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RESEARCH

The effectiveness of an expressive writing diary on preoperative anxiety in breast cancer patients undergoing surgery: a mixed methods intervention design

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Abstract

Purpose This study examined the effectiveness of an expressive writing diary (EWD) in reducing preoperative anxiety among breast cancer patients awaiting surgery. It also explores patient experiences in both EWD and the relaxing diary (RD) groups, with an emphasis on anxiety levels and writing engagement.

Methods We employed a mixed methods intervention design in a randomized controlled trial of 30 breast cancer patients. The participants were assigned to either the EWD (intervention) or RD (control) group. Preoperative anxiety levels were measured via the State-Trait Anxiety Inventory before and after in both groups. Qualitative data were then analyzed to investigate patient experiences.

Results The EWD and RD significantly reduced preoperative anxiety. However, the EWD yielded a greater reduction (mean difference = 5.1; 95% CI − 1.7, 11.9). The qualitative findings indicated that the EWD offered a structured outlet for emotional expression. This approach fostered heightened emotional awareness, personal growth, and transformation. In contrast, RD participants reported difficulty engaging, largely because of insufficient structure and guidance.

Conclusion Both the EWD and RD effectively reduced preoperative anxiety in breast cancer patients, although the EWD had stronger effects. Moreover, the EWD increased patients' emotional well-being and quality of life prior to surgery. Thus, an EWD may serve as a valuable supplement to preoperative care.

Keywords Breast cancer · Expressive writing diary · Mixed methods research · Preoperative anxiety

Introduction

Breast cancer is a major invasive disease that significantly affects women's lives [1, 2]. It presents common challenges throughout its course, from early screening and diagnosis to treatment, recovery, and end-of-life care [3, 4]. In surgical contexts, breast cancer patients frequently experience intense negative emotions, often linked to uncertainty surrounding their surgical outcomes [5].

Preoperative anxiety is a frequent psychiatric symptom among surgical patients and occurs throughout the preoperative period [6, 7]. It is characterized by apprehension, nervousness, and autonomic responses to unpredictable and threatening preoperative situations [8, 9]. In patients with breast cancer, preoperative anxiety is particularly prevalent and is correlated with increased morbidity and mortality, as well as postoperative complications, such as pain, infection, lymphedema, and restricted shoulder or arm mobility [7,

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10–12]. Furthermore, it increases postoperative demands, such as higher doses of narcotic analgesics, prolonged surgical recovery, and extended hospitalization [13, 14]. Therefore, efforts to mitigate preoperative anxiety in breast cancer patients are crucial.

Anxiolytic medications and sedatives are commonly prescribed to manage preoperative anxiety [15]. However, several nonpharmacological interventions, such as music therapy, art therapy, yoga therapy, preoperative mindfulness-based interventions, and cognitive behavioral therapy, are less costly and noninvasive [16, 17]. These measures are often used in conjunction with anxiolytic agents to further reduce preoperative anxiety [18].

Expressive writing intervention (EWI) is a therapeutic approach that prompts individuals to articulate their thoughts, emotions, and personal experiences through writing. Typically, it involves continuous writing for 15 to 30 min on a specified topic or reflective theme. The primary goal is to foster emotional processing, promote insight, and facilitate cognitive restructuring, thereby improving psychological well-being and overall health outcomes. EWI has been investigated for its efficacy in reducing stress, improving mood, enhancing coping skills, and supporting emotional health among individuals facing diverse challenges or trauma [19–23]. It has also been employed to bolster emotional regulation and augment physical health outcomes in patients with primary breast cancer. Despite these documented benefits, no studies have examined the potential of the EWI to alleviate preoperative anxiety among breast cancer patients awaiting surgery [20, 24, 25].

A diary is a personal record that documents events, thoughts, emotions, and feelings. In breast cancer patients, its use has been associated with reduced fatigue and improved self-management and dietary practices [26–28]. Building on these advantages, researchers have adapted EWI by integrating a holistic perspective into a diary format, creating an expressive writing diary (EWD). This approach facilitates easy writing and is tailored to the needs of Thai patients [29, 30]. Our primary objective was to investigate the effectiveness of the EWD in reducing preoperative anxiety levels among breast cancer patients awaiting surgery. Our secondary objective was to explore patients' experiences with preoperative anxiety following the diaries.

Materials and methods

Study design

We used a mixed methods design to assess the effectiveness of the diaries and to gain a deeper understanding of the experiences associated with its outcomes [31]. The study combined a randomized controlled trial to evaluate the effectiveness of the EWD with instrumental qualitative case studies that explored patient experiences [32]. The protocol was approved by the institutional review board of the Faculty of Medicine Siriraj Hospital, Mahidol University (reference number Si-594/2021). It was also registered in the Thai Clinical Trials Registry (TCTR20220211003) on 11 February 2022.

