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A Cross-Level Diary Study of Psychological Flexibility and Its Effects on Self-Esteem and Negative Emotional Dynamics in Women Survivors of Breast Cancer

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Received: 8 October 2025 | **Revised:** 29 April 2026 | **Accepted:** 18 May 2026

Keywords: anxiety | breast cancer | cross-level | diary study | expressive suppression | negative affect | psychological flexibility | self-esteem | women survivors

ABSTRACT

Background: Breast cancer primarily affects women from all countries around the world. Psychological flexibility is a personal resource that helps cancer patients accept the disease, reduce emotional distress, and enhance self-esteem. Scarcely explored within this type of breast cancer, it might help women survivors in their daily lives.

Aims: This study investigates whether trait psychological flexibility in women survivors of breast cancer has benefits for their daytime levels of evening self-esteem, anxiety, and expressive suppression.

Methods: A total of 94 women (47 breast cancer survivors and 47 controls) completed full diary surveys twice daily for five consecutive workdays (n = 470 daily data). The diary used a two-level design: 5-day repeated measures (Level 1, day-level) nested within persons (Level 2, person-level), employing a within-person approach.

Results: Multilevel analyses showed main effects of daily morning negative affect on daily evening self-esteem, anxiety, and expressive suppression in the breast cancer group, as well as main effects of trait psychological flexibility on all outcomes for both groups. Cross-level interactions showed that on days when women survivors of breast cancer experienced high levels of daily morning negative affect, those low (vs. high) in trait psychological flexibility decreased their levels of daily evening self-esteem and increased daily evening anxiety and expressive suppression.

Conclusions: A within-person approach is relevant for understanding psychological flexibility among breast cancer survivors. It has a dual beneficial function for their self-esteem and for negative emotional dynamics daily.

1 | Background

Breast cancer occurs in all countries around the world, primarily among women [1]. The Global Breast Cancer Initiative (GBCI) aims to reduce breast cancer mortality by 2.5% annually, potentially saving 2.5 million lives by 2040 [2]. This means that a large proportion of women diagnosed with the disease will become survivors who must deal with the life-changing implications of the illness. Among women survivors of breast cancer, the well-known psychological outcomes of self-esteem, anxiety, and emotion regulation strategies are closely interrelated, and taken together, these may account for their psychological distress, lifestyle behaviors, and quality of life [3]. Breast cancer patients tend to experience worse mental health outcomes than healthy women, including higher levels of anxiety, fatigue, cognitive problems, and sexual dysfunction [4]. Nevertheless, most studies to date have examined these outcomes in isolation,

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primarily using cross-sectional designs. Consequently, the understanding of the psychological processes underlying these short-term outcomes remains limited.

In recent years, the diary study methodology applied to breast cancer research has revealed encouraging findings. For example, a recent diary study by Bierbauer et al. [5] has helped clarify the relationship between women's coping efforts regarding medication-related side effects during Adjuvant Endocrine Therapy (AET) and their levels of daily well-being. In line with previous research, the design of the present diary study allowed for real-time data collection and analysis of intra-individual variability in women during the breast cancer checkup phase. It is important to note that this approach goes beyond cross-sectional designs by capturing daily fluctuations, thereby increasing sensitivity to the psychological processes of self-esteem, anxiety, and expressive suppression, characteristic of this phase of the disease [6]. Therefore, the current study adopts a within-person perspective and examines how psychological flexibility might be a key personal resource for women breast cancer survivors' self-esteem and negative emotional dynamics in their daily lives—unlike in healthy women—providing a more accurate understanding of the disease process.

1.1 | Emotional Distress in Women Survivors of Breast Cancer

Emotional complaints among breast cancer survivors range from negative emotions to anxiety and difficulties with emotional regulation strategies. In this population, higher negative affect, as a state mood, steadily lowers quality of life [7]. A recent study reported that breast cancer patients who struggle with goal-directed behavior and have limited emotion regulation strategies under distress are at a higher risk for anxiety and depressive symptoms [8]. Similarly, morning negative affect may increase the risk of anxiety and maladaptive emotion regulation, such as expressive suppression, while also lowering evening self-esteem. However, little is known about how negative affective states fluctuate daily among women survivors and how these fluctuations affect them throughout the day. In fact, evidence on emotion regulation interventions among breast cancer patients demonstrates that proper management of emotions is essential to women's quality of life [9]. The approach of the present diary study aims to overcome this limitation by analyzing women's morning negative affect to determine whether adverse effects impact throughout the day. Therefore, it is hypothesized that women survivors of breast cancer who experience high levels of negative affect upon waking up, unlike healthy women, have lower self-esteem and higher levels of distress before going to bed in the evening:

Hypothesis 1. *In the breast cancer group, daily morning negative affect will be negatively related to daily evening self-esteem (H1a), positively associated with daily evening anxiety (H1b), and expressive suppression (H1c).*

Hypothesis 2. *In the control group, daily morning negative affect will not be significantly related to daily evening self-esteem (H2a), anxiety (H2b), and expressive suppression (H2c).*

