

RESEARCH ARTICLE

Stress and psychological adjustment in breast cancer patients: The mediator role of zest

M. Victoria Cerezo^{ID}, Lorena M. Soria-Reyes^{*ID}, and María J. Blanca^{ID}

Faculty of Psychology and Speech Therapy, University of Malaga, Málaga, Spain

Abstract

Background: A breast cancer diagnosis can be an emotionally overwhelming experience that poses significant challenges for coping and adjustment. Recent studies on the role of character strengths have shown that hope and zest can buffer the impact of disease stressors, improving patients' well-being. However, it remains unclear whether they can also help reduce psychological distress during this stressful period.

Objectives: This study aims to expand knowledge regarding psychological adjustment in the context of breast cancer by exploring its association with character strengths and identifying those strengths which may mediate the relationship between breast cancer stressors (stress as stimulus) and psychological distress (depression, anxiety, and stress as response, and psychological distress).

Methods: Participants were 211 breast cancer patients from different Spanish healthcare centers. Correlational and statistical mediation analyses were performed.

Results: Correlation analysis revealed that depression, anxiety, stress, and distress were most strongly associated with four strengths: zest, hope, curiosity, and gratitude. Mediation analysis showed that zest was the sole mediator of the relationship between stressors and these indicators of psychological adjustment. These results indicate that higher levels of stressors are related to decreased zest, which in turn are associated with greater symptoms of depression, anxiety, stress, and distress. This pattern suggests that zest may be relevant for understanding the association between stressors and psychological outcomes.

Conclusion: Interventions promoting zest may therefore improve psychological adjustment in breast cancer patients, given that zest may function as a mediating resource in the association between cancer-related stressors and psychological distress.

Keywords: Breast neoplasms; Psychological distress; Depression; Anxiety; Hope; Psycho-oncology

***Corresponding author:**Lorena M. Soria-Reyes
(lorena.soria@uma.es)

Citation: Cerezo MV, Soria-Reyes LM, Blanca MJ. Stress and psychological adjustment in breast cancer patients: The mediator role of zest. *Health Psychol Res.* 2026;14(3):026170086. doi: 10.36922/HPR026170086

Received: April 23, 2026**Revised:** May 22, 2026**Accepted:** June 4, 2026**Published online:** July 6, 2026

Copyright: © 2026 Author(s). This is an Open-Access article distributed under the terms of the Creative Commons AttributionNon-Commercial 4.0 International (CC BY-NC 4.0), which permits all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Publisher's Note: AccScience Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

A breast cancer diagnosis is considered a highly stressful life event that significantly impacts women's quality of life and well-being.¹⁻⁴ In recent years, the global incidence of breast cancer has increased, reaching 46.23 cases per 100,000 population. This rising impact is further reflected in an increase in years lived with disability (YLD), which have reached 32.26 years per 100,000 population. In contrast, years of life lost (YLL) due

to premature mortality have declined to 423.30 years per 100,000 population, suggesting improvements in survival. Overall, disability-adjusted life years (DALYs)—a measure of disease impact that combines both YLD and YLL—were recently estimated at 455.56 per 100,000 population.⁵ This indicates that, for every 100,000 individuals, more than 455 years of healthy life are lost annually due to breast cancer. Although this impact has shown a slight global decline, likely due to advances in diagnosis and treatment, it remains unevenly distributed across age groups, with a particularly notable increase among young women aged 20 to 54.^{5,6} Importantly, this impact not only reflects physical health consequences but also increases vulnerability to psychological disorders such as depression, anxiety, and stress.⁷⁻¹² These symptoms may persist even after medical treatment has concluded, highlighting the need for a comprehensive psycho-oncological approach to support long-term psychological adjustment.^{13,14}

The psychological stress associated with a breast cancer diagnosis varies across individuals, insofar as it depends on the specific nature of the stressors involved.^{11,15-17} and the individual's available psychosocial and personal resources.^{7,17} The stress process model¹⁸ is a theoretical framework that has helped to explain how stressors affect people with a variety of diseases, including breast cancer.¹⁹

The stress process model (Figure 1) includes a series of factors that influence the ability of individuals to manage stress: (i) Contextual variables: sociodemographic characteristics of the person and variables referring to the specific situation of breast cancer; (ii) Stressors: factors related to the demands of the situation, either directly or arising from it; (iii) Mediating or moderating variables: psychosocial resources that individuals use to manage stress, such as social support, coping strategies, sense of

control over the situation, values, and beliefs; and (iv) Health outcomes: psychological and physical manifestations or consequences arising from the individual's response to stressors.

Research examining the mediating role of personal resources within the stress process model remains limited in breast cancer populations. While certain variables—such as personality traits,¹⁷ resilience,^{17,20} and coping styles²⁰—have been investigated as mediators and have been shown to be linked to psychological well-being,⁴ the potential mediating role of other psychosocial resources, particularly character strengths, has received comparatively little attention in relation to cancer-related stressors and mental health outcomes.

Values and character strengths are considered key resources that facilitate coping in adverse situations. Peterson and Seligman²¹ identified six universal virtues (wisdom and knowledge, courage, humanity, justice, temperance, and transcendence) that encompass 24 character strengths. Depending on their nature, character strengths can be categorized into strengths of the heart or strengths of the mind. The former are primarily associated with emotional, interpersonal, and affective connections—such as zest, love, hope, and gratitude—and are driven by feelings, relationships, and a sense of vitality. By contrast, the latter are related to cognitive processes and decision-making, including prudence, self-regulation, perspective, and judgment.²²

Character strengths show strong associations with indicators of psychological functioning. For example, Karris Bachik *et al.*²³ reported that strengths such as zest, hope, and gratitude were most strongly linked to life satisfaction, and further identified a negative association

