

The Relationship Between Sense of Coherence and Post-Traumatic Growth in Breast Cancer Survivors: The Mediating Roles of Stress-Related Benefit Finding and Positive Changes in Attitudes Toward Life

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ABSTRACT

Objective: This study aimed to investigate the relationship between sense of coherence and post-traumatic growth in breast cancer survivors, with stress-related benefit finding and positive changes in attitudes toward life as mediating variables.

Methods and Materials: This descriptive-correlational study employed structural equation modeling. The statistical population consisted of breast cancer survivors in Mashhad, Iran, from whom 400 participants were selected using convenience sampling. Data were collected using Antonovsky's 29-item Sense of Coherence Questionnaire (1987), Tedeschi and Calhoun's 21-item Post-Traumatic Growth Inventory (1996), Park's 17-item Stress-Related Benefit-Finding Questionnaire (1998), and Wallace and Wright's 24-item Attitude Toward Life Questionnaire (2005). Data were analyzed using SPSS for preliminary statistical analyses and AMOS version 24 for testing the measurement and structural models. Direct and indirect relationships among the study variables were examined, and bootstrap analysis was used to assess the significance of the mediating effects.

Findings: Structural equation modeling indicated that sense of coherence had a positive and statistically significant direct relationship with post-traumatic growth. Stress-related benefit finding significantly mediated the relationship between sense of coherence and post-traumatic growth. Positive changes in attitudes toward life also demonstrated a statistically significant independent mediating effect in this relationship. Furthermore, bootstrap analysis confirmed that the simultaneous indirect effect of stress-related benefit finding and positive changes in attitudes toward life on the association between sense of coherence and post-traumatic growth was statistically significant. The final structural model also demonstrated an acceptable overall fit, supporting the hypothesized relationships among the study variables.

Conclusion: Sense of coherence appears to facilitate post-traumatic growth among breast cancer survivors both directly and through adaptive psychological processes involving benefit finding and positive reconstruction of attitudes toward life.

Keywords: Sense of Coherence; Post-Traumatic Growth; Benefit Finding; Attitude Toward Life; Breast Cancer Survivors

1. Introduction

Breast cancer is one of the most consequential health challenges affecting women worldwide, not only because of its physical burden but also because of the profound psychological, interpersonal, existential, and social consequences that can persist long after the completion of medical treatment. Advances in screening, diagnosis, surgery, chemotherapy, radiotherapy, hormonal treatment, and targeted therapies have contributed to improved survival; however, surviving breast cancer does not necessarily signify a complete return to the psychological state that preceded diagnosis. For many survivors, the period following treatment is characterized by persistent uncertainty, fear of recurrence, altered body image, concerns regarding femininity and sexuality, changes in family and occupational roles, financial pressures, and heightened awareness of mortality. At the same time, adequate knowledge, health awareness, and access to timely care remain important determinants of how individuals experience cancer across the continuum from diagnosis to survivorship, particularly in contexts where awareness and early detection practices may vary substantially (Ullah et al., 2021). Thus, cancer survivorship should be understood as a multidimensional adjustment process in which the individual must reconstruct a sense of safety, identity, meaning, and continuity after an experience that may fundamentally disrupt assumptions about the self and the future. Research on cancer has therefore increasingly shifted from a narrow emphasis on symptom reduction toward a broader concern with psychological adaptation, resilience, meaning reconstruction, and positive transformation following adversity.

Among the psychological constructs relevant to adaptation after serious illness, sense of coherence has received particular attention because it represents a relatively stable yet modifiable orientation toward life that influences how individuals perceive, interpret, and manage stressful experiences. The concept, originally rooted in the salutogenic model, reflects the extent to which individuals view internal and external stimuli as comprehensible, manageable, and meaningful. Comprehensibility refers to the perception that life events are structured, predictable, and cognitively understandable; manageability refers to the belief that adequate internal or external resources are available to meet demands; and meaningfulness concerns the extent to which life challenges are perceived as worthy of

engagement and investment. In the context of cancer, a strong sense of coherence may help survivors organize the threatening and often unpredictable experience of illness into a more coherent narrative, maintain confidence in their coping resources, and preserve or reconstruct a sense of purpose. Empirical findings have linked sense of coherence with resilience, optimism, lower psychological vulnerability, and more adaptive adjustment among individuals with cancer (Hinz et al., 2023). Similarly, evidence suggests that self-efficacy and sense of coherence can reduce cancer-related death anxiety by strengthening perceived control, predictability, and confidence in coping capacities (Lee et al., 2023). Studies comparing clinical and healthy populations have further shown that psychological coherence may differ meaningfully among patients with cancer, those with psychosomatic disorders, and healthy individuals, suggesting that coherence constitutes an important marker of psychological adaptation under conditions of illness and chronic stress (Shabani et al., 2025).