1.2 | The Role of Psychological Flexibility in Breast Cancer

Psychological flexibility refers to a person's ability to respond to a specific interference while taking their own values into consideration, and it is the most crucial element in acceptance and commitment therapy (ACT) [10]. Although research has shown it to be a valuable resource for coping with stressful life events [11], few studies have examined its effects in the context of breast cancer, let alone using a diary design. The present study posits that psychological flexibility is not about emotional control, but rather about accepting all psychological daily events related to the disease, aiming to free up resources for current action in specific situations throughout the day. Despite the scarce evidence in this area, some findings among breast cancer survivors indicate that women with higher psychological flexibility tend to experience a higher degree of self-esteem [12] and a more positive body image [13]. These direct effects suggest that psychological flexibility itself appears to be a useful resource for women with breast cancer. Thus, the following hypothesis is proposed:

Hypothesis 3. *In the breast cancer group, trait psychological flexibility will be positively related to daily evening self-esteem (H3a), and negatively related to daily evening anxiety (H3b) and expressive suppression (H3c).*

Hypothesis 4. *In the control group, trait psychological flexibility will not be significantly related to daily evening self-esteem (H4a), anxiety (H4b), expressive suppression (H4c).*

However, the benefits of psychological flexibility as a personal resource in cancer are not limited to its predictive role, but also extend to its function as a moderator. In particular, Chowdhury et al. [14] demonstrated that it attenuated the psychological distress associated with androgen deprivation therapy (ADT) in prostate cancer. Similarly, Servier-Guy et al. [15] found that psychological flexibility moderated the relationship between fear of recurrence and psychological distress, with low psychological flexibility amplifying the negative impact of fear on distress. Based on previous evidence, it is hypothesized that women survivors of breast cancer who are low in psychological flexibility would be more vulnerable to the adverse impact of morning negative affect on the evening outcomes. Thus, the following hypotheses are proposed:

Hypothesis 5. *In the breast cancer group, women with lower levels of trait psychological flexibility will show lower levels of daily evening self-esteem (H5a), and higher levels of daily evening anxiety (H5b), and expressive suppression (H5c) on days when they experience more daily morning negative affect, compared with women with higher levels of trait psychological flexibility.*

Hypothesis 6. *In the control group, interactions between daily morning negative affect and trait psychological flexibility will not be significantly related to daily evening self-esteem (H6a), anxiety (H6b) and expressive suppression (H6c).*

2 | Methods

2.1 | Participants and Study Design

The current diary study is part of a larger research project investigating the role of personal positive resources in daily

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outcomes among women survivors of breast cancer, approved by the Ethics Committee in Human Research of the University of Jaén (NOV.22/3. PRY). The final sample consisted of 94 women from Spain ($n_{total} = 54$; $n_{breast\ cancer} = 27$, Response Rate: 69.23%; $n_{control} = 27$, Response Rate: 100%) and Portugal ($n_{total} = 40$; $n_{breast\ cancer} = 20$, Response Rate: 70%; $n_{control} = 20$, Response Rate: 98%), who completed a total of 470 diary surveys across five consecutive weekdays (Level 1: day-level) and were nested within individuals (Level 2: person-level). Following methodological recommendations for multilevel studies [16], two levels of statistical power were considered. At the within-person level (Level 1), the total number of diary entries (470) exceeds the minimum threshold (≈384 observations) required to achieve stable parameter estimates with 95% confidence. At the between-person level (Level 2), the sample of 94 women (47 breast cancer survivors and 47 healthy controls) provides adequate power ($\beta = 0.80$, $\alpha = 0.05$) to detect medium-sized group differences ($d \approx 0.50$).

Women participants were specifically selected based on their health status. Eligibility criteria for participants in the breast cancer group ($n = 47$; $M_{age} = 53.11$; SD = 10.69; 71.9% more than 2 years since diagnosis; 26.1% currently under psychotherapy) required (a) being female, (b) being over 18 years of age, (c) having received a diagnosis of breast cancer, and (d) being in the checkup phase. Exclusion criteria were severe cognitive impairment, acute psychiatric disorder, and ongoing treatment. Eligibility criteria for participants in the control group ($n = 47$; $M_{age} = 49.23$; SD = 14.50) required (a) being female, (b) being over 18 years of age, and (c) healthy with no history of cancer. Exclusion criteria included a current diagnosis of any disease. Written and signed informed consent was obtained from all participants. Analyses revealed no significant differences for sociodemographic characteristics between groups (Table 1).

2.2 | Procedure

Breast cancer patients and control participants were recruited separately, and data were collected independently for each group in Spain and Portugal using purposive and snowball sampling strategies. Initially, researchers approached their personal networks to identify eligible women who had survived breast cancer. Subsequently, a woman-to-woman snowball sampling procedure was employed, in which participants were invited to refer other eligible women within their social circles. All participants who expressed willingness to take part in the study were invited to attend an initial in-person session. During this session, researchers provided participants with all study materials, including a paper-and-pencil envelope containing (a) a letter describing the study's objective, instructions for completing the surveys, and a code to preserve anonymity; (b) two letters of the informed consent form (i.e., researchers' and participants' copies); and (c) general and diary paper-based questionnaires, and explained these contents. The purpose of this session was to ensure that participants fully understood the study procedures and requirements, and to address any questions or concerns before data collection began. The paper-based diary questionnaires were assessed using a notebook adapted to the diary format, so that entries were organized and divided into sections by date (from day 1 Monday to day 5 Friday) and, within each day, further categorized into two moments: (a) in the morning, upon waking; and (b) in the evening, before going to bed. Subsequently, each participant completed these two diary entries per day for five consecutive days, from Monday to Friday (i.e., Day 1, Monday: (a) in the morning, upon waking; and (b) in the evening, before going to bed; Day 2, Tuesday: (a) in the morning, upon waking; and (b) in the evening, before going to bed, etc.). To verify that participants completed the questionnaires every morning and evening as intended over the 5 days, researchers maintained regular contact with participants to monitor progress, provide support, and ensure that the data collection procedures were being followed correctly. Additionally, participants were asked to report the time they completed the diary questionnaires on each occasion, and this information was used in the analyses as a control variable.

