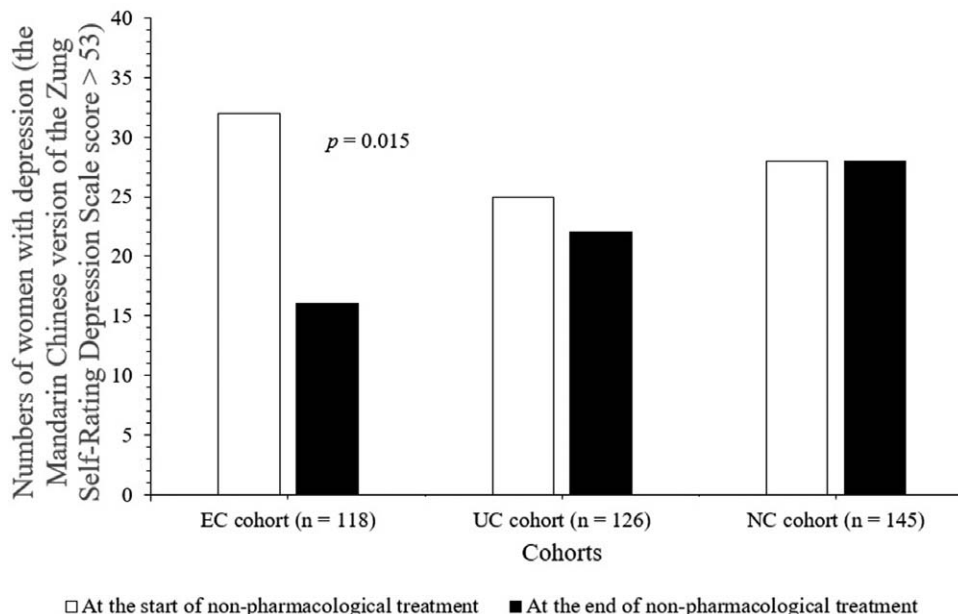
At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort have increased Pittsburgh Sleep Quality Index score ( $14.76 \pm 2.18$ /woman vs  $13.94 \pm 2.90$ /woman,  $P = .045$ ,  $q = 3.523$ ). However, women of UC ( $P = .381$ ) and NC ( $P = .743$ ) cohorts have not increased Pittsburgh Sleep Quality Index score. At the end of non-pharmacological treatment, the Pittsburgh Sleep Quality Index score of women of the EC cohort was higher than those of the NC cohort ( $P = .002$ ,  $q = 4.889$ ). The details of the Pittsburgh Sleep Quality Index score are presented in Figure 5.

### 3.6. Adverse events

No adverse events due to exercise, cognitive-behavioral care, or usual care were reported.

## 4. Discussion

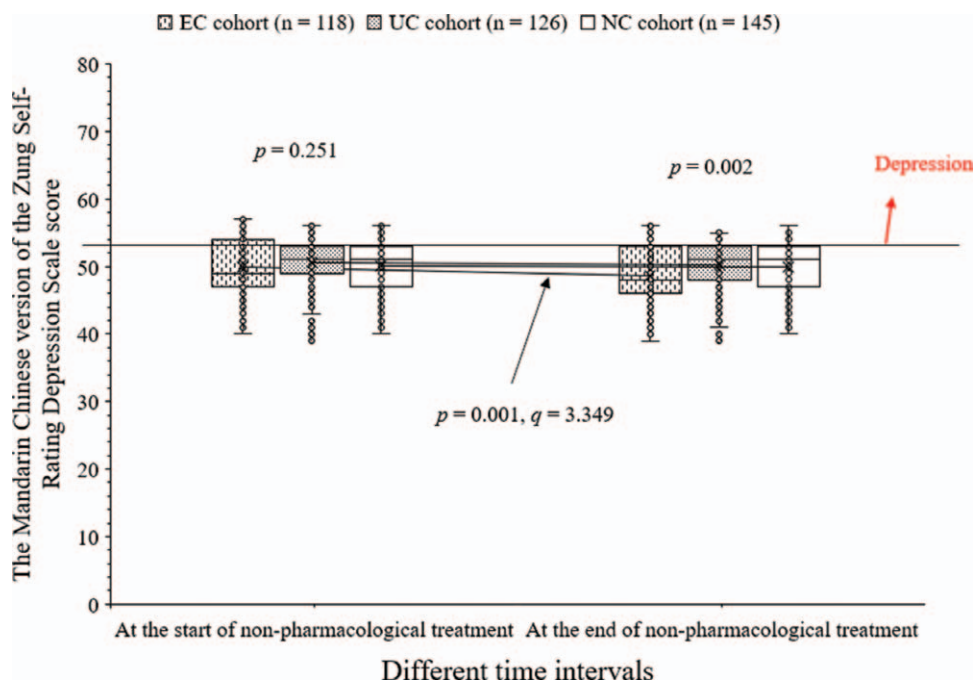
Han Chinese women who received nurse-led exercise and cognitive-behavioral care have less cancer-related fatigue than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Piper Fatigue Scale score of the current study are consistent with those of a randomized trial,<sup>[11]</sup> a pilot study,<sup>[14]</sup> a Cochrane database Systematic Review,<sup>[10]</sup> and meta-analyses<sup>[8,9,12,13]</sup> but not consistent with a randomized controlled trial.<sup>[15]</sup> A randomized trial<sup>[11]</sup> and a pilot study<sup>[14]</sup> both are performed