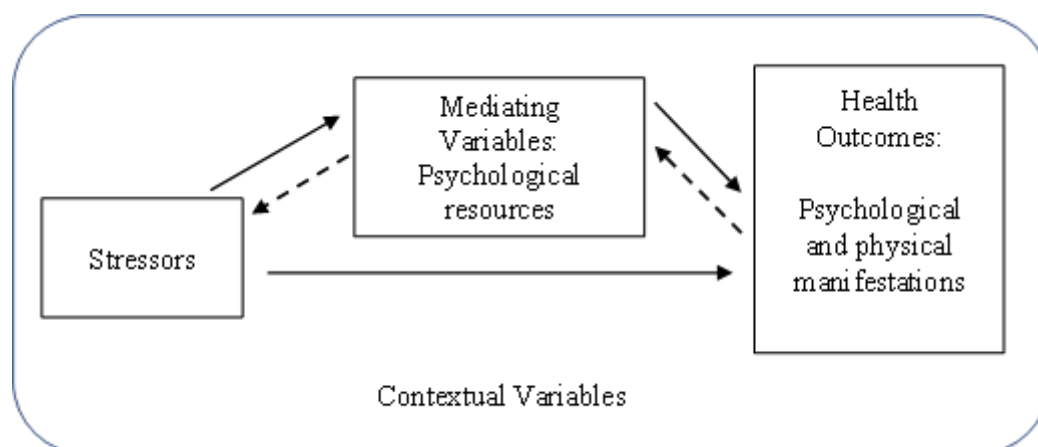


Figure 1. Explanatory stress process model in breast cancer, adapted from Pearlin and Bierman (2013)¹⁸

between zest and depression. These findings underscore the relevance of specific strengths in shaping both well-being and mental health, suggesting that some strengths may play a more influential role than others in promoting adaptive outcomes. In line with these findings, research with breast cancer patients has shown that among the character strengths studied, hope and zest are significant predictors of life satisfaction.²⁴ More recently, these two strengths have also been identified as mediators in the relationship between stressors related to the breast cancer experience and patients' well-being, represented by life satisfaction and flourishing. When patients exhibit adequate levels of hope and zest, they are more likely to make a positive appraisal of their lives, which may help buffer the impact of stressors. Conversely, the absence or low presence of these strengths may serve as a pathway through which stress leads to diminished well-being.

Although previous research has examined the role of character strengths such as hope and zest in relation to well-being outcomes (e.g., life satisfaction or flourishing) in breast cancer patients, their role in relation to broader indicators of psychological adjustment remains less explored. In particular, there is limited evidence regarding whether these strengths may help explain variations in depression, anxiety, stress, and overall psychological distress in this population. Furthermore, the potential mediating role of these strengths within the stress process model has received relatively little attention. Addressing these gaps may contribute to a more comprehensive understanding of the psychological mechanisms underlying adjustment to breast cancer. The aim of this study is therefore to expand knowledge regarding psychological adjustment in the context of breast cancer by exploring the association between character strengths and depression, anxiety, stress as response, and psychological distress. Having identified the strengths most strongly related to these mental health indicators, and following the framework proposed by Pearlin and Bierman,¹⁸ the study aims to examine whether these strengths serve as mediators in the relationship between cancer-related stressors and psychological adjustment. If such mediating effects are found, psycho-oncological interventions focusing on these specific strengths could be designed with the aim of improving patients' ability to cope with cancer-related stressors.

2. Materials and methods

2.1. Participants

The sample comprised 211 women with a diagnosis of breast cancer, aged 23–77 years ($M = 52.55$; $SD = 9.65$), all of whom were recruited in Spain and were of Spanish nationality. The mean time since diagnosis was 5.34

years ($SD = 6.40$) and their age at disease onset ranged between 19 and 75 years ($M = 47.22$ years, $SD = 9.5$). The study inclusion criteria were having a diagnosis of breast cancer and no other types of cancer, signing the informed consent form, and being of legal age. Most participants were married and had secondary or higher education. Clinically, most of the women had been diagnosed as having stage II cancer within the past two years, had undergone surgery, and were attending medical checkups every three to six months. Nearly half of the participants were receiving psychological treatment. Table 1 shows the sociodemographic and clinical characteristics of study participants.

2.2. Instruments

Relevant data on sociodemographic variables (age, marital status, educational level, etc.) and clinical variables (cancer stage, time since diagnosis, treatments received, etc.) were collected from each participant. In addition, the following instruments were administered:

*Stressors in Breast Cancer Scale (SBCS).*¹⁵ The SBCS assesses stressors (stress as stimulus) in the context of breast cancer through five dimensions or sources of stress: physical appearance and sex strains, health and daily difficulties, interpersonal relationship strains, healthcare strains, and worries and concerns about the future. It comprises 24 items, each rated on a 5-point Likert-type scale (1 = not at all stressful or is irrelevant to me; 5 = very stressful). A total score is computed as the mean of all item scores, with high scores indicating higher levels of stress as stimulus. McDonald's omega coefficient in the present sample was 0.96.

The Spanish version of the *VIA Inventory of Strengths (VIA-IS)*.^{21,25} The VIA-IS comprises 72 items that explore each of the 24 character strengths (as shown in Table 2). Each item is rated on a 5-point Likert-type scale (1 = very different from me; 5 = very similar to me), and high scores indicate a higher level of the corresponding strength. McDonald's omega coefficient in this sample ranged from 0.56 (self-regulation) to 0.87 (humor).

The *Depression, Anxiety, and Stress Scales (DASS-21)*,²⁶ in its Spanish version²⁷ that has been validated in breast cancer patients. The DASS-21 assesses the presence and intensity of distress over the past week through three scales: depression, anxiety, and stress (as response), with a total score representing psychological distress. It comprises 21 items rated on a 4-point Likert-type scale (0 = did not apply to me at all; 3 = applied to me very much, or most of the time), and high scores are indicative of a higher level of the construct measured by each scale. McDonald's omega coefficients in the present sample were 0.87 for depression,

Table 1. Sample characteristics (N = 211)