2.3 | Measures

All questionnaires were administered using the Spanish or Portuguese versions of the original scales. Following Ohly et al. [6], items and statements were adapted to the daily query, and selected items in its daily version were based on higher factorial loadings.

2.3.1 | *Trait Psychological Flexibility (Level 2, Person-Level)*

The Acceptance and Action Questionnaire [17] (Spanish [18] and Portuguese [19] versions) assessed the women's experiential avoidance, referring to the willingness to experience undesirable experiences, in pursuit of their own values and goals (e.g., "My painful memories prevent me from having a fulfilling life"). The AAQ–II comprises a 7-item scale ranging from 1 "never true" to 7 "always true". All items' scores were reversed, with higher scores indicating greater trait psychological flexibility. Cronbach's alphas were: breast cancer $\alpha = 0.94$ and control $\alpha = 0.94$ for the Spanish sample, and breast cancer $\alpha = 0.86$ and control $\alpha = 0.87$ for the Portuguese sample.

2.3.2 | *Daily Morning Negative Affect (Level 1, Day-Level)*

The short version of the Positive and Negative Affect Schedule [20] (Spanish [21] and Portuguese [22] versions) assessed women's daily negative affect upon waking up in the morning (e.g., "I feel afraid"). The 5-item negative affect subscale was used on its daily version, and responses were recorded on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". Higher scores indicate greater daily morning negative affect. Cronbach's alpha ranged from $\alpha = 0.63$ to $\alpha = 0.87$ for the Spanish sample, and from $\alpha = 0.69$ to $\alpha = 0.87$ for the Portuguese sample.

2.3.3 | *Daily Evening Self-Esteem (Level 1, Day-Level)*

The Rosenberg Self-Esteem Scale [23] (Spanish [24] and Portuguese [25] versions) was used to assess daily self-esteem in the evening, which refers to women's feelings of self-worth before going to bed. From the original one-dimensional 10-item scale, three positively worded items (e.g., "I feel that I have a number of good qualities") and two negatively (e.g., "I feel 1do not have much to be proud of") were selected for the daily version. Responses were provided on a 4-point Likert scale ranging from 1 "strongly disagree" to 4 "strongly agree". Higher scores indicate greater daily evening self-esteem. Cronbach's alpha ranged from

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TABLE 1 | Sociodemographic characteristics of the sample and descriptives of all variables.

	Total (n = 94)		Breast cancer (n = 47)		Control (n = 47)		
	M	**(SD)**	**M**	**(SD)**	**M**	**(SD)**	$\chi 2$
Age	51.17	(12.82)	53.11	(10.69)	49.23	(14.50)	$p = 0.79$
	f	%	*f*	%	*f*	%	
Country					47	100	$p = 1.00$
Spain	54	57.4	27	57.4	27	57.4	
Portugal	40	42.6	20	42.6	20	42.6	
Range of age							$p = 0.43$
Up to 35	9	9.6	2	4.3	7	14.9	
36–45	17	18.1	8	17	9	19.1	
46–55	40	42.6	22	46.8	18	38.3	
56–65	17	18.1	10	21.3	7	14.9	
66–75	11	11.7	5	10.6	6	12.8	
Conjugal status							$p = 0.48$
Married or in couple	65	69.1	30	63.8	35	74.5	
Single	10	10.6	7	14.9	3	6.4	
Separated or divorced	12	12.8	7	14.9	5	10.6	
Widowed	7	7.4	3	6.4	4	8.5	
Education level							$p = 0.07$
Junior high school or less	34	37	18	39.1	16	34.8	
High school graduation or more	58	63	28	60.9	30	65.3	
Occupational status							$p = 0.13$
Working	56	61.5	24	51.1	32	68.1	
Not working	10	11	6	12.8	4	8.5	
Sick leave	10	11	8	17	2	4.3	
Retired. Pensioner	15	16.5	9	19.1	6	12.8	
	M	**(SD)**	**M**	**(SD)**	**M**	**(SD)**	
Trait psychological flexibility[a]							
Spain	5.04	(1.65)	5.22	(1.58)	4.86	(1.73)	
Portugal	5.58	(1.10)	5.90	(0.99)	5.25	(1.13)	
Daily morning negative affect[b]							
Spain	1.63–1.75	(0.83–0.88)	1.58–1.86	(0.61–0.91)	1.52–1.76	(0.67–0.85)	
Portugal	1.49–1.73	(54.–0.73)	1.52–1.72	(0.60–0.80)	1.48–1.75	(0.48–0.67)	
Daily evening self-esteem[b]							
Spain	3.36–3.47	(0.58–0.50)	3.25–3.41	(0.56–56)	3.44–3.57	(0.60–0.37)	
Portugal	3.21–3.33	(0.59–0.59)	3.35–3.60	(0.59–0.56)	3.17–3.04	(0.55–0.59)	
Daily evening anxiety[b]							
Spain	2.01–2.17	(0.70–0.70)	2.77–2.89	(0.74–0.78)	2.00–2.14	(0.61–0.59)	
Portugal	1.93–2.02	(0.48–0.39)	2.97–3.14	(0.58–0.41)	1.90–2.10	(0.42–0.96)	
Daily evening expressive suppression[b]							
Spain	1.78–1.93	(1.06–1.17)	1.76–1.91	(0.96–1.22)	1.78–2.07	(1.03–1.00)	
Portugal	2.73–3.04	(1.06–0.98)	2.78–3.08	(1.21–1.08)	2.63–3.03	(0.98–1.06)	

Abbreviations: f, frequency; M, mean; SD, standard deviation.
[a]Mean between individuals and standard deviation (in parentheses) is displayed for person-level variables.
[b]Mean range from lower to higher scores between 5 days and standard deviation (in parentheses) is displayed for day-level variables.