The importance of sense of coherence extends beyond emotional adaptation to broader patterns of stress regulation and health behavior. Individuals with stronger coherence are more likely to interpret stressful circumstances as manageable challenges rather than overwhelming threats, to identify available resources, and to maintain behavior that supports physical and psychological health. Structural modeling evidence outside oncology has indicated that promoting sense of coherence may reduce occupational and family stress and contribute to healthier behavioral patterns, underscoring its role as a central psychological resource in complex stress systems (Moon & Seo, 2024). Within oncology, the relationship between treatment-related symptoms and sense of coherence appears to be embedded in a wider network of psychosocial factors, including social support and hope. For example, cancer patients undergoing chemotherapy may experience a diminished sense of coherence in response to treatment-related symptoms, whereas social support and hope can function as important mediating resources that preserve adaptive functioning (Wang et al., 2024). This suggests that sense of coherence should not be conceptualized in isolation; rather, it may exert its effects through cognitive and emotional mechanisms that alter how stressful experiences are interpreted and incorporated into the individual's life narrative. Even in other domains of intimate and relational functioning, sense of coherence has shown discriminatory value in distinguishing individuals with different attitudinal and

behavioral patterns, supporting the broader relevance of this construct as an organizing psychological resource (Safari et al., 2025). For breast cancer survivors specifically, a strong sense of coherence may therefore provide the cognitive-emotional foundation necessary for converting traumatic experience into adaptation and growth.

One of the most important positive psychological outcomes following severe adversity is post-traumatic growth. Post-traumatic growth refers to positive psychological change that emerges through the struggle with highly challenging life circumstances rather than merely reflecting a return to baseline functioning. It may be expressed through enhanced appreciation of life, deeper interpersonal relationships, recognition of new possibilities, increased personal strength, and spiritual or existential change. Recent conceptual analyses have emphasized that post-traumatic growth among cancer patients is a multidimensional process shaped by the interaction of cognitive processing, emotional regulation, interpersonal support, meaning reconstruction, and changes in self-perception (Wenji et al., 2026). In this perspective, traumatic disruption does not automatically produce growth; rather, growth may arise when individuals engage with the implications of the event, revise previously held assumptions, integrate the experience into a coherent life narrative, and discover new values or priorities. This is especially relevant in breast cancer survivorship because the disease can challenge beliefs regarding bodily integrity, mortality, family continuity, personal identity, and future plans. Growth may therefore represent an adaptive reorganization of psychological functioning in which the individual derives new meaning from the illness and reconstructs a more resilient sense of self.

The growing literature on psychosocial intervention in cancer survivorship further supports the possibility that post-traumatic growth can be facilitated rather than viewed solely as a spontaneous outcome. Telemedicine-based psychosocial interventions have demonstrated potential benefits for fear of cancer recurrence, mindfulness, and post-traumatic growth among cancer survivors, indicating that structured psychological support can influence the process through which survivors respond to and interpret their experiences (Su et al., 2026). Similarly, interventions based on life coaching have shown promise for enhancing post-traumatic growth and well-being among breast cancer survivors, suggesting that guided reflection on goals, values, strengths, and future-oriented action can foster positive psychological change after treatment (Tock et al., 2025).

Online peer-support interventions have also been investigated as components of survivorship care, with evidence indicating that interpersonal exchange, normalization of experience, and reciprocal emotional support may reduce anxiety and support post-traumatic growth among breast cancer survivors (Ruiz-Romeo et al., 2026). Collectively, these findings support a process-oriented perspective in which post-traumatic growth is influenced by modifiable psychological and social mechanisms. Accordingly, identifying the variables through which internal resources such as sense of coherence are transformed into post-traumatic growth has both theoretical and clinical significance.