Sociodemographic variables	N (%)	Clinical variables	N (%)
<i>Age (years)</i>		<i>Breast cancer stage</i>	
<40	21 (10.0)	0	15 (7.1)
40–50	66 (31.3)	I	50 (23.7)
51–60	81 (38.3)	II	106 (50.2)
>60	43 (20.4)	III	35 (16.6)
<i>Age at diagnosis (years)</i>		IV	5 (2.4)
<40	42 (19.9)	<i>Time since diagnosis (years)</i>	
40–50	99 (46.9)	<2	88 (41.7)
51–60	51 (24.2)	2–5	61 (28.9)
>60	19 (9.0)	>5	62 (29.4)
<i>Marital status</i>		<i>Type of treatment received</i>	
Single	28 (13.2)	Surgery	201 (95.3)
Married	146 (69.2)	Radiotherapy	150 (71.1)
Divorced	25 (11.8)	Chemotherapy	140 (66.4)
Widowed	12 (5.8)	Endocrine therapy	91 (43.1)
<i>Educational Level</i>		Monoclonal antibody	33 (15.6)
Primary	27 (12.8)	Other	21 (10.0)
Secondary	95 (45.0)	<i>Lymphedema</i>	
University	89 (42.2)	No	153 (72.5)
<i>Employment status</i>		Yes	58 (27.5)
Working at home	24 (11.3)	<i>Medical checkup frequency</i>	
Unemployed	46 (21.8)	3–6 months	158 (74.9)
Retired	44 (20.9)	Every year or more	53 (25.1)
Medical leave	39 (18.5)	<i>Receiving psychological treatment</i>	
Employed	58 (27.5)	No	102 (48.3)
		Yes	109 (51.7)

0.87 for anxiety, 0.88 for stress, and 0.95 for total scores. Raw scores on the DASS-21 should be multiplied by two, and according to Lovibond and Lovibond,²⁶ the following cut-off scores apply. For depression: 9 or below, normal; 10–13, mild; 14–20, moderate; 21–27, severe; and over 28, extremely severe. For anxiety: 7 or below, normal; 8–9, mild; 10–14, moderate; 15–19, severe; and over 20, extremely severe. For stress: 14 or below, normal; 15–18, mild; 19–25, moderate; 26–33, severe; and over 34, extremely severe.

2.3. Procedure

The study was approved by the Research Ethics Committee of the University of Malaga (Spain) and was conducted in accordance with the ethical standards of the Declaration of Helsinki. Participants were recruited by convenience sampling in several Spanish cancer centers. The research team initially contacted center managers to explain the purpose of the study and to request their collaboration in the recruitment of participants. All accepted and gave

their consent. The psychological team at each center then invited women to participate anonymously and without incentives. Potential participants were informed of the study objective, and those who agreed to take part were sent an email with further details. The email reiterated the study objective, made clear that all data collected would remain anonymous and confidential, and included a link to the questionnaires, which were hosted online. Once participants had signed (electronically) the informed consent form on the first page of the survey, they were able to complete the questionnaires (socio-demographic and disease-related data, VIA-IS, SBCS, and DASS-21). The survey could not be submitted until all questions had been answered, thus avoiding data omissions.

2.4. Data analysis

We began by computing descriptive statistics for each of the study variables of interest. Next, Pearson correlations were calculated as a measure of the associations between psychological adjustment—depression, anxiety, stress as responses, and distress (scores on the DASS-21)—stressors (total score on the SBCS), and the 24 strengths (scores on VIA-IS). Traditionally, correlation coefficients are interpreted following Cohen's guidelines (namely $|.10|$, weak; $|.30|$, moderate; and $|.50|$ or above, strong correlation), although more recent research²⁸ proposes the following: $|.10|$, small; $|.20|$, typical; and $|.30|$ or above, strong. Based on the latter criterion, those strengths that showed a correlation equal to or greater than 0.20 with one or more psychological adjustment indicators were selected to be introduced in the mediation analysis. The use of this criterion enabled the exploration of a broader range of potentially relevant strengths, minimizing the risk of excluding variables that may play an important role in psychological adjustment.

Mediation analysis consistent with Pearl's stress process model was then performed to examine the mediating role of character strengths in the relationship between stressors and each of the psychological adjustment indicators (depression, anxiety, stress, and distress). For this analysis, we followed Hayes's²⁹ procedure, using Macro Process 5.0 in IBM SPSS[®] 29 and selecting Model 4, which refers to mediation with multiple mediating variables in parallel (in this case, character strengths). Statistical significance of the indirect effect was determined using 10,000 bootstrap samples to generate 95% confidence intervals, establishing that indirect effects are significant when these intervals do not contain the value 0. One-tailed tests were conducted because directional effects were expected among variables based on the correlation analysis³⁰. The following sociodemographic and clinical variables were considered as control variables: age, time

since diagnosis in years, cancer stage, and those that were recoded into dummy variables, namely marital status (0 = single/divorced/widowed; 1 = married), primary education (0 = other; 1 = primary), secondary education (0 = other; 1 = secondary), and employment status (0 = works at home/unemployed/on sick leave/retired; 1 = employed).

3. Results

Table 2 shows the results of the descriptive analysis, indicating the mean, standard deviation, skewness, and kurtosis. The mean total stressor score was close to 3, indicating a moderate level of stress. Mean scores for character strengths ranged from 2.75 to 4.28, representing adequate values. Mean values for the psychological adjustment indicators indicated moderate levels of depression and anxiety, and mild levels of stress, according to the cutoff points established by the scales' authors.²⁶

Results of the correlational analysis indicated a number of significant negative associations between scores on character strengths and scores on the psychological adjustment indicators. These correlations are shown in descending order in **Table 3**. Zest, hope, curiosity, and gratitude were the strengths with coefficients higher than or close to 0.20.

The mediation analysis introduced the four above-mentioned strengths as potential mediators in the relationship between breast cancer stressors and psychological adjustment indicators, controlling for contextual variables. **Table 4** shows the regression coefficients for each mediation model. The assumptions of the statistical models were met, as residuals showed normality, homoscedasticity, and absence of multicollinearity. The results showed that higher levels of depression were associated with being unmarried, having only primary education, and a more advanced cancer stage, as well as with higher scores on stressors and lower scores on zest. Higher levels of anxiety and stress were also associated with having only primary education, higher scores on stressors, and a lower level of zest. Higher levels of distress were related to having only primary education, a shorter time since diagnosis, higher scores on stressors, and a lower level of zest. The direct effects of hope, curiosity, and gratitude on psychological adjustment indicators were not statistically significant. However, the direct effect of stressors on zest, hope, curiosity, and gratitude was statistically significant. **Figure 2** shows a summary of results for the mediation models, with significant paths.