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$\alpha = 0.58$ to $\alpha = 0.75$ for the Spanish sample, and from $\alpha = 0.83$ to $\alpha = 0.87$ for the Portuguese sample.

2.3.4 | *Daily Evening Anxiety (Level 1, Day-Level)*

The Hospital Anxiety and Depression Scale [26] (Spanish [27] and Portuguese [28] versions) assessed daily anxiety in the evening, referring to women's cognitive, emotional, and behavioral symptoms before going to bed. The daily version selected three items from the 7-item anxiety subscale (e.g., "Worrying thoughts have been going through my mind"). Responses were provided on a 4-point Likert scale ranging from 1 "not at all along the day" to 4 "most of the time along the day". Higher scores indicate greater daily evening anxiety. Cronbach's alpha ranged from $\alpha = 0.66$ to $\alpha = 0.86$ for the Spanish sample, and from $\alpha = 0.55$ to $\alpha = 0.77$ for the Portuguese sample.

2.3.5 | *Daily Evening Expressive Suppression (Level 1, Day-Level)*

The Emotion Regulation Questionnaire [29] (Spanish [30] and Portuguese [31] versions) assessed daily expressive suppression in the evening as an emotion-regulation strategy, defined as women's inhibition of emotion-expressing behavior after the emotional response. The daily version selected two items from the 4-item expressive suppression subscale (e.g., "I have controlled my emotions by not expressing them"). Responses were provided on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". Higher scores indicate greater daily evening expressive suppression. Cronbach's alpha ranged from $\alpha = 0.75$ to $\alpha = 0.95$ for the Spanish sample, and from $\alpha = 0.81$ to $\alpha = 0.90$ for the Portuguese sample.

2.4 | Data Analysis

Multilevel hierarchical analyses were conducted separately for the breast cancer group and the control group using MLwiN software for each criterion variable [32]. The collected data included variables from two levels simultaneously: 470 daily data from 5-day repeated measures to examine within-person variations (Level 1, day-level) nested within 94 women at the person-level (Level 2), which consisted of trait-level measurements that examined between-person variations. Multilevel main effects were tested to assess the direct effects of daily morning negative affect (Hypotheses 1a, 1b and 1c for the breast cancer group; Hypotheses 2a, 2b and 2c for the control group) and trait psychological flexibility (Hypotheses 3a, 3b and 3c for the breast cancer group; Hypotheses 4a, 4b and 4c for the control group) on criterion variables. Cross-level interaction effects were tested to assess the moderating role of trait psychological flexibility on the relationships between daily morning negative affect and evening criterion variables (Hypotheses 5a, 5b and 5c for the breast cancer group; Hypotheses 6a, 6b and 6c for the control group).

Based on Ohly et al. [6], the daily predictor variable (daily morning negative affect) at the day-level of Level 1 was centered using the person-mean centering method. The person-mean is the mean score across the 5 days for each woman participant and is the only appropriate method for interpreting within-person effects. The trait predictor variable (trait psychological flexibility) at the person-level of Level 2 was centered using the grand-mean centering method, which considers the mean scores of all participants. Breast cancer patients and the control group were considered separately for centering methods. To test the hypotheses, a set of four models for each outcome was conducted. In the sequence of models for each criterion variable, the Null Model was tested first, where the intercept was included. Second, control variables were included in Model 1 (country for both the breast cancer and control group, and time since diagnosis only for the breast cancer group). In addition, the variable "time" was included for both the breast cancer and the control group as a control variable following Blanco-Donoso and colleagues (2025) [33] procedure in order to avoid possible accumulation effects on the day-level outcomes over the course of the five consecutive days. In Model 2, day-level main effects tested the predictive role of daily morning negative affect. In Model 3, person-level main effects tested the predictive role of trait psychological flexibility. In Model 4, the hypothesized cross-level interactions between daily morning negative affect and trait psychological flexibility were included. The improvement of each model over the previous one was tested by computing $\Delta -2{*}Log\ Likelihood$. Following the multilevel models, simple slope tests were calculated to examine the pattern of the significant cross-level interactions [34].

3 | Results

3.1 | Descriptive and Preliminary Analysis

Table 1 presents the means and standard deviations for all the study variables. Before testing the hypotheses, the intra-class correlation was examined. The results showed that 28% of the variance in daily evening self-esteem, 37% in daily evening anxiety, and 45.3% in daily evening expressive suppression can be attributed to within-person variation across the 5 days, supporting the use of multilevel analysis [6, 32].