Participants

All participants were female, aged 18 years or older, and had been diagnosed with breast cancer. They were newly admitted for surgery and were scheduled to undergo either a total/simple mastectomy or breast-conserving surgery. A visual analog scale anxiety score of 4 or higher was required for eligibility. We excluded patients if they reported a visual analog scale pain score of 7 or higher. We also excluded those with dementia, intellectual disabilities, severe psychiatric disorders, or communication difficulties (e.g., deaf or mute) that prevented them from reading or writing in Thai. Participants who withdrew due to adverse events, which were promptly resolved, or who experienced significant pain during the writing were also excluded.

Sample size

We calculated the sample size on the basis of differences in pretreatment and posttreatment anxiety scores within the EWD group. Because no prior studies existed, we assumed an effect size of 0.80 (upper bound of the medium effect), a significance level of 0.05, and 80% power. This assumption informed the sample size calculations. G*Power software (version 3.1.9.6; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) indicated that at least 15 participants were needed in each group. To compare anxiety scores between the intervention group and the control group, we allocated the minimum of 15 participants to each group, which recognized the constraints imposed by the COVID-19 pandemic.

Intervention

The EWD is an 11-page handmade booklet designed to enhance mental well-being. A preoperative nurse and a clinical psychologist developed it by adapting elements of the EWI to suit breast cancer patients preparing for surgery. The diary prompts participants to write about their thoughts and emotions, particularly those related to surgery, in structured and confidential sessions. Each session lasts approximately 35−45 min, with privacy ensured to encourage candid self-expression. Additional details about the booklet are provided in Supplementary 1. The EWD's

content was reviewed by three experts: a psychiatrist, a research nurse, and a breast cancer patient who underwent surgery.

For the control group, the RD includes unstructured blank pages, allowing participants to write freely for 5−15 min. The patient was asked to write about their thoughts, emotions, and feelings, or anything else they wished to express. This approach, which is commonly employed in the surgical ward at Siriraj Hospital, supports relaxation and self-expression.

Instruments

Quantitative instrument

We used the State–Trait Anxiety Inventory (STAI), originally developed by Charles D. Spielberger, to measure preoperative anxiety. The STAI comprises two subscales: (1) the State Anxiety Scale, which assesses transient anxiety linked to specific situations, and (2) the Trait Anxiety Scale, which evaluates a person's general tendency toward anxiety. Both subscales rely on self-reported items to gauge anxiety intensity and frequency. Widely used in clinical and research settings, the STAI has proven effective across diverse populations [33]. The Thai-translated version has strong psychometric properties, with Cronbach's alpha values ranging from 0.86 to 0.92 and test–retest reliability values between 0.73 and 0.92. The inventory includes 40 items (20 state and 20 trait anxiety items), incorporating positively and negatively worded statements. We measured preoperative anxiety levels before and after writing in both groups. Permission to use and purchase the STAI was obtained from Mind Garden, Inc, Menlo Park, CA, USA.

Qualitative instrument

This study employed two qualitative instruments. First, a set of questions embedded in the EWD explored participants' experiences. Second, a broader set of qualitative questions was developed to understand how the intervention functioned in both groups. Three experts—a clinical psychologist, a psychiatrist, and a research nurse—validated these questions to ensure they aligned with the objectives of the interview. These questions include (1) When you think of a diary, what comes to your mind? (2) How is it different before you start writing a diary and after you have written a diary? (3) Does writing a diary have any advantages or disadvantages? How? and (4) What suggestions do you have for developing a diary? Finally, the research nurse developed probing questions and adjusted them for use during the interviews. The interview lasted 10 to 20 min.

Procedure

This study followed the Consolidated Standards of Reporting Trials (CONSORT). Block randomization was performed via nQuery Advisor 6.0 (Statistical Solutions Ltd, Cork, Ireland), with a research assistant blinded to the procedure. The program generated a mixed block randomization sequence that allocated 30 participants into two groups: 15 in the intervention group and 15 in the control group. The CONSORT flow diagram of participant enrollment, allocation, and study progression details is shown in Fig. 1. After patients were admitted and underwent nursing and relevant medical assessments, an independent research assistant invited them to participate in the study, and the informed consent process was completed. Sealed envelopes containing group assignments were prepared and opened. A pretest using the STAI was administered to both groups. Each diary intervention was then implemented. Participants were given approximately 4 h to complete the diary, after which a posttest STAI assessment was conducted. Patients demonstrating significant changes in anxiety scores (≥ 10-point increase or decrease on the STAI) after the intervention were selected for interviews to further explore their diary-writing experiences. These interviews were conducted by another independent research assistant, who was a research nurse. Following this process, all patients were instructed to bathe and rest in preparation for surgery the following day.