Regarding indirect effects, only zest mediated the relationship between stressors and all the psychological adjustment indicators. Results showed that the higher the stressors score, the higher the score on psychological

Table 2. Descriptive statistics (N = 211)

Variables		Mean	SD	Skewness	Kurtosis
<i>Stressors (SBCS)</i>		2.91	1.01	−0.05	−0.86
<i>Virtues and character strengths (VIA-IS)</i>					
Wisdom and knowledge	Creativity	3.22	0.78	0.03	−0.18
	Curiosity	3.58	0.80	−0.04	−0.22
	Judgment	3.53	0.72	−0.27	0.14
	Love of learning	3.12	1.02	−0.01	−0.71
	Perspective	3.34	0.82	−0.15	0.03
Courage	Bravery	3.66	0.73	−0.36	0.17
	Perseverance	3.63	0.86	−0.36	−0.40
	Honesty	4.12	0.68	−0.47	−0.52
	Zest	3.67	0.88	−0.59	0.29
Humanity	Love	4.03	0.76	−0.86	1.07
	Kindness	4.20	0.66	−0.49	−0.47
	Social intelligence	3.54	0.74	−0.19	0.44
Justice	Teamwork	4.06	0.69	−0.44	−0.47
	Fairness	4.28	0.59	−0.50	−0.59
	Leadership	3.94	0.74	−0.55	−0.20
Temperance	Forgiveness	3.76	0.80	−0.44	−0.31
	Humility	3.60	0.79	−0.14	0.03
	Prudence	3.77	0.80	−0.27	−0.47
	Self-regulation	3.36	0.89	−0.10	−0.42
Transcendence	Appreciation of beauty and excellence	4.04	0.70	−0.48	−0.38
	Gratitude	4.11	0.68	−0.49	−0.16
	Hope	3.77	0.76	−0.35	−0.43
	Humor	3.57	0.95	−0.33	−0.51
	Spirituality	2.75	1.09	0.21	−0.82
<i>Psychological adjustment indicators (DASS-21)</i>					
Depression		14.92	10.36	0.61	−0.40
Anxiety		15.52	10.78	0.63	−0.37
Stress		17.42	10.62	0.34	−0.77
Distress (total score)		48.22	29.62	0.56	−0.47

adjustment indicators, with this relationship being mediated by zest. Table 5 shows the coefficients from the mediation analysis. No significant indirect effects were found for hope, curiosity or gratitude.

Table 3. Correlation coefficients between scores on the three variables: stressors, character strengths, and psychological adjustment indicators ($N = 211$)

Variables	Depression	Anxiety	Stress	Distress
Stressors	0.43***	0.41***	0.42***	0.45***
Character strengths				
Zest	-0.43***	-0.38***	-0.40***	-0.43***
Hope	-0.35***	-0.31***	-0.31***	-0.35***
Curiosity	-0.25***	-0.19**	-0.22***	-0.24***
Gratitude	-0.23***	-0.18**	-0.17**	-0.21***
Love of learning	-0.18**	-0.15*	-0.14*	-0.17**
Judgment	-0.18**	-0.14*	-0.12*	-0.16*
Perseverance	-0.16**	-0.11	-0.14*	-0.14*
Honesty	-0.16*	-0.01	-0.06	-0.11*
Social intelligence	-0.15*	-0.10	-0.10	-0.13*
Prudence	-0.13*	-0.14*	-0.12*	-0.14*
Self-regulation	-0.12*	-0.05	-0.04	-0.07
Creativity	-0.10	-0.06	-0.09	-0.08
Leadership	-0.10	-0.04	-0.03	-0.06
Love	-0.09	-0.12*	-0.09	-0.11
Humor	-0.09	-0.10	-0.01	-0.07
Fairness	-0.08	-0.04	-0.03	-0.05
Perspective	-0.05	-0.02	-0.02	-0.03
Forgiveness	-0.03	-0.05	-0.08	-0.05
Spirituality	0.02	0.04	0.00	0.02
Kindness	-0.02	0.01	0.06	0.02
Bravery	-0.02	-0.00	0.02	0.01
Teamwork	0.01	-0.00	0.10	0.04
Humility	0.01	0.02	0.05	0.03
Appreciation of beauty and excellence	0.01	0.04	0.02	0.03

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4. Regression coefficients for the psychological adjustment indicators, and adjusted R^2

Variables	Depression	Anxiety	Stress	Distress
Adjusted R^2	0.37***	0.31***	0.32***	0.38***
Contextual variables				
Age	0.02	-0.01	-0.04	-0.01
Marital status (married)	-1.54**	-0.70	0.14	-2.23
Primary education	3.03***	3.44***	2.30*	8.77***
Secondary education	0.78	0.44	0.49	1.60
Employment status (employed)	-0.67	0.32	-0.63	-0.67
Cancer stage	0.66*	0.29	0.17	1.10
Time since diagnosis	-0.07	-0.08	-0.09	-0.25*
Stressors				
Breast cancer stressors	1.52***	1.56***	1.47***	4.66***
Character strengths				
Zest	-1.72**	-2.01***	-2.40***	-6.10***
Hope	-0.96	-0.97	-0.51	-2.37
Curiosity	0.18	0.66	0.35	1.20
Gratitude	0.49	0.75	0.97	2.02

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5. Mediation model with parameter estimation testing the mediating effect of zest on the relationship between breast cancer stressors and psychological adjustment indicators ($N = 211$)

Variables	a	b	c'	ab	95% CI
Depression	-0.22***	-1.72***	1.52***	0.37	[0.05, 0.84]
Anxiety	-0.22***	-2.01***	1.56***	0.44	[0.07, 0.93]
Stress	-0.22***	-2.40***	1.47***	0.52	[0.15, 1.02]
Distress	-0.22***	-6.11***	4.66***	1.32	[0.32, 2.70]

Note: *** $p < 0.001$.