3.2 | Multilevel Analysis: Main Effects of Daily Negative Affect

The results of the multilevel analyses systematically supported Hypotheses 1 and 2 (see Model 2 in Tables 2 to 4). For the breast cancer group, the results supported Hypotheses 1a ($\beta = -0.17$, SE = 0.05, $t = -3.17$, $p < 0.05$); 1b ($\beta = 0.15$, SE = 0.07, $t = 2.18$, $p < 0.05$), and 1c ($\beta = 0.34$, SE = 0.10, $t = 3.54$, $p < 0.05$). Thus, on days when daily morning negative affect was high, women in the breast cancer group experienced lower daily evening self-esteem and higher daily evening anxiety and expressive suppression. In contrast, as expected for the control group in Hypotheses 2a, 2b, and 2c, daily morning negative affect was not significantly related to daily evening self-esteem ($\beta = -0.07$, SE = 0.05, $t = -1.48$, ns), anxiety ($\beta = 0.04$, SE = 0.06, $t = 0.68$, ns) and expressive suppression ($\beta = 0.07$, SE = 0.11, $t = 0.63$, ns).

3.3 | Multilevel Analysis: Main Effects of Trait Psychological Flexibility

The results of the multilevel analyses supported Hypothesis 3 (see Model 3 in Tables 2, 3, and 4). In particular, the results supported Hypotheses 3a ($\beta = 0.15$, SE = 0.05, $t = 2.88$, $p < 0.05$); 3b ($\beta = -0.29$, SE = 0.04, $t = 6.90$, $p < 0.01$), and 3c

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TABLE 2 | Results of multilevel analyses predicting daily evening self-esteem.

	Null model				Model 1				Model 2				Model 3				Model 4			
	Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group	
	β	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE
Intercept	3.37	0.08	3.34	0.07	3.30	0.10	3.48	0.08	3.30	0.10	3.49	0.08	3.34	0.10	3.51	0.07	3.37	0.10	3.51	0.07
Country					0.15	0.16	−0.43*	0.12	0.15	0.16	−0.44*	0.12	0.07	0.15	−0.50*	0.11	0.07	0.15	−0.50*	0.11
Time					0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.01	0.02	0.01
Time since diagnosis (months)					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00		
Daily morning negative affect									−0.17*	0.05	−0.07	0.05	−0.17*	0.05	−0.06	0.05	−0.12*	0.05	−0.06	0.05
Trait psychological flexibility													0.15*	0.05	0.13*	0.04	0.15*	0.05	0.13*	0.04
Daily morning negative affect × trait psychological flexibility																	0.11*	0.03	0.02	0.03
−2*Log likelihood	251.63		214.69		245.07		201.28		234.97		199.04		227.37		186.57		217.86		186.34	
Δ −2*Log likelihood					6.56*		13.41***		10.10***		2.24		7.60**		12.47***		9.51**		0.23	
Df					2		1		1		1		1		1		1		1	
Level 1 intercept variance (SE)	0.10	(0.01)	0.09	(0.01)	0.10	(0.01)	0.09	(0.01)	0.10	(0.01)	0.09	(0.01)	0.10	(0.01)	0.09	(0.01)	0.09	(0.01)	0.09	(0.01)
Level 2 intercept variance (SE)	0.26	(0.06)	0.20	(0.04)	0.24	(0.06)	0.15	(0.03)	0.24	(0.06)	0.15	(0.03)	0.20	(0.05)	0.11	(0.03)	0.20	(0.05)	0.11	(0.03)

Note: $N = 94$ women with a full of 5 days; $n = 470$ daily data. Breast Cancer group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women. Control group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women.
Abbreviations: SE, standard error; *β*, unstandardized regression coefficient; Δ −2*Log Likelihood, Difference between −2*Log Likelihood of the model parameters.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

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TABLE 3 | Results of multilevel analyses predicting daily evening anxiety.

	Null model				Model 1				Model 2				Model 3				Model 4			
	Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group	
	β	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE
Intercept	2.08	0.08	2.04	0.06	2.20	0.11	2.05	0.08	2.20	0.11	2.04	0.08	2.13	0.08	2.03	0.08	2.13	0.08	2.02	0.08
Country					−0.24	0.17	−0.06	0.12	−0.24	0.17	−0.05	0.12	−0.08	0.12	−0.02	0.11	−0.08	0.12	−0.02	0.11
Time					−0.01	0.02	0.01	0.02	−0.01	0.02	0.01	0.02	−0.01	0.02	0.01	0.02	−0.01	0.02	0.01	0.02
Time since diagnosis (months)					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00		
Daily morning negative affect									0.15*	0.07	0.04	0.06	0.15*	0.07	0.03	0.06	0.10	0.07	0.03	0.06
Trait psychological flexibility													−0.29**	0.04	−0.10*	0.04	−0.29**	0.04	−0.10*	0.04
Daily morning negative affect × trait psychological flexibility																	−0.11*	0.04	−0.05	0.04
−2*Log likelihood	346.25		314.32		336.96		313.73		332.14		313.27		299.30		306.31		293.36		305.10	
Δ −2*Log likelihood					9.07**		0.59		4.82*		0.46		32.84***		6.96**		5.94*		1.21	
Df					2		1		1		1		1		1		1		1	
Level 1 intercept variance (SE)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.16	(0.02)	0.15	(0.02)	0.16	(0.02)
Level 2 intercept variance (SE)	0.28	(0.06)	0.12	(0.03)	0.27	(0.06)	0.12	(0.03)	0.27	(0.06)	0.12	(0.03)	0.12	(0.03)	0.08	(0.03)	0.12	(0.03)	0.10	(0.03)

Note: $N = 94$ women with a full of 5 days; $n = 470$ daily data. Breast Cancer group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women. Control group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women.
Abbreviations: SE, standard error; *β*, unstandardized regression coefficient; Δ −2*Log Likelihood, Difference between −2*Log Likelihood of the model parameters.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

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TABLE 4 | Results of multilevel analyses predicting daily evening expressive suppression.