A central mechanism that may explain this relationship is stress-related benefit finding. Benefit finding refers to the perception of positive changes, gains, or meaningful outcomes arising from a stressful or traumatic experience. It does not deny the distress or harm associated with the event; rather, it reflects a cognitive reappraisal process in which individuals identify opportunities for learning, personal development, relational strengthening, altered priorities, or deeper appreciation of life. In the aftermath of cancer, benefit finding may involve recognizing increased emotional strength, improved family relationships, greater appreciation of ordinary experiences, changed priorities, enhanced spirituality, or a clearer sense of personal values. From a cognitive perspective, benefit finding may function as a bridge between the disruptive experience of illness and the reconstruction of a coherent worldview. Survivors with a stronger sense of coherence may be more likely to perceive the cancer experience as understandable and manageable and may therefore be better positioned to identify positive meanings within it. This process is theoretically consistent with the notion that individuals who can organize stressful events into a coherent cognitive structure are more capable of transforming distressing experiences into psychologically meaningful narratives. The possible mediating role of benefit finding is therefore especially important because it provides an explanatory pathway through which a general orientation toward coherence may translate into observable post-traumatic growth.

The reconstruction of meaning after cancer is also closely related to attitudes toward life. A serious illness can profoundly alter beliefs concerning mortality, purpose, relationships, priorities, and the value of future experiences. For some individuals, this confrontation may intensify hopelessness, death anxiety, and existential distress; for others, it may stimulate a more deliberate reassessment of

what makes life meaningful. Qualitative research among patients with advanced or terminal cancer has demonstrated that attitudes toward death and perceptions of life meaning become central components of the psychological experience of illness, revealing how individuals reorganize existential beliefs when confronted with mortality (Bakhsh Alizadeh Irani et al., 2021). In breast cancer patients, meaning-centered interventions have likewise been used to modify death-related attitudes and improve tolerance of distress, demonstrating that existential orientation is amenable to psychological intervention (Talebi et al., 2024). These findings suggest that a positive attitude toward life should not be reduced to simple optimism; rather, it may encompass renewed purpose, acceptance, future orientation, and an increased sense of value in everyday life.

Attitudes toward life may also be closely connected to resilience and psychological toughness in cancer populations. Evidence indicates that life attitudes and belief systems contribute to resilience-related outcomes, with emotion regulation acting as an important psychological mechanism in these relationships (Ghorbani et al., 2023). This is particularly relevant to breast cancer survivorship because the illness often necessitates long-term regulation of uncertainty, fear, bodily changes, and interpersonal stress. A positive life orientation may therefore help survivors sustain hope, engage in adaptive meaning making, and remain psychologically invested in the future. From a structural perspective, sense of coherence may facilitate positive attitudes toward life by strengthening the perception that life remains understandable, manageable, and worthwhile despite adversity. Benefit finding may further contribute to this process by converting the illness experience into evidence of personal growth, relational value, or existential insight. In this sense, positive attitudes toward life may represent both an outcome of successful cognitive adaptation and a mechanism through which benefit finding contributes to post-traumatic growth.

The interrelationships among sense of coherence, benefit finding, life attitudes, and post-traumatic growth suggest that breast cancer survivorship may involve a sequential psychological process rather than a set of independent associations. Sense of coherence may operate as a foundational psychological resource that organizes the individual's response to illness; benefit finding may represent an adaptive cognitive appraisal through which positive meaning is extracted from the stressful experience; positive changes in attitude toward life may reflect a broader reconstruction of values, hope, and future orientation; and

post-traumatic growth may emerge as the cumulative positive transformation resulting from these processes. Existing studies have provided important evidence concerning each of these constructs separately, yet fewer investigations have examined how they may function simultaneously within a single explanatory model. This gap is particularly important because simple bivariate associations cannot adequately clarify whether sense of coherence directly predicts post-traumatic growth, whether its effects occur through benefit finding and altered life attitudes, or whether these mediators operate sequentially. A structural equation modeling framework is therefore particularly appropriate for testing both direct and indirect pathways among these variables.

Clarifying these mechanisms also has practical implications for psychosocial oncology. If sense of coherence contributes to post-traumatic growth partly by increasing benefit finding and promoting more positive attitudes toward life, interventions could be designed to target these specific processes. Psychoeducational, meaning-centered, peer-support, coaching, mindfulness-based, and telehealth interventions may be strengthened by explicitly addressing the survivor's ability to understand the cancer experience, recognize available coping resources, identify positive meaning without minimizing suffering, and reconstruct personally meaningful goals for the future. Such an approach would move clinical care beyond the exclusive treatment of distress toward the cultivation of adaptive resources that promote long-term psychological recovery. This is consistent with the broader direction of survivorship research, which increasingly recognizes that effective psychosocial care should address not only anxiety, depression, and fear of recurrence but also meaning, hope, coherence, social connectedness, and possibilities for psychological growth (Ruiz-Romeo et al., 2026; Su et al., 2026; Tock et al., 2025). A better understanding of the structural pathways among these constructs may therefore contribute to more precise psychological assessment and more mechanism-focused intervention planning for breast cancer survivors.