4. Discussion

The aim of this study was to expand knowledge regarding psychological adjustment in the context of breast cancer by exploring the association between character strengths and depression, anxiety, stress as response, and

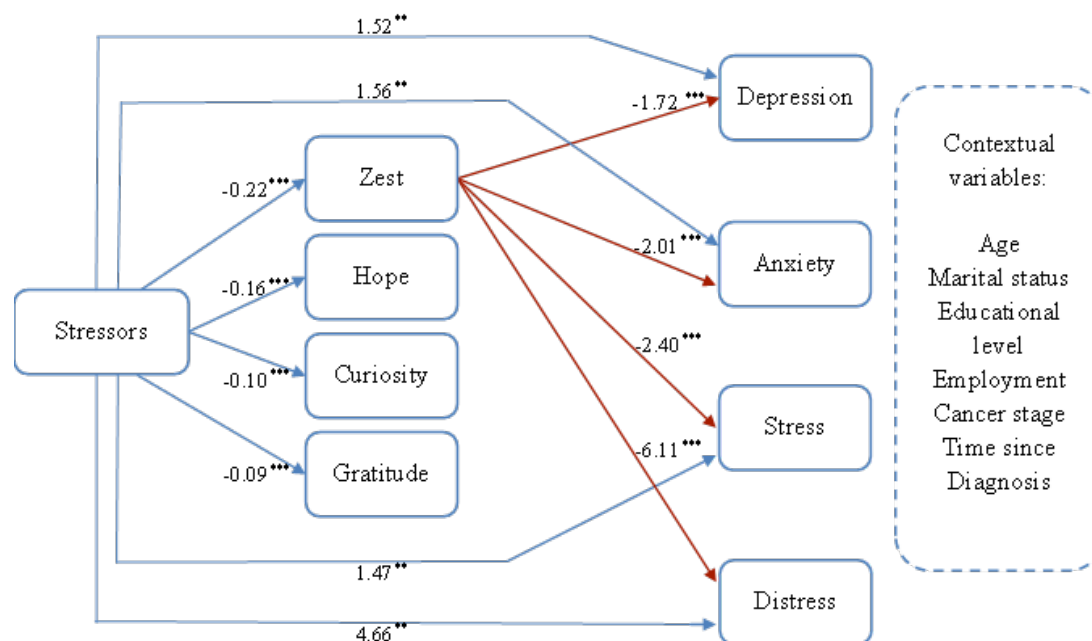


Figure 2. Summary of results for the mediation models, showing significant paths

psychological distress. Having identified the strengths most strongly related to these mental health indicators, we examined—following the framework of the stress process model¹⁸—whether these strengths serve as mediators in the relationship between cancer-related stressors and psychological adjustment.

Descriptive results indicated that women in the present sample had moderate levels of depression and anxiety, and mild levels of stress, according to established DASS-21 cut-offs.²⁶ This suggests an emotional need that should be addressed, consistent with findings from other studies in this population.^{7-12,15,16,31} The mean score for stressors was close to 3, which indicates that the factors contributing to stress in breast cancer are of moderate intensity. Regarding psychological strengths, most scores were high, suggesting generally adequate resources in this domain.

Correlation analysis revealed a significant relationship between stressors and symptoms of depression, anxiety, stress, and overall psychological distress. This reflects previous research indicating that a diagnosis of breast cancer may be perceived as a highly stressful situation.^{1-4,9,15,16} It is therefore essential to prioritize psychological support, as the impact of the stressors experienced by women with breast cancer is reflected in psychological adjustment indicators.

Four character strengths, namely zest, hope, curiosity, and gratitude, showed a strong or moderate negative association with both stressors and the indicators of

psychological adjustment. This suggests that patients with lower levels of these strengths tend to experience higher levels of cancer-related stressors and greater symptoms of depression, anxiety, and stress. Three of these four strengths—zest, hope, and gratitude—are included among the so-called strengths of the heart.²² Previous studies involving breast cancer patients support the associations observed here, insofar as strengths of the heart have been shown to be positively related to well-being²⁴ and negatively associated with depression and anxiety.³²⁻³⁴ Overall, these findings suggest that the cultivation of strengths of the heart may contribute to improved mental health outcomes in this population.

Regarding contextual variables, higher levels of depression were associated with having only primary education, not being married, and being diagnosed with advanced-stage cancer. Elevated anxiety and stress were specifically related to having only primary education. Similarly, higher levels of psychological distress were associated with primary education and a shorter time since diagnosis. These results indicate that breast cancer patients with only primary education are at increased risk for depression, anxiety, stress, and distress, consistent with previous research.^{8,10} A lower educational level has also been found to be significantly associated with reduced life satisfaction in this population.²⁴ A possible explanation for this relationship is that individuals with lower levels of education often have less access to psychosocial and economic resources, potentially limiting

their access to adequate information and increasing psychological distress.^{8,10,24} Further research should investigate the underlying mechanisms linking education level to psychological health outcomes so as to clarify why lower educational attainment is associated with poorer psychological adjustment among breast cancer patients.

The observed association between marital status and depression is consistent with previous research.¹⁰ Having a supportive partner with whom one can share emotions and who can offer support in coping with the breast cancer experience may serve as a protective factor against psychological distress.^{8,35} Although prior studies have established that social support can act as a buffer against depressive symptoms,¹² few have specifically differentiated between general social support and support provided by a partner. A task for future research might therefore be to explore further the relationship between depressive symptoms and emotional support, paying particular attention to the distinct roles of partner support versus broader social support networks.

With respect to cancer stage, our results align with previous findings linking advanced cancer stages to higher levels of depressive symptoms in patients with breast cancer,³⁶ as well as in people with other types of cancer.³⁷ We also found that more recently diagnosed patients reported higher levels of stress and psychological distress, which supports the idea that receiving a cancer diagnosis is a highly stressful and emotionally challenging experience.^{1-4,9,15,16} These findings underscore the importance of early psycho-oncological assessment and intervention, particularly for patients with recently diagnosed or advanced-stage breast cancer.