	Null model				Model 1				Model 2				Model 3				Model 4			
	Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group		Breast cancer group		Control group	
	β	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE	*β*	SE
Intercept	2.29	0.16	2.31	0.13	1.86	0.19	2.07	0.17	1.87	0.19	2.09	0.17	1.77	0.17	2.04	0.17	1.73	0.16	2.04	0.12
Country					1.10*	0.29	0.86*	0.24	1.10*	0.29	0.85*	0.24	1.31*	0.25	0.98*	0.19	1.31*	0.25	0.98*	0.19
Time					−0.01	0.03	−0.07*	0.03	−0.02	0.03	−0.07*	0.03	−0.02	0.03	−0.07*	0.03	−0.02	0.03	−0.06	0.03
Time since diagnosis (months)					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00		
Daily morning negative affect									0.34*	0.10	−0.07	0.11	0.34*	0.10	−0.09	0.11	0.25*	0.10	−0.09	0.11
Trait psychological flexibility													−0.38*	0.09	−0.34*	0.06	−0.38*	0.09	−0.33*	0.06
Daily morning negative affect × Trait psychological flexibility																	−0.19*	0.06	0.10	0.07
−2*Log likelihood	551.09		579.04		528.23		563.39		515.98		563.02		500.31		540.86		491.50		538.75	
Δ −2*Log likelihood					22.86***		15.65***		12.25***		0.37		15.67***		22.16***		8.81**		2.11	
Df					2		1		1		1		1		1		1		1	
Level 1 intercept variance (SE)	0.35	(0.04)	0.47	(0.05)	0.35	(0.04)	0.46	(0.05)	0.33	(0.03)	0.46	(0.05)	0.33	(0.03)	0.46	(0.05)	0.31	(0.03)	0.46	(0.05)
Level 2 intercept variance (SE)	1.11	(0.24)	0.72	(0.17)	0.83	(0.19)	0.54	(0.13)	0.84	(0.19)	0.55	(0.13)	0.58	(0.13)	0.31	(0.08)	0.58	(0.13)	0.30	(0.08)

Note: $N = 94$ women with a full of 5 days; $n = 470$ daily data. Breast Cancer group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women. Control group: $N_{\text{Level 1}} = 235$ daily data, and $N_{\text{Level 2}} = 47$ women.
Abbreviations: SE, standard error; *β*, unstandardized regression coefficient; Δ −2*Log Likelihood, Difference between −2*Log Likelihood of the model parameters.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

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($\beta = -0.38$, SE = 0.09, $t = 4.32$, $p < 0.05$). Women in the breast cancer group who were high in trait psychological flexibility experienced higher daily evening self-esteem and lower daily evening anxiety and expressive suppression. Interestingly, significant results were also observed in the control group across all outcomes (daily evening self-esteem: $\beta = 0.13$, SE = 0.04, $t = 3.80$, $p < 0.05$; daily evening anxiety: $\beta = -0.10$, SE = 0.04, $t = 2.72$, $p < 0.05$; and daily evening expressive suppression: $\beta = -0.34$, SE = 0.06, $t = 5.32$, $p < 0.05$). Thus, Hypotheses 4a, 4b and 4c were not supported. Additionally, a control variable was significant (see Model 1 in Tables 2, 3, and 4). Specifically, country (breast cancer group: $\beta = 1.10$, SE = 0.29, $t = 3.81$, $p < 0.05$; control group: $\beta = 0.86$, SE = 0.24, $t = 3.60$, $p < 0.05$) showed a main effect on daily evening expressive suppression. Portuguese women reported higher levels of daily evening expressive suppression than Spanish women.

3.4 | Multilevel Analysis: Cross-Level Interaction Effects of Psychological Flexibility

The results of the multilevel analyses systematically supported Hypotheses 5 and 6 (see Model 4 in Tables 2, 3, and 4). For the breast cancer group, as expected in Hypothesis 5a, there was a significant cross-level interaction between daily morning negative affect and trait psychological flexibility in explaining daily evening self-esteem among women survivors of breast cancer ($\beta = 0.11$, SE = 0.03, $t = 3.81$, $p < 0.05$, see Model 4 in Table 2). Simple slope tests showed that on days when they experienced high levels of daily morning negative affect, those low (vs. high) in trait psychological flexibility decreased their levels of daily evening self-esteem ($\gamma = 0.63$, SE = 0.26, $z = 2.45$, $p < 0.01$) (see Figure 1). Moreover, consistent with Hypothesis 5b, there was a significant cross-level interaction between daily morning negative affect and trait psychological flexibility in explaining daily