Analysis

Statistical analysis

The research team conducted data collection and verification to ensure accuracy. Statistical analyses were performed using IBM SPSS Statistics, version 27 (IBM Corp, Armonk, NY, USA). Before analysis, the data were checked for errors and outliers. Quantitative variables are summarized as the means and standard deviations, whereas qualitative variables are described as frequencies and percentages. Demographic characteristics were compared via independent *t* tests for continuous variables and either Pearson's chi-square test or Fisher's exact test for categorical variables, depending on expected frequencies.

To evaluate the effectiveness of the EWD intervention, multiple statistical analyses were conducted. Dependent-sample *t*-tests were used to examine within-group changes in state anxiety from preintervention to postintervention. To assess between-group differences in the extent of change, independent-sample *t*-tests were performed on the change scores (posttest minus pretest). Additionally, three separate analyses of covariance (ANCOVA) were conducted to control for potential baseline differences in anxiety levels. In each model, posttest scores for state anxiety, trait anxiety,

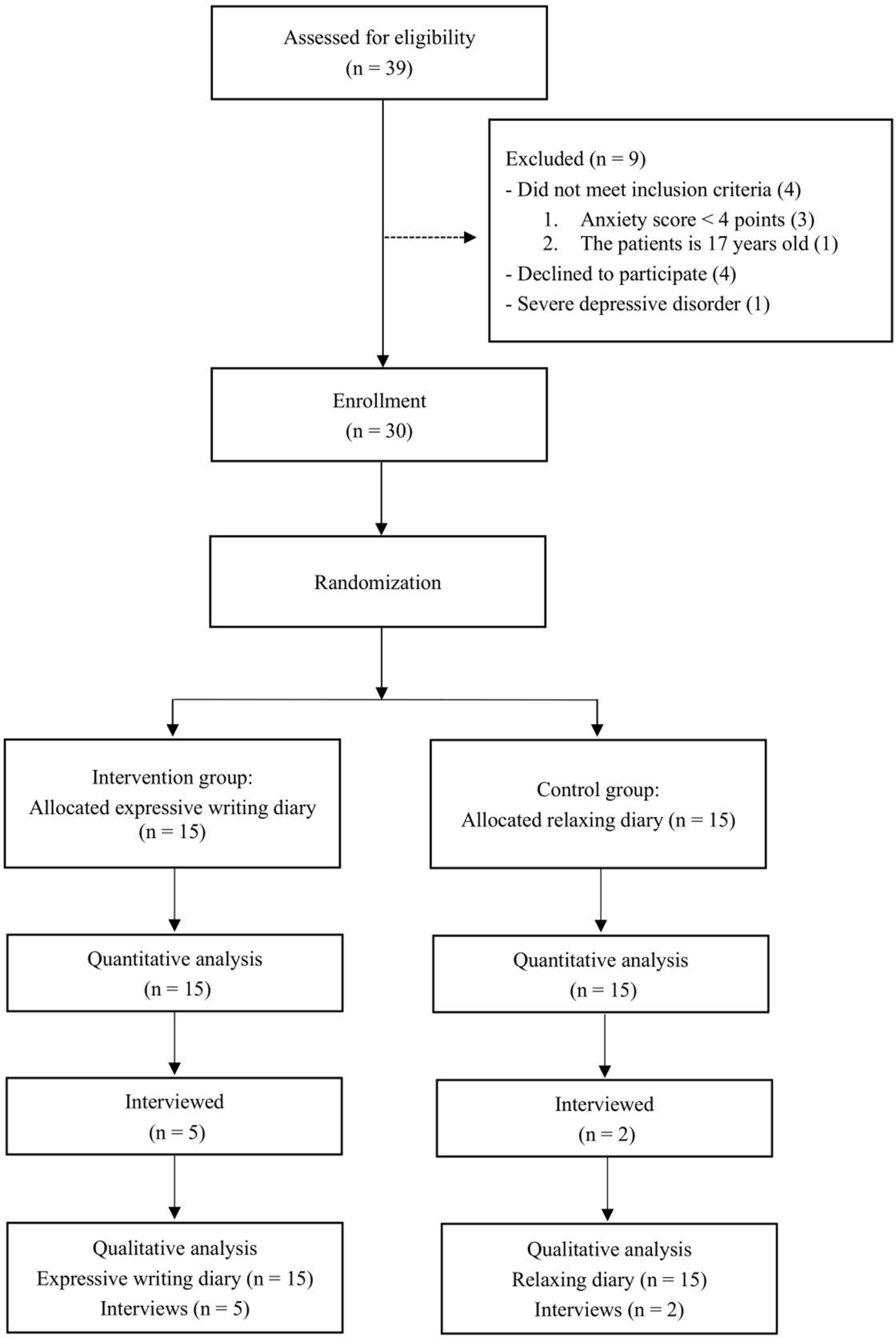

Fig. 1 CONSORT flow diagram of participant enrollment, allocation, and study progression

and total anxiety served as the dependent variables; the corresponding pretest scores were included as covariates; and group (EWD vs. RD) was entered as the independent variable. This approach enabled a more accurate estimation of the intervention's effect by statistically adjusting for baseline variability. Statistical significance was set at $P < 0.05$ for all analyses.