Results of the mediation analysis indicated that zest was the sole character strength that significantly mediated the relationship between stressors and all indicators of psychological adjustment. These results partially align with prior studies demonstrating that zest, in conjunction with hope, mediates the association between cancer-related stressors and life satisfaction.⁴ The present study expands the current evidence base by identifying zest as a mediating variable not only in relation to life satisfaction but also in connection with a broader range of psychological adjustment indicators. This suggests that maintaining adequate levels of zest may help to reduce distress and mitigate the emotional impact of the disease. From a clinical perspective, these findings support the relevance of incorporating interventions aimed at enhancing zest within psycho-oncological care. Given its mediating function, fostering zest may contribute to the mitigation of psychological symptoms (particularly distress, depression, anxiety, and stress), leading to improved mental health

outcomes in individuals facing breast cancer-related stressors.

From the perspective of positive psychology, zest can be cultivated through psychological interventions that help individuals identify, reinforce, and apply their personal strengths to enhance well-being. In Spain, a specific intervention known as positive psychotherapy has been developed for cancer survivors.¹⁴ This program has shown efficacy in reducing depressive symptoms among participants by fostering resilience, personal strengths, a proactive attitude toward illness, and healthy lifestyle habits. These components are likely to contribute to increased levels of zest.¹⁴

In addition to strength-based interventions, other therapeutic approaches, such as mindfulness-based interventions, acceptance and commitment therapy, and cognitive behavioral therapy, may also promote zest through their emphasis on psychological flexibility, present-moment awareness, and values-based living.^{13,30,38} Although empirical research specifically targeting zest remains limited, these interventions share mechanisms (e.g., values-based action, behavioral activation, emotional regulation) that could plausibly increase zest in women with breast cancer.

It is important to highlight that zest has been described as a “contagious” strength,²¹ that is to say, witnessing zest in others can be inspiring, energizing, and motivating. This characteristic supports the use of group-based interventions aimed at fostering zest, where social dynamics, shared experiences, and mutual encouragement may amplify zest collectively. In addition, interdisciplinary approaches may contribute to the development of zest through engagement in restorative experiences. Activities such as physical exercise, participation in pleasurable or meaningful pursuits, and practices that enhance sensory awareness, such as nature walks or meditation, may positively influence well-being and serve as indirect pathways to increasing zest.^{39,40}

In the present study, hope did not emerge as a significant mediator, which is unexpected given its role as a predictor of life satisfaction across diverse populations, including women with breast cancer.²⁴ Previous research has also demonstrated its mediating function between cancer-related stressors and life satisfaction.⁴ Furthermore, various targeted interventions aimed at enhancing hope have been associated with reductions in symptoms of depression, anxiety, and stress.^{14,41,42} It is possible that our use of a general character strengths measure, with only three items assessing hope, did not sufficiently capture the complex and aspects of hope that are relevant to cancer patients. Future studies should consider employing

specific instruments to assess this strength, particularly those validated in oncology, so as to clarify its role in psychological adjustment among cancer patients. Additionally, it is possible that in this population, the need to generate immediate psychological energy and mobilize in the face of illness—a quality more closely aligned with zest—may be more critical for alleviating symptoms of depression, anxiety, and stress. Hope, by contrast, is often more future-oriented and goal-directed. These findings suggest that different character strengths may play distinct roles depending on the outcome considered, highlighting the importance of examining multiple indicators of psychological adjustment rather than focusing exclusively on well-being outcomes.

This study has several limitations that should be acknowledged. First, participants were recruited through convenience sampling and all of whom were of Spanish nationality. Participants were recruited through cancer centers and psychological support services, which may imply that the sample includes individuals more engaged with healthcare or psychological support. This potential selection bias, together with the relative sociodemographic homogeneity of the sample, may limit the generalizability of the findings to the broader population of breast cancer patients. Second, all measures were self-reported, making the data susceptible to response bias. Third, the study did not include the full range of psychosocial and personal resources that may mediate the relationship between stressors and psychological adjustment, such as social support, resilience, self-efficacy and coping styles. Future research should expand knowledge by including these additional variables in order to explore their role in the relationship between cancer-related stressors and psychological adjustment outcomes. Another limitation concerns the cross-sectional nature of the study, which makes it difficult to draw causal inferences from the mediation models due to the lack of a temporal sequence among variables. Given that all variables are measured at the same time, a cross-sectional design cannot establish whether the predictor precedes the mediator or whether the mediator precedes the outcome. Consequently, the mediation model should be interpreted in terms of statistical associations rather than causal or directional relationships. Future research should aim to adopt longitudinal designs to establish temporal precedence and more accurately examine the causal pathways of zest and other character strengths. Finally, another limitation concerns the use of a broad measure of character strengths. Our aim was to explore which strengths are associated with psychological adjustment, which is why all 24 strengths were assessed using a general instrument. Once the most relevant strengths have been identified, future

studies could examine these relationships in greater depth by employing more specific instruments tailored to the strengths of interest.

5. Conclusion

This study advances our understanding of the stress process in patients with breast cancer by contributing to the limited literature on psychological strengths through a comprehensive approach. Specifically, it first identifies the most relevant strengths associated with psychological adjustment and subsequently examines their role in the stress process. The results reveal that depression, anxiety, stress, and distress were most strongly associated with four strengths: zest, hope, curiosity, and gratitude. Of these, zest is identified as a key psychological resource, showing a consistent pattern of associations with both stressors and indicators of psychological adjustment and acting as a mediator in the relationship between them. Specifically, higher levels of stressors are related to lower levels of zest, which in turn are associated with greater symptoms of depression, anxiety, stress, and distress. This pattern suggests that zest may be relevant for understanding the association between stressors and psychological outcomes. From a psycho-oncological perspective, the promotion of zest should be prioritized. Future research on psychological interventions is therefore warranted to explore and evaluate strategies specifically aimed at enhancing zest within this patient population.

Acknowledgments

None.