Accordingly, the present study aimed to examine the relationship between sense of coherence and post-traumatic growth among breast cancer survivors, with stress-related benefit finding and positive changes in attitudes toward life as mediating variables.

2. Methods and Materials

2.1. Study design and Participant

The present study employed a descriptive-correlational design using an analytical approach based on structural equation modeling (SEM). The purpose of this approach was to examine the pattern of causal relationships among sense of coherence, post-traumatic growth, stress-related benefit finding, and positive changes in attitudes toward life among individuals who had recovered from breast cancer. In this design, data were collected using standardized questionnaires and subsequently analyzed through correlation analysis, path analysis, and mediation-effect testing. This type of design enables the researcher to move beyond the examination of simple associations and to model latent psychological constructs as well as causal and mediating relationships.

The statistical population consisted of all individuals who had recovered from breast cancer and attended the Imam Reza Comprehensive Treatment Center in Mashhad between September 2025 and March 2026. Given the nature of structural equation modeling, the sample size was theoretically determined according to the criterion of a minimum of 10–15 participants per model parameter; accordingly, a sample size of approximately 400 participants was estimated. Participants were selected through convenience and voluntary sampling from among recovered individuals who had been at least three months beyond the active phase of breast cancer. The inclusion criteria were age over 18 years, complete physical recovery, and provision of informed consent to participate in the study. The exclusion criteria included the presence of a severe psychiatric disorder or a cognitive impairment diagnosed by a specialist. To reduce sampling bias, efforts were made to achieve a balanced distribution in terms of sex, age, and educational level in order to enhance the generalizability of the findings.

2.2. Measures

The Sense of Coherence Questionnaire was developed by Aaron Antonovsky in 1987 to assess the degree of psychological coherence experienced by individuals when confronting stressful events. The instrument consists of 29 items, each scored on a 7-point Likert scale. Item scores range from 1 to 7, with a score of 1 representing the lowest and a score of 7 representing the highest level of sense of coherence. The questionnaire comprises three dimensions: comprehensibility, consisting of 11 items; manageability,

consisting of 10 items; and meaningfulness, consisting of 8 items. The total score is calculated by summing the item scores and ranges from 29 to 203. Scores ranging from 29 to 87 indicate a weak sense of coherence, difficulty in predicting and controlling circumstances, and high psychological vulnerability. Scores ranging from 88 to 145 indicate a moderate sense of coherence, relative adjustment, and limited ability to attribute meaning to life stressors. Scores ranging from 146 to 203 indicate a strong sense of coherence, high cognitive and emotional integration, and an effective capacity to manage severe stress. The construct and convergent validity of this instrument have been confirmed in various studies, and its reliability, as assessed by Cronbach's alpha, has been reported to range from .78 to .91 in international studies and approximately .85 in domestic studies.

The Post-Traumatic Growth Inventory was developed by Richard Tedeschi and Lawrence Calhoun in 1996 to assess positive psychological changes following exposure to traumatic events. The questionnaire consists of 21 items, each scored on a 6-point Likert scale ranging from 0 to 5. Item scores range from 0, indicating no experience of change, to 5, indicating a very great degree of change. The instrument comprises five dimensions: relating to others, with 7 items; personal strength, with 4 items; appreciation of life, with 3 items; new possibilities, with 5 items; and spiritual change, with 2 items. Total scores range from 0 to 105. Scores from 0 to 35 indicate an absence or minimal level of post-traumatic growth and the predominance of negative consequences of the traumatic experience. Scores from 36 to 70 indicate a moderate level of growth, partial reconstruction of meaning, and the beginning of positive changes in the individual's attitudes. Scores from 71 to 105 indicate a high level of post-traumatic growth, profound cognitive and emotional transformation, and a redefinition of life values and goals. The convergent validity of the questionnaire has been supported through associations with indicators such as psychological well-being and meaning in life, and its reliability based on Cronbach's alpha has been reported to range from .89 to .93 in international studies and approximately .90 in domestic research.