Content analysis

Qualitative data were derived from two principal sources: diaries (in both the intervention and control groups) and interviews transcribed verbatim from digital recordings. A qualitative instrumental case study approach was used, with a focus on a holistic unit of analysis. The analytical procedure followed three stages: data condensation, data display, and conclusion drawing/verification [34].

The researcher, a clinical psychologist with experience in perioperative care, used an inductive approach to ground the codes in qualitative data. These grounded codes were then applied to identify key statements. In parallel, two research nurses independently reviewed and analyzed all transcripts, grounding the codes on their own. The coders also engaged in ongoing discussions using the constant comparative method, which allowed for the refinement, adjustment, and resolution of the codes. These codes were then organized into meaningful codes and themes.

Results

Quantitative results

Between May and August 2022, 39 newly admitted breast cancer patients were consecutively recruited. Among these, 30 patients who underwent complete mastectomy were randomly assigned to either the intervention group or the control group. No statistically significant differences were observed in demographic or clinical characteristics between the two groups, as shown in Table 1.

Table 2 presents the mean STAI ratings for both the EWD and RD groups at pretests and posttests. Within each group, the state, trait, and total anxiety scores significantly decreased from pretest to posttest. Although the between-group comparisons were not statistically significant, the EWD group presented greater reductions in all anxiety measures (state, trait, and total) than did the RD group.

State anxiety

At pretest, the EWD group had a slightly higher mean state-anxiety score (47.5 ± 8.4) than the RD group did (42.9 ± 10.5), but this difference was not significant (mean difference = 4.7; 95% CI − 2.4, 11.8; $P = 0.189$). The posttest scores were similar (41.3 ± 8.2 for EWD vs 40.1 ± 10.8 for RD), resulting in a mean difference of 1.2 (95% CI − 5.9, 8.3; $P = 0.733$). Within-group analysis revealed significant state-anxiety reductions in both the EWD group (mean change = 6.3; 95% CI 2.7, 9.8; $P = 0.002$) and the RD group (mean change = 2.8; 95% CI 0.6, 5.0; $P = 0.016$). Although the between-group difference in these pretest to posttest changes was not statistically significant (mean difference = 3.5; 95% CI − 0.5, 7.5; $P = 0.087$), the EWD group demonstrated a more pronounced decline.

Trait anxiety

The trait-anxiety scores followed a similar pattern. The EWD group's mean trait-anxiety score at pretest was 44.1 ± 6.8, whereas the RD group's score was 42.1 ± 10.3, with no statistically significant difference (mean difference = 2.0; 95% CI − 4.5, 8.5; $P = 0.534$). By posttest, the mean difference

Table 1 Baseline demographic and clinical characteristics of breast cancer patients in the intervention and control groups

Variables	Total ($n = 30$)	Intervention ($n = 15$)	Control ($n = 15$)	P-value
Age, mean ± SD	55.8 ± 11.3	57.5 ± 11.8	53.9 ± 10.9	0.384[a]
Level of education, n (%)	4 (13.3)	2 (13.3)	2 (13.3)	0.828[b]
Primary school and below	3 (10.0)	2 (13.3)	1 (6.7)	
High school	23 (76.7)	11 (73.3)	12 (80.0)	
Bachelor's degree and above				
Occupation, n (%)	23 (76.7)	11 (73.3)	12 (80.0)	1.000[c]
Employed	7 (23.3)	4 (26.7)	3 (20.0)	
Unemployed				
Comorbidities, n (%)	11 (36.7)	6 (40.0)	5 (33.3)	1.000[c]
Comorbidity	19 (63.3)	9 (60.0)	10 (66.7)	
Non-comorbidity				

[a]Independent t-test

[b]Pearson chi-square test

[c]Fisher's exact test

Table 2 Preoperative anxiety scores (state, trait, and total) in the intervention and control groups: within-group and between-group comparisons

Measure	Assessment	Mean ± SD			
		Intervention ($n = 15$)	Control ($n = 15$)	Δ between groups (95% CI)	P-value[a]
STAI—State-Anxiety	Pretest	47.5 ± 8.4	42.9 ± 10.5	4.7 (− 2.4, 11.8)	0.189
	Posttest	41.3 ± 8.2	40.1 ± 10.8	1.2 (− 5.9, 8.3)	0.733
Δ Pretest–posttest (95% CI)		6.3 (2.7, 9.8)	2.8 (0.6, 5.0)	3.5 (− 0.5, 7.5)	0.087
P-value[b]		**0.002**	**0.016**		
STAI—Trait-Anxiety	Pretest	44.1 ± 6.8	42.1 ± 10.3	2.0 (− 4.5, 8.5)	0.534
	Posttest	39.7 ± 8.1	39.1 ± 10.2	0.5 (− 6.4, 7.4)	0.875
Δ Pretest–posttest (95% CI)		4.5 (1.9, 7.0)	3.0 (2.0, 7.0)	1.5 (− 2.0, 4.9)	0.391
P-value[b]		**0.002**	**0.024**		
STAI—Total-Anxiety	Pretest	91.7 ± 14.4	85.0 ± 20.2	6.7 (− 6.5, 19.8)	0.307
	Posttest	80.9 ± 15.8	79.3 ± 20.5	1.6 (− 12.1, 15.3)	0.812
Δ Pretest–posttest (95% CI)		10.7 (5.1, 16.4)	5.6 (1.3, 10.0)	5.1 (− 1.7, 11.9)	0.138
P-value[b]		**0.001**	**0.015**		