Funding

This work was supported by the University of Malaga with the Andalusia FEDER Program 2021-2027 (PPRO-CTS110-G-2023). The funder had no role in the design of this study, data collection, management, analysis, and interpretation of data, writing of the manuscript, and the decision to submit the manuscript for publication.

Conflict of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contributions

Conceptualization: M. Victoria Cerezo, María J. Blanca

Data curation: M. Victoria Cerezo, Lorena M. Soria-Reyes

Formal analysis: M. Victoria Cerezo, María J. Blanca

Supervision: María J. Blanca

Writing—original draft: All authors

Writing–review & editing: All authors

Ethical approval and consent to participate

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2013. This study was approved by the Experimentation Ethics Committee of the University of Malaga (55-2017 H). All participants signed informed consent to participate in the study.

Consent for publication

The authors declare that informed consent was obtained online for the use of data and/or images presented in this paper.

Availability of data

Data are available from the corresponding author upon reasonable request.

References

1. Borgi M, Collacchi B, Ortona E, *et al.* Stress and coping in women with breast cancer: Unravelling the mechanisms to improve resilience. *Neurosci Biobehav Rev.* 2020;119:406-421.
doi: 10.1016/j.neubiorev.2020.10.011
2. Ruan F, Ding X, Li H, *et al.* A study on the relationships among character strengths, perceived social support and subjective well-being of breast cancer patients. *J Med Imaging Health Inform.* 2021;11:1967-1972.
doi: 10.1166/jmihi.2021.3493
3. Soria-Reyes LM, Alarcón R, Cerezo MV, Blanca MJ. Psychometric properties of the Depression Anxiety Stress Scales (DASS-21) in women with breast cancer. *Sci Rep.* 2024;14(1):20473.
doi: 10.1038/s41598-024-68814-9
4. Soria-Reyes LM, Cerezo MV, Polak AT, Blanca MJ. The stress process and well-being in breast cancer: The mediating role of hope and zest. *Integr Cancer Ther.* 2025;24.
doi: 10.1177/15347354251396665
5. Shahbazi F, Heidari F, Moslehi S, Shojaeian A, Khazaei S, Khezrian A. Trends in and projections of breast cancer incidence, mortality, and disability-adjusted life years (DALY) at global and regional levels, 1990-2030: a bayesian age-period-cohort modeling study: BC Trends & 2030 Projections. *Arch Breast Cancer.* 2026;13(2):209-222.
doi: 10.32768/abc.9720461583-207
6. Ouyang X, Liu H, Jin H. Global comparison of breast cancer burden between women aged 20–54 and ≥55 years (1990–2021). *Front Oncol.* 2026;15:1688642.
doi: 10.3389/fonc.2025.1688642
7. Wang X, Wang N, Zhong L, *et al.* Prognostic value of depression and anxiety on breast cancer recurrence and mortality: A systematic review and meta-analysis of 282,203 patients. *Mol Psychiatry.* 2020;25(12):3186-3197.
doi: 10.1038/s41380-020-00865-6
8. Civilotti C, Botto R, Maran DA, *et al.* Anxiety and depression in women newly diagnosed with breast cancer and waiting for surgery: Prevalence and associations with socio-demographic variables. *Medicina.* 2021;57(5):454.
doi: 10.3390/medicina57050454
9. Fortin J, Leblanc M, Elgbeili G, Cordova MJ, Marin M-F, Brunet A. The mental health impacts of receiving a breast cancer diagnosis: A meta-analysis. *Br J Cancer.* 2021;125:1582-1592.
doi: 10.1038/s41416-021-01542-3
10. Guo YQ, Ju QM, You M, Liu Y, Yusuf A, Soon LK. Depression, anxiety and stress among metastatic breast cancer patients on chemotherapy in China. *BMC Nurs.* 2023;22:33.
doi: 10.1186/s12912-023-01184-1
11. Li J, Gao W, Yang Q, Cao F. Perceived stress, anxiety, and depression in treatment-naïve women with breast cancer: A case-control study. *Psychooncology.* 2021;30(2):231-239.
doi: 10.1002/pon.5555
12. Zamanian H, Amini-Tehrani M, Jalali Z, *et al.* Perceived social support, coping strategies, anxiety and depression among women with breast cancer: Evaluation of a mediation model. *Eur J Oncol Nurs.* 2021;50:101892.
doi: 10.1016/j.ejon.2020.101892
13. Ghorbani V, Zanjani Z, Omidi A, Sarvzadeh M. Efficacy of Acceptance and Commitment Therapy (ACT) on depression, pain acceptance, and psychological flexibility in married people with breast cancer. *Trends Psychiatry Psychother.* 2021;43(2).
doi: 10.47626/2237-6089-2020-0022
14. Ochoa-Arnedo C, Prats C, Travier N, *et al.* Stressful life events and distress in breast cancer: A 5-years follow-up. *Int J Clin Health Psychol.* 2022;22(2):216972600.
doi: 10.1016/j.ijchp.2022.100303
15. Cerezo MV, Soria-Reyes LM, Pajares B, Gómez-Millán J, Blanca MJ. Development and psychometric properties of the Stressors in Breast Cancer Scale. *Front Psychol.* 2023;14:1102169.
doi: 10.3389/fpsyg.2023.1102169
16. Hu W, Bao J, Yang X, Ye M. Psychometric evaluation of the Chinese version of the stressors in breast cancer scale: A translation and validation study. *BMC Public Health.*