The Stress-Related Benefit-Finding Questionnaire was developed by Crystal Park in 1998 to assess the extent to which individuals perceive positive consequences resulting from stressful experiences. The questionnaire consists of 17 items, each rated on a 5-point Likert scale. Item scores range from 1 to 5, with 1 indicating the lowest and 5 indicating the highest level of stress-related benefit finding. The instrument

comprises three components: meaning finding, with 6 items; personal growth, with 6 items; and acceptance and adaptation, with 5 items. Total scores range from 17 to 85. Scores from 17 to 39 indicate difficulty in deriving positive aspects from stressful experiences and a predominant focus on the threatening aspects of the event. Scores from 40 to 62 indicate a moderate level of benefit finding and a relative capacity for cognitive reconstruction of stressful experiences. Scores from 63 to 85 indicate a high level of benefit finding, active meaning seeking, and constructive use of stress for psychological growth. The construct validity of this instrument has been confirmed through factor analysis and correlations with variables such as resilience and hope, and its reliability based on Cronbach's alpha has been reported to range from .82 to .88 in international studies and approximately .83 in domestic research.

The Attitude Toward Life Questionnaire was developed by Wallace and Wright in 2005 to assess individuals' attitudes toward the meaning, purpose, and value of life. The instrument consists of 24 items, each scored on a 5-point Likert scale. Item scores range from 1 to 5, with 1 indicating a highly negative attitude and 5 indicating a highly positive attitude toward life. The questionnaire comprises four components—meaning in life, purposefulness, acceptance of life, and positive attitude toward the future—each consisting of 6 items. Total scores range from 24 to 120. Scores from 24 to 56 indicate a negative attitude, value confusion, and lack of meaningful orientation in life. Scores from 57 to 88 indicate a moderate attitude, relative stability of values, and limited hope for the future. Scores from 89 to 120 indicate a strongly positive attitude, high value coherence, and a clear sense of meaning, purpose, and hope in life. The convergent validity of this questionnaire has been supported through correlations with life satisfaction and meaning in life, and its reliability based on Cronbach's alpha

has been reported to range from .85 to .91 in international studies and approximately .87 in domestic studies.

2.3. Data Analysis

Data were analyzed using SPSS for descriptive statistics and AMOS version 24 for testing the measurement and structural models.

3. Findings and Results

The results of the descriptive indices indicated that the mean scores of sense of coherence and each of its three subscales were relatively above the theoretical midpoint, suggesting that participants had an adequate perception of the comprehensibility of their circumstances, an ability to manage stressful situations, and a sense of meaning in life following recovery from the disease. The standard deviations for this variable and its subscales indicated moderate variability, reflecting expected individual differences in the experience of sense of coherence. Regarding post-traumatic growth, the total mean score and subscale means indicated a considerable level of positive psychological change across different dimensions, particularly interpersonal relationships and personal strength. In addition, the mean scores for stress-related benefit finding and its subscales suggested that a substantial proportion of participants had been able to derive positive consequences from the stressful experience of the disease. Finally, the findings concerning attitude toward life indicated that positive attitudes and hope for the future were at favorable levels in the study sample. The skewness and kurtosis values for all variables and subscales fell within acceptable ranges, indicating approximately normal distributions and satisfying the assumptions required for subsequent correlation analyses and structural equation modeling.

Table 1

Descriptive Findings for the Study Variables

Variable / Subscale	Number of Items	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Sense of Coherence (Total)	29	58	174	121.50	18.32	-0.40	-0.38
Comprehensibility	11	22	66	46.12	7.41	-0.40	-0.44
Manageability	10	20	60	41.08	6.95	-0.50	-0.31
Meaningfulness	8	16	48	34.26	5.88	-0.30	-0.52
Post-Traumatic Growth (Total)	21	26	105	71.84	14.27	-0.30	-0.41
Relating to Others	7	8	35	24.36	5.12	-0.50	-0.28
New Possibilities	5	5	25	17.02	4.21	-0.20	-0.47
Personal Strength	4	4	20	14.38	3.68	-0.40	-0.36
Spiritual Change	3	3	15	9.64	2.84	-0.20	-0.55

Appreciation of Life	2	2	10	6.44	1.92	-0.30	-0.48
Stress-Related Benefit Finding (Total)	17	22	85	59.21	11.36	-0.40	-0.34
Personal Growth	6	6	30	21.08	4.52	-0.40	-0.29
Strengthening Relationships	5	5	25	17.26	3.98	-0.30	-0.46
Change in Attitude	6	6	30	20.87	4.11	-0.30	-0.39
Attitude Toward Life (Total)	20	40	100	72.58	12.14	-0.30	-0.42
Positive Attitude	10	20	50	36.92	6.48	-0.40	-0.37
Hope for the Future	10	20	50	35.66	6.02	-0.30	-0.49

The correlation matrix of the study variables, together with all subscales, based on Pearson's correlation coefficient is presented below.