ΔMean change in anxiety score from pretest to posttest within group and between groups at any point

[a]Independent *t*-test between groups

[b]Dependent *t*-test within a group

STAI, State-Trait Anxiety Inventory

was 0.5 (95% CI − 6.4, 7.4; $P = 0.875$). Both groups displayed significant within-group reductions in trait anxiety from pretest to posttest (EWD: mean change = 4.5; 95% CI 1.9, 7.0; $P = 0.002$; RD: mean change = 3.0; 95% CI 2.0, 7.0; $P = 0.024$). However, the difference in reduction between the groups was not statistically significant (mean difference = 1.5; 95% CI − 2.0, 4.9; $P = 0.391$). Nevertheless, the EWD group presented a slightly greater decrease.

Total anxiety

The total anxiety scores followed a comparable trend, with the EWD group reporting a higher mean pretest score (91.7 ± 14.4) than the RD group did (85.0 ± 20.2). This difference was not statistically significant (mean difference = 6.7; 95% CI − 6.5, 19.8; $P = 0.307$). By posttest, the between-group difference was 1.6 (95% CI − 12.1, 15.3; $P = 0.812$), which was also nonsignificant. Both groups exhibited significant reductions in total anxiety from pretest to posttest. In the EWD group, the mean change was 10.7 (95% CI 5.1, 16.4; $P = 0.001$). In the RD group, the mean change was 5.6 (95% CI 1.3, 10.0; $P = 0.015$). Although the between-group difference in these pretest to posttest changes was not statistically significant (mean difference = 5.1; 95% CI − 1.7, 11.9; $P = 0.138$), the EWD group presented a more pronounced reduction.

To account for baseline differences in anxiety, three ANCOVAs were conducted with posttest scores for state, trait, and total anxiety as dependent variables, respective pretest scores as covariates, and group as the fixed factor. For *state anxiety*, there was no statistically significant between-group difference after adjusting for baseline scores [$F(1, 27) = 1.94$, $P = 0.175$]. The adjusted mean posttest scores were 39.29 (SE = 1.38) for the EWD group and 42.04 (SE = 1.38) for the RD group, resulting in an estimated marginal mean difference of − 2.75 (SE = 1.98, $P = 0.175$). Similarly, for *trait anxiety*, the ANCOVA showed no significant difference between groups [$F(1, 27) = 2.00$, $P = 0.168$], with adjusted means of 37.87 (SE = 1.51) for the EWD group and 40.93 (SE = 1.51) for the RD group, yielding an estimated marginal mean difference of − 3.06 (SE = 2.16, $P = 0.168$). For *total anxiety*, no significant between-group difference was observed [$F(1, 27) = 1.72$, $P = 0.2$], with adjusted posttest scores of 77.91 (SE = 2.37) for the EWD group and 82.36 (SE = 2.37) for the RD group. The estimated marginal mean difference was − 4.45 (SE = 3.39, $P = 0.2$). These ANCOVA findings are consistent with the independent-sample *t*-test results and collectively support the conclusion that, while both groups experienced reductions in anxiety, the EWD group exhibited a relatively greater decrease across all measures, although the differences did not reach statistical significance.

Qualitative results

The qualitative findings revealed three key categories related to preoperative anxiety and participants' experiences with the EWD and RD interventions. The first category, "Preoperative anxiety in the EWD group," noted that all 15 participants reported preoperative anxiety. The second category, "Preoperative anxiety in the RD group," showed a similar pattern among the 15 participants assigned to that group.

Finally, the third category, "Writing experience in the EWD and RD groups," explored the unique writing experiences associated with each diary. Interviews were conducted with five participants from the EWD group and two participants from the RD group. Table 3 presents each theme along with illustrative participant quotations.

First category: Preoperative anxiety in the EWD group

Breast cancer and treatment

Breast cancer patients in the EWD group scheduled for surgery often grappled with existential questions, such as "Why me?" These patients felt distressed by the cancer diagnosis, particularly when they believed themselves to be healthy. Concerns about possible lymph node involvement and the need for further surgery or chemotherapy caused additional concern. Patients expressed fears regarding surgical complications, such as pain, infection, and reduced mobility, and some described concerns about anesthesia-related events, including inadvertent awareness during surgery or postoperative memory loss. Many also felt guilty about burdening their families, worrying that they might need extensive care. These anxieties led to discouragement and a sense of helplessness.