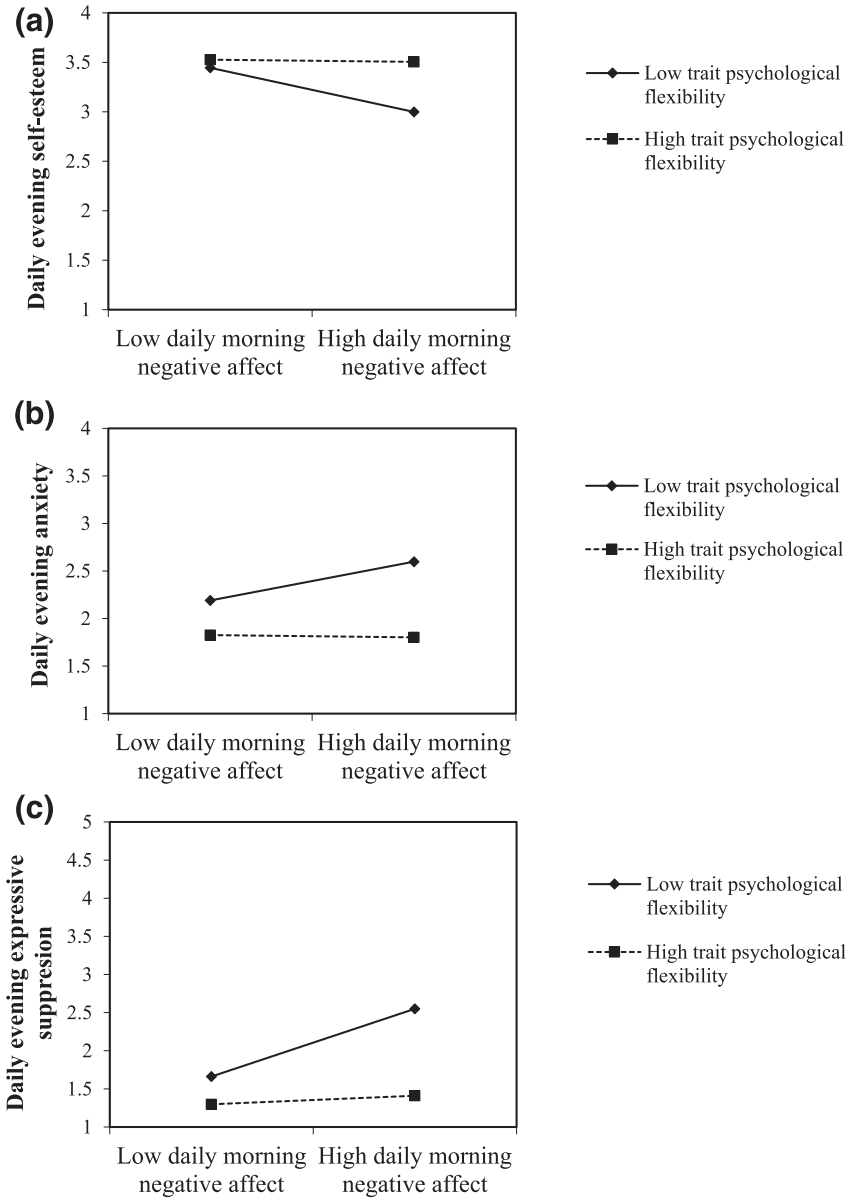


FIGURE 1 | (a–c) Significant interaction effect between daily negative affect in the morning and trait psychological flexibility on daily evening self-esteem (a), anxiety (b) and expressive suppression (c) among breast cancer group.

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evening anxiety among women survivors of breast cancer ($\beta = -0.19$, SE = 0.06, $t = -3.08$, $p < 0.05$; see Model 4 in Table 3). Simple slope tests showed that on days when they experienced high levels of daily morning negative affect, those low (vs. high) in trait psychological flexibility increased their levels of daily evening anxiety in the evening ($\gamma = -0.66$, SE = 0.26, $z = -2.55$, $p < 0.01$) (see Figure 1).

Additionally, congruent with Hypothesis 5c, there was a significant cross-level interaction between daily morning negative affect and trait psychological flexibility in explaining daily evening expressive suppression among women survivors of breast cancer ($\beta = -0.11$, SE = 0.04, $t = -2.45$, $p < 0.05$; see Model 4 in Table 4). Simple slope tests showed that on days when they experienced high levels of daily morning negative affect in the morning, those low (vs. high) in trait psychological flexibility increased their levels of daily evening expressive suppression ($\gamma = -1.11$, SE = 0.48, $z = -2.30$, $p < 0.05$) (see Figure 1).

For the control group, supporting Hypotheses 6a ($\beta = 0.01$, SE = 0.03, $t = 0.33$, ns); 6b ($\beta = -0.05$, SE = 0.04, $t = -1.25$, ns); and 6c ($\beta = -0.11$, SE = 0.07, $t = 1.57$, ns), there were no significant interactions between daily morning negative affect and trait psychological flexibility on daily evening self-esteem, anxiety and expressive suppression in healthy women.

4 | Discussion

The present diary study makes a significant contribution to the existing literature on psychological flexibility as a key resource for women survivors of breast cancer daily. In this study, women's trait-level psychological flexibility showed both direct and indirect effects on their daily evening levels of self-esteem, anxiety, and expressive suppression on days when they reported morning negative affect. Furthermore, the results showed that the direct effect of daily morning negative affect has a negative impact at the end of the day, causing women survivors of breast cancer to experience reduced evening self-esteem and increased evening anxiety and expressive suppression. In accordance with the methodology of diary studies, these findings suggest that the adverse effect of experiencing morning negative affect persists throughout the same day. Most notably, trait psychological flexibility may serve as a useful personal resource with a dual function for women who have overcome the early stages of the disease and require new mechanisms for daily coping.