- 2024;24:425.
doi: 10.1186/s12889-024-18000-3
17. Zhang X, Lu J, Ding Z, *et al.* Psychological resilience and post-traumatic stress disorder as chain mediators between personality traits and cognitive functioning in patients with breast cancer. *BMC Psychiatry*. 2024;24:750.
doi: 10.1186/s12888-024-06219-8
18. Pearlin LI, Bierman A. Current issues and future directions in research into the stress process. In: Aneshensel CS, Phelan JC, Bierman A, eds. *Handbook of the Sociology of Mental Health*. 2nd ed. Dordrecht, Netherlands: Springer Science+Business Media; 2013:325-340.
doi: 10.1007/978-94-007-4276-5_16
19. Paek MS, Lim JW. Understanding the stress process of Chinese- and Korean-American breast cancer survivors. *J Immigr Minor Health*. 2016;18:1159-1167.
doi: 10.1007/s10903-015-0255-4
20. Esmaili S, Nikoogoftar M, Yaghoobi S, Nazari R. The mediating role of coping strategies and resilience in the relationship between stressful life events and positive and negative emotions in women with breast cancer. *Health Psychol*. 2024;13(51):21-36.
doi: 10.30473/hpj.2024.68222.5834
21. Peterson C, Seligman MEP. *Character Strengths and Virtues: A Handbook and Classification*. New York, NY: Oxford University Press; 2004. Accessed January 21, 2026. <https://psycnet.apa.org/record/2004-13277-000>.
22. Peterson C. *A Primer in Positive Psychology*. New York, NY: Oxford University Press; 2004. Accessed January 21, 2026. <https://psycnet.apa.org/record/2006-09689-000>.
23. Karris Bachik MA, Carey G, Craighead WE. VIA character strengths among U.S. college students and their associations with happiness, well-being, resiliency, academic success and psychopathology. *J Posit Psychol*. 2021;16(4):512-525.
doi: 10.1080/17439760.2020.1752785
24. Soria-Reyes LM, Cerezo MV, Molina P, Blanca MJ. Life satisfaction and character strengths in women with breast cancer: Zest and hope as predictors. *Integr Cancer Ther*. 2023;22:15347354231197648.
doi: 10.1177/15347354231197648
25. Azañedo CM, Fernández-Abascal EG, Barraca J. Character strengths in Spain: Validation of the Values in Action Inventory of Strengths (VIA-IS) in a Spanish sample. *Clin Salud*. 2014;25(2):123-130.
doi: 10.1016/j.clysa.2014.06.002
26. Lovibond SH, Lovibond PF. *Manual for the Depression Anxiety Stress Scales*. 2nd ed. Sydney, Australia: Psychology Foundation of Australia; 1995.
27. Daza P, Novy DM, Stanley MA, Averill P. The Depression Anxiety Stress Scale-21: Spanish translation and validation with a Hispanic sample. *J Psychopathol Behav Assess*. 2002;24:195-205.
doi: 10.1023/A:1016014818163
28. Gignac GE, Szodorai ET. Effect size guidelines for individual differences researchers. *Pers Individ Dif*. 2016;102:74-78.
doi: 10.1016/j.paid.2016.06.069
29. Hayes AE. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. 3rd ed. New York, NY: The Guilford Press; 2022.
30. Cho HC, Abe S. Is two-tailed testing for directional research hypotheses tests legitimate? *J Bus Res*. 2013;66(9):1261-1266.
doi: 10.1016/j.jbusres.2012.02.023
31. Li H, Wu J, Ni Q, Zhang J, Wang Y, He G. Systematic review and meta-analysis of effectiveness of acceptance and commitment therapy in patients with breast cancer. *Nurs Res*. 2021;70(4):E152-E160.
doi: 10.1097/nnr.0000000000000499
32. Okati-Aliabad H, Ansari-Moghadam A, Mohammadi M, Kargar S, Shahraki-Sanavi F. The prevalence of anxiety and depression and its association with coping strategies, supportive care needs, and social support among women with breast cancer. *Support Care Cancer*. 2022;30(1):703-710.
doi: 10.1007/s00520-021-06477-2
33. Tomczyk J, Krejtz I, Kornacka M, Nezlek JB. A grateful disposition promotes the well-being of women with breast cancer through adaptive coping. *Int J Womens Health*. 2021;13:579-590.
doi: 10.2147/IJWH.S294216
34. Tomczyk J, Nezlek JB, Krejtz I. Gratitude can help women at-risk for depression accept their depressive symptoms, which leads to improved mental health. *Front Psychol*. 2022;13:878819.
doi: 10.3389/fpsyg.2022.878819
35. Yang Y, Lin Y, Sikapokoo GO, *et al.* Social relationships and their associations with affective symptoms of women with breast cancer: A scoping review. *PLoS One*. 2022;17(8):e0272649.
doi: 10.1371/journal.pone.0272649
36. Cáceres MC, Nadal-Delgado M, López-Jurado C, Pérez-Civantos D, Guerrero-Martín J, Durán-Gómez N. Factors related to anxiety, depressive symptoms and quality of life in breast cancer. *Int J Environ Res Public Health*. 2022;19(6):3547.
doi: 10.3390/ijerph19063547

37. Naser AY, Hameed AN, Mustafa N, *et al.* Depression and anxiety in patients with cancer: A cross-sectional study. *Front Psychol.* 2021;12:585534.
doi: 10.3389/fpsyg.2021.585534
38. Reangsing C, Punsuwun S, Keller K. Effects of mindfulness-based interventions on depression in patients with breast cancer: A systematic review and meta-analysis. *Integr Cancer Ther.* 2023;22.
doi: 10.1177/15347354231220617
39. Petrigna L, Zanghi M, Maugeri G, D'Agata V, Musumeci G. Methodological consideration for a physical activity intervention in breast cancer population: An umbrella review. *Heliyon.* 2023;9(7):e17470.
doi: 10.1016/j.heliyon.2023.e17470
40. Salam A, Woodman A, Chu A, *et al.* Effect of post-diagnosis exercise on depression symptoms, physical functioning and mortality in breast cancer survivors: A systematic review and meta-analysis of randomized control trials. *Cancer Epidemiol.* 2022;77:102111.
doi: 10.1016/j.canep.2022.102111
41. Arefian M, Asgari-Mobarakeh K. Psychoeducational intervention for pain, psychological distress, hope, and post-traumatic growth among breast cancer patients during chemotherapy: A pilot randomized controlled trial. *Pain Manag Nurs.* 2024;25(5):e355-e366.
doi: 10.1016/j.pmn.2024.04.012
42. Feldman DB, Corn BW. Hope and cancer. *Curr Opin Psychol.* 2023;49:101506.
doi: 10.1016/j.copsyc.2022.101506