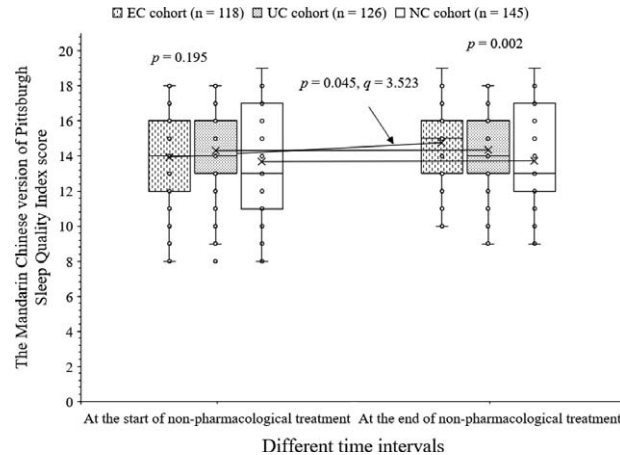
**Figure 3.** The numbers of women with depression. A score greater than 53 was considered as depression. EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

with a small sample size. The possible justification for the contradictory results is different inclusion criteria between both studies and a randomized controlled trial<sup>[15]</sup> has used home-based exercise intervention. While the current study had used nurse-lead exercise and cognitive-behavioral

care and nurse-lead usual care at the institutes. Nurse-led intervention(s) has more effect than those of home-based.<sup>[1]</sup> Nurse-led exercise and cognitive-behavioral care can help Han Chinese women with ovarian cancer to decrease cancer-related fatigue.



**Figure 4.** Depressive symptoms evaluation at different time points. The Mandarin Chinese version of the Zung Self-rating Depression Scale score. The total score is 80 and a score greater than 53 was considered as depression. EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.



**Figure 5.** Quality of sleep evaluation at different time points. The Mandarin Chinese version of the Pittsburgh Sleep Quality Index score. The score range was 0 to 21. Higher the score the higher the would-be quality of sleep. EC cohort = women have received nurse-led exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-led exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

Han Chinese women who received nurse-led exercise and cognitive-behavioral care have fewer depressive symptoms than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Zung Self-rating Depression Scale score of the current study are consistent with those of a randomized trial,<sup>[11]</sup> a pilot study,<sup>[14]</sup> and meta-analyses<sup>[8,9,12,13]</sup> but not consistent with a randomized controlled trial.<sup>[15]</sup> Nurse-led cognitive-behavioral care can help Han Chinese women with ovarian cancer to generate hope about their life.

Han Chinese women who received nurse-led exercise and cognitive-behavioral care have a higher quality of sleep than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Pittsburgh Sleep Quality Index questionnaires of the current study are consistent with those of a randomized trial<sup>[11]</sup> but not consistent with a randomized controlled trial.<sup>[15]</sup> Reduction of depression of women leads to improvement of quality of sleep.<sup>[22]</sup> Nurse-led exercise and cognitive-behavioral care can provide better sleep to Han Chinese women with ovarian cancer.

In the limitations of the study, for example, retrospective analysis and lack of randomized trial. The study only includes Han Chinese women with ovarian cancer. Only short-term effects were evaluated, long-term effects of exercise and cognitive-behavioral care, and usual care were not discussed. The other limitations are that the results were self-reported data, which are less accurate than objective parameters. The possible justification is that cancer-related fatigue, depression, and poor quality of sleep are subjective parameters and are not objective parameters.<sup>[11]</sup> Self-reported data does have value in that it takes into account the women’s experience, and it should be appreciated, in no way less accurate than objective parameters which may not reflect the day-to-day functioning of activities. The effects differ by advanced cancer staging is not discussed.

**5. Conclusions**

Nurse-led exercise and cognitive-behavioral care can help to decrease cancer-related fatigue and depression among Han

Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue. Also, it can improve the quality of sleep. The study data provide background for the solution of ovarian cancer-related problems in women in different regions. Also, focused on implementation of the nurse-led exercise and cognitive-behavioral care intervention into practice.

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**Author contributions**

- Conceptualization: Jia Xi.
- Data curation: Jia Xi.
- Investigation: Lingxin Guo.
- Methodology: Jia Xi, Zhefei Cao.
- Project administration: Wei Yang.
- Resources: Wei Yang, Jia Xi, Lingxin Guo, Zhefei Cao.
- Software: Wei Yang, Lingxin Guo.
- Supervision: Wei Yang, Lingxin Guo.
- Visualization: Zhefei Cao.
- Writing – original draft: Zhefei Cao.
- Writing – review & editing: Zhefei Cao.

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