Women survivors of breast cancer reported that on days they woke up experiencing negative affect, they also experienced lower self-esteem and higher anxiety and expressive suppression by bedtime. As expected, there were no significant associations for the control group. This implies that women who are unable to break this negative emotional cycle might see their mental health deteriorate in a shorter period of time, leaving them unprotected. Notably, this finding regarding short-term negative emotional dynamics highlights the potential usefulness of strategies such as expressive writing diaries, which may not only prevent anxiety but also dimmish the use of maladaptive emotion regulation strategies, such as expressive suppression [35, 36].

Multilevel analysis confirmed a direct association between trait psychological flexibility and all evening outcomes. Interestingly, this relationship was also observed in the control group. Aligned with published literature, psychological flexibility appears to be a powerful personal resource for breast cancer patients, helping them cope with daily stress and promoting health outcomes [37]. Furthermore, it constitutes a fundamental resource for the non-clinical population in terms of quality of life and well-being [11], which is consistent with the current findings. Nevertheless, the major finding of the present study is the moderating role of trait psychological flexibility. In line with previous research, cross-level interactions have demonstrated that low levels amplify the adverse impact of daily morning negative affect on all evening outcomes [15]. Therefore, consistent with existing evidence on this type of cancer, women survivors of breast cancer (compared to the control group) with low levels of trait psychological flexibility were more vulnerable by the end of the day [38]. In particular, they experienced lower levels of daily evening self-esteem and higher levels of daily evening anxiety and expressive suppression. In summary, findings from the present diary study suggest that the dual role of psychological flexibility within the same day is a useful personal resource for protecting women survivors of breast cancer.

4.1 | Clinical and Research Implications

Current findings underscore psychological flexibility as a key target for interventions in breast cancer survivorship. The dual function of psychological flexibility highlights its role as a protective resource for patients. On the one hand, the present results support the development of ACT-based psychosocial group interventions, such as the AVANZACT intervention protocol [39]. On the other hand, it supports personalized ACT-based therapeutic approaches, such as the one described by Ksiksou et al. [40]. Accordingly, women survivors of breast cancer with low levels of psychological flexibility may benefit from more intensive or timely support on days when they experience heightened negative affect. A major research implication arises from the design of this study. Aligned with previous diary studies that assess negative emotional dynamics using a within-person approach, and protocols based on daily entries, this design enables healthcare providers to initiate discussions about potentially adaptive coping resources, such as psychological flexibility [6]. Consequently, this diary study constitutes an important advancement for research in the field of breast cancer by capturing real-time psychological dynamics and providing clinically relevant insights for personalized and psychosocial interventions for groups.

4.2 | Study Limitations

Several limitations have been observed when interpreting the results. In terms of design, no causal conclusions can be drawn due to the diary design [6]. However, the tested models temporarily separated the predictive and outcome variables [41]. The diary questionnaires were completed in a paper notebook formatted as a diary, rather than in an online format (i.e., http://ilumivu.com/). Therefore, the lack of control over time could constitute a limitation, despite the fact that participants reported the time at each moment and that the "time" variable was included as a control variable in the multilevel analyses. All data were collected through self-report measures, rather than using a mixed-method approach that adds qualitative information about

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specific behaviors or contexts. Moreover, it would be interesting for future studies to continue exploring how psychological flexibility can mediate relationships between predictors and outcomes, as previous studies have tested [42]. One could even explore the effects from one day to the next, as other daily studies have done [43], rather than focusing solely on the effects within the same day. Another limitation to acknowledge is that, although the present study identifies and tests differences between the breast cancer group and the healthy control group, these differences were not examined through direct statistical comparisons, but rather were analyzed separately. Future diary studies employing larger sample sizes would be better positioned to conduct more rigorous direct between-group comparisons in order to enhance the robustness, precision, and generalizability of the findings. On the other hand, the sample could be expanded to include women from other countries with cultural differences, in order to verify whether psychological flexibility maintains its effects and to explore comparisons among countries in social dimensions [44].

5 | Conclusions

Evidence from the current diary study suggests that psychological flexibility helps women survivors of breast cancer adapt in their daily emotional processes rather than simply reducing a painful psychological experience. The results showed that daily morning negative affect experienced can be an enormous burden for breast cancer patients with low levels of psychological flexibility, reducing self-esteem and increasing anxiety and expressive suppression by bedtime. This growing line of research on daily methods in the field of breast cancer encourages researchers to further explore the dual role of psychological flexibility. An ACT-based therapeutic and psychosocial intervention approach may benefit women by targeting coping mechanisms.

Author Contributions

Conception and design: Isabel Carmona-Cobo, M. Modesta Ballesteros, Cristina Camilo, M. Luisa Lima. Collection and assembly of data: Isabel Carmona-Cobo, Cristina Camilo, M. Luisa Lima. data analysis and interpretation: Isabel Carmona-Cobo, M. Luisa Lima. writing – original draft: Isabel Carmona-Cobo, M. Modesta Ballesteros, Cristina Camilo, M. Luisa Lima.

Acknowledgments

The authors would like to express their sincere gratitude to all the women who participated in this study. Their voluntary contributions and sharing of experiences and insights were indispensable to the comprehensiveness of our research. This research was funded by the "Instituto de Estudios Giennenses" from Diputación de Jaén. Call for grants for research projects related to the province of Jaén or issues affecting it, in the field of social and legal sciences for the year 2022".

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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