Perspectives on life and breast cancer

Before receiving a diagnosis, participants in the EWD group reported good health, stable careers, and effective stress management. During treatment, they received strong support from family, relatives, and colleagues, which made them feel valued and cared for. Early detection of cancer was perceived as a blessing that encouraged them to adopt healthier habits, such as improved nutrition and regular exercise. The participants also shifted their priorities from work to self-care and education about coping strategies. With renewed optimism, they faced their cancer journey by drawing strength from their support systems and a stronger commitment to personal well-being.

Second category: Preoperative anxiety in the RD group

Experienced anxiety

Patients in the RD group reported substantial stress, anxiety, and fear from the earliest stages of screening. After a confirmed diagnosis, many described sleepless nights, crying, and deep existential concerns about life. They also worried persistently about potential cancer spread, fearing increased suffering. Although some realized that these thoughts were excessive, they often felt powerless in controlling them, despite acknowledging the importance of managing their worries.

Fear of the surgical procedure

Many patients in the RD group experienced overwhelming anxiety, which was caused by fears of the worst outcomes. They focused on pain, suffering, and potential death during surgery, particularly concerning anesthesia-related risks. Postoperative pain and the possibility of chemotherapy heightened their stress, as these factors could complicate self-care and increase their dependence on family. Financial strain from medical expenses added to their concerns. Additionally, changes in physical appearance caused by surgery led to insecurity and diminished confidence in their femininity.

Third category: Writing experience in the EWD and RD groups

The EWD group

Empathic friend Patients awaiting breast cancer surgery often found that the EWD felt like a trusted companion, one that truly understood their struggles. Topics that were difficult to voice aloud could be written privately in the diary. The prompts of the diary resembled those of an empathic listener, who posed questions that mirrored the patient's own concerns and offered a sense of being heard. In this way, the EWD served as a symbolic friend, providing both solace and understanding.

Emotional awareness Through the EWD, patients reported heightened awareness of their emotions and anxieties related to surgery. Writing allowed them to pinpoint their deepest concerns while reinforcing the support they received from family, friends, and loved ones.

Distress transference The EWD also acted as a conduit for anxiety relief by enabling the physical and emotional release of stress through writing. Upon reviewing their entries, many participants noted that they experienced relief and a sense of relaxation as if a burden had been lifted. This safe space for expressing pent-up emotions fostered greater peace and emotional clarity.

The RD group

Development point In contrast, patients in the RD group expressed dissatisfaction with the lack of writing prompts and suggested that the researchers decorate the plain diary

Table 3 Key themes and representative quotations on preoperative anxiety and writing experiences in the expressive writing diary (EWD) and relaxing diary (RD) groups

Theme	Significant quotation
First category: Preoperative anxiety in the EWD group	
Breast cancer and treatment	"I feel excited, scared, and anxious, constantly imagining the worst possible outcomes, such as the cancer spreading to my lymph nodes. I'm terrified of needing surgery to remove the lymph nodes, followed by chemotherapy, which could cause arm swelling and limit my physical abilities, making it difficult to live a normal life. On top of that, life after surgery may feel less agile, with fears of pain from the wounds, declining health, high medical expenses, prolonged treatment, and the impact on both my physical appearance and mental well-being." **Case 1**
	"Honestly, yes, I'm worried. This is the first time I've had to face such a major surgery, and I'm going to lose one of my breasts. What's going to happen? Will the wound hurt? What will the scar look like? Will I have difficulty moving? How many days will it take for the wound to heal properly? Will I recover fully from the anesthesia? How long will the surgery take? So many questions are flooding my mind. What will my body be like afterward? I feel anxious and confused, and I can't seem to figure out what to expect after the surgery. Even though I've tried to prepare myself, I'm still uncertain. How much pain will the surgical wound cause? Will it hurt and swell? Will I be able to use my arm normally again? Will my arm swell, or will my shoulder get stiff? How will I manage to pick things up with my right arm, my dominant hand? And how many days before I can go home? Right now, there are so many questions running through my mind." **Case 8**
Perspective on life and breast cancer	"I was happy in my daily life, whether spending time with my family or friends. Whenever we had the chance, my family would go on trips to relax, visit different places, enjoy delicious food together, or simply hang out with friends. Work-related stress was normal, but I always managed to handle and solve problems effectively. I enjoyed learning new things and expanding my knowledge, never wanting to waste time. For instance, after work, I took classes on coffee making and makeup. My daily routine also included taking care of my family, doing household chores, and cooking—things I truly enjoyed and found great happiness in" **Case 3**
	"I consider myself lucky that the doctor detected the cancer when the tumor was still small—just 0.8 cm—making it manageable and treatable. I also feel fortunate to have this chance at life, especially starting at 50; anything beyond that feels like a bonus. I've made peace with it and found a sense of calm within myself. I immediately began transforming my life—researching how to cope, how to prepare, what to eat, and how to exercise. Most importantly, I am surrounded by the unwavering support and encouragement of my family and coworkers, which gives me the strength to keep moving forward." **Case 8**

Table 3 (continued)

Theme		Significant quotation
Second category: Preoperative anxiety in the RD group		
Experienced anxiety		"Finding a lump in the breast and feeling uneasy enough to see a doctor led to further testing. After the doctor ordered a mammogram and ultrasound, an additional lump and an area of tissue distortion were discovered, heightening the patient's anxiety. When the doctor mentioned that a biopsy would be needed at three different points, the patient's anxiety deepened. If the biopsy results came back positive, there was a 50% chance it could be cancer. On the day the biopsy results were received, it was confirmed as breast cancer, triggering overwhelming stress, anxiety, and tears. The patient was left with many unanswered questions: How much longer would I live? What stage was the cancer at? Would the treatment be effective? These were the worries that consumed their mind." **Case 23**
Fear of surgical procedure		"I am deeply worried about the pain after surgery and have asked several people for their opinions. Most say it won't hurt too much, but I remain unconvinced and anxious. I am also concerned about the financial burden—while there is enough money to cover expenses, it feels as though I am just continuing to work to keep up with health-related costs. Right now, it feels as though I am a sick person who isn't actually sick—there's no pain, discomfort, or symptoms—but the upcoming surgery and chemotherapy still feel overwhelming. The only hope is that the cancer hasn't spread to the bones, and I am anxiously awaiting the results of the upcoming bone scan. For now, I just want to indulge in all the foods I have been craving." **Case 25**
Third category: Writing experience in the EWD and RD groups		
Intervention	Empathic friend	"The diary is like a friend who listens to my problems." **Case 10**
		"The questions in the diary are like sitting in my heart, making me want to answer because I am currently thinking about those issues." **Case 13**
	Emotional awareness	"Writing in the diary helps bring awareness to what I am truly worried about." Case 11
		"Writing in the diary helps me realize that I need to make plans, as if preparing for what comes after surgery. It supports me emotionally by helping me focus on things I might overlook when I'm worried, ultimately contributing to my happiness." **Case 28**
	Distress transference	"I feel that my mental state has improved, as if I've expressed my feelings. I put my troubles into a diary, and then I read it. I wrote it like this, and by expressing it, I'm done." **Case 10**
		"I feel that my mental state has improved. It's as if I was able to describe my feelings and put my suffering into a diary. Once I had vented it out, I felt much more relaxed. Then, when I wrote it down, it was like the doctor or nurse understood my concerns, and they came to talk and provide very helpful information." **Case 11**

Table 3 (continued)

Theme		Significant quotation
Control	Development point	"Writing can help reduce anxiety to some extent." and "The diary should provide topics, because I don't have anything to write about." **Case 5** "I feel a little anxious, but writing helps a bit, and I am also confident in the doctor's abilities" and "The diary should be decorated, such as with artificial flowers, because plain paper doesn't inspire me to write." **Case 12**

to make it more engaging. Without guided questions, they struggled to connect emotionally with the writing process, leading to less emotional relief compared to the EWD group.

Discussion

This study examined the effectiveness of the EWD and RD methods in reducing preoperative anxiety among breast cancer patients undergoing surgery. Quantitative and qualitative findings supported this investigation. This is the first study to evaluate EWD in this specific clinical context. The results show that both EWD and RD effectively reduce preoperative anxiety, which is consistent with prior research involving various populations, ethnicities, and cancer types [25, 35, 36].

Baseline demographic and clinical characteristics were comparable between the intervention and control groups, so no treatment was required as a covariate [37]. Similarly, the preintervention state, trait, and total STAI scores did not differ significantly and were therefore excluded as covariates [38]. Nevertheless, we used the pre–postchange in STAI scores to account for baseline variability and to more accurately measure intervention effectiveness.

Patients in the EWD group were primarily worried about anesthesia-related complications (e.g., intraoperative awareness, death, and memory loss) and surgical risks such as arm swelling, pain, or reduced mobility. They also expressed concerns about breast loss, altered femininity, possible metastasis, and perceived familial burdens, paralleling previous findings [39, 40]. Social support has emerged as a vital protective factor that improves quality of life [41]. In our study, it provided encouragement, love, and resilience, thereby lowering anxiety levels. These results highlight the need to address both medical and psychosocial factors to optimize the overall well-being of breast cancer patients.

Interestingly, we found that preoperative anxiety among certain patients in the EWD group was related to the denial stage of the grieving process. Although these patients practiced self-care, they remained uncertain about their cancer diagnosis and continued to experience emotional distress. Brief preoperative counseling by nurses and other healthcare providers is therefore recommended to offer emotional support and potentially reduce postoperative complications [42]. Our observations are consistent with those of previous studies showing that breast cancer patients often experience positive life changes after diagnosis [43]. In our study, some participants described their cancer diagnosis as transformative, viewing it as an impetus for personal growth and self-discovery. These findings suggest that, for some individuals, a breast cancer diagnosis can prompt posttraumatic growth and meaningful life changes.

When we integrated qualitative and quantitative findings, we noted that the EWD group presented a more substantial decrease in anxiety, despite the lack of statistically significant differences between groups. The qualitative data confirmed that the EWD acted as a therapeutic tool, prompting emotional awareness through writing. By transferring their distress onto the diary pages, patients achieved greater clarity about their anxieties, strengthened their perceived support from loved ones, and expressed personal transformations resulting from their cancer experience. This process, in turn, alleviated anxiety.

Therefore, the EWD may facilitate emotional processing by allowing patients to articulate their concerns and reframe their thoughts, helping them process negative emotions and enhance positive ones through writing. Many participants initially expressed fears related to surgery and anesthesia, such as concerns about the risks of surgery or the fear of not waking up from anesthesia. However, after writing, they reported a shift in perspective, a greater sense of readiness for surgery, and an overall improvement in emotional regulation. Future research should explore potential mediators, such as cognitive restructuring and emotional regulation, to better understand the mechanisms through which EWD reduces preoperative anxiety.

In contrast, patients in the RD group sometimes struggled with uncertainty about what to write, suggesting a potential explanation for discrepancies between qualitative and quantitative findings. This divergence highlights the importance of a mixed methods approach in capturing multiple perspectives and providing deeper insights into patient experiences [31].

Limitations

This study has several limitations. First, due to COVID-19 restrictions, the study was conducted with a sample size of 15 participants per group, determined based on an effect size of 0.8 to detect within-group changes. This sample size was sufficient for detecting large within-group effects; however, it limited the power to detect between-group differences. Consequently, while the study identified a meaningful reduction in anxiety within both groups, the small sample size may have contributed to the lack of statistically significant between-group differences. Future research with larger sample sizes will be essential to confirm these effects with greater statistical power and to better assess the relative benefit of the EWD intervention.

Importantly, qualitative findings from participant interviews emphasized the potential therapeutic value of EWD, as participants reported improvements in emotional well-being and quality of life. These insights suggest that EWD may provide meaningful psychological benefits beyond quantitative measures. While statistical power was limited, the combination of qualitative findings and observed within-group changes provides compelling evidence for the potential benefits of EWD. Future studies with larger sample sizes will be necessary to confirm these findings and more definitively assess EWD's efficacy in this population.

Second, the brief diary-writing period may have been insufficient for patients to experience the full benefits of the intervention. Future research should consider extending the writing duration and explore the longitudinal follow-up of preoperative anxiety and its progression to postoperative anxiety, which would be an interesting area of study. Additionally, exploring comparative effectiveness trials to evaluate how EWD compares with other brief psychosocial interventions, such as mindfulness-based therapy, cognitive-behavioral therapy, or guided imagery, would be an interesting avenue for future research.

Third, relying exclusively on self-reported STAI scores may introduce response or social desirability bias. Future studies should consider incorporating objective biomarkers of stress (e.g., cortisol levels, heart rate variability) or observer-rated anxiety scales to complement self-reported data.

Fourth, the interviews were limited to extreme cases, potentially constraining the generalizability of our findings. Broader inclusion of patient experiences in future studies could help clarify the diverse needs and responses of breast cancer patients. Additionally, this study was conducted in a single hospital setting in Thailand, which may limit the generalizability of the findings to broader populations. Future studies should replicate this research in diverse clinical and cultural settings to assess the effectiveness of EWD in different contexts.

Conclusion

This study demonstrated that both the EWD and RD methods can effectively reduce preoperative anxiety in breast cancer patients awaiting surgery. Although each diary provided benefits, EWD showed greater promise by facilitating emotional awareness and offering structured writing support. The qualitative findings suggest that EWD serves as an empathic tool, enabling patients to process emotional distress and thereby reduce anxiety. In contrast, a lack of guidance limited the effectiveness of the RD method. Overall, our results underscore the therapeutic value of expressive writing in improving emotional well-being and quality of life for breast cancer patients, especially as a strategy to address preoperative anxiety and enhance comprehensive patient care.

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Data availability No datasets were generated or analysed during the current study.

Code availability Not applicable.

Declarations

Ethical approval The study was conducted in compliance with the Declaration of Helsinki (1996) and adhered to all applicable ethical guidelines. Ethical approval was obtained from the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University (Reference No. Si-594/2021).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Competing interests The authors declare no competing interests.

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