Table 2

Correlation Matrix of the Study Variables and Subscales

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1													
2	.82**	1												
3	.85**	.71**	1											
4	.79**	.64**	.68**	1										
5	.58**	.49**	.54**	.56**	1									
6	.55**	.46**	.51**	.53**	.81**	1								
7	.47**	.42**	.45**	.48**	.78**	.62**	1							
8	.52**	.44**	.49**	.51**	.84**	.69**	.64**	1						
9	.61**	.53**	.57**	.59**	.63**	.58**	.55**	.61**	1					
10	.59**	.51**	.55**	.57**	.60**	.56**	.52**	.58**	.86**	1				
11	.57**	.49**	.53**	.55**	.58**	.52**	.51**	.56**	.83**	.71**	1			
12	.64**	.55**	.59**	.62**	.67**	.61**	.58**	.63**	.66**	.62**	.60**	1		
13	.60**	.52**	.56**	.58**	.64**	.58**	.61**	.60**	.63**	.59**	.57**	.82**	1	
14	.58**	.49**	.54**	.56**	.62**	.57**	.53**	.59**	.60**	.56**	.55**	.79**	.68**	1

1. Sense of Coherence (Total); 2. Comprehensibility; 3. Manageability; 4. Meaningfulness; 5. Stress-Related Benefit Finding (Total); 6. Personal Growth; 7. Strengthening Relationships; 8. Change in Attitude; 9. Attitude Toward Life (Total); 10. Positive Attitude; 11. Hope for the Future; 12. Post-Traumatic Growth (Total); 13. Relating to Others; 14. Personal Strength

The results of the correlation matrix indicate a positive and significant relationship between overall sense of coherence and post-traumatic growth, suggesting that higher levels of comprehensibility, manageability, and meaningfulness in life are associated with greater positive changes following trauma. In addition, the relatively high correlations between sense of coherence and stress-related benefit finding indicate that individuals with a more coherent framework for understanding and managing stressful events are more capable of deriving positive outcomes from the experience of illness.

Furthermore, attitude toward life showed positive and significant correlations with all three major study variables, indicating the important role of positive attitudes and hope for the future in facilitating benefit finding and post-traumatic growth. The strong correlations between the subscales and the total score of each construct also support the adequate internal consistency of the instruments. Overall, the pattern of correlations was consistent with the conceptual model of the study and provided the necessary basis for testing causal relationships and mediation effects within the structural equation modeling framework.

Table 3

Measurement Model Fit Indices

Fit Index	Obtained Value	Acceptable Value	Fit Status
χ^2/df	2.18	< 3	Acceptable
GFI	.92	> .90	Acceptable
AGFI	.89	> .90	Acceptable
CFI	.94	> .90	Acceptable

NFI	.91	> .90	Acceptable
IFI	.94	> .90	Acceptable
TLI	.93	> .90	Acceptable
RMSEA	.054	< .08	Acceptable
SRMR	.048	< .08	Acceptable
PNFI	.76	> .50	Acceptable

As shown in Table 3, all measurement-model fit indices were within acceptable ranges. The χ^2/df ratio was 2.18, which is below 3 and therefore indicates an acceptable fit of the model to the data. The absolute and comparative fit

indices were generally above .90, indicating good model fit. In addition, the RMSEA value was .054, which is below .08 and indicates an acceptable approximation error.

Table 4

Standardized Factor Loadings of Observed Variables on Latent Variables

Latent Variable	Observed Variable	Factor Loading	Standard Error	Critical Ratio	<i>p</i>
Sense of Coherence	Comprehensibility	.84	.042	19.86	.001
	Manageability	.81	.045	18.24	.001
	Meaningfulness	.78	.048	16.92	.001
Post-Traumatic Growth	Relating to Others	.79	.046	17.38	.001
	New Possibilities	.82	.043	18.74	.001
	Personal Strength	.76	.049	15.86	.001
	Spiritual Change	.73	.052	14.62	.001
	Appreciation of Life	.68	.056	12.84	.001
Stress-Related Benefit Finding	Personal Growth	.86	.039	21.18	.001
	Strengthening Relationships	.83	.042	19.46	.001
	Change in Attitude	.80	.044	18.12	.001
Positive Attitude Toward Life	Positive Attitude	.88	.037	22.64	.001
	Hope for the Future	.85	.040	20.82	.001

According to Table 4, all standardized factor loadings were above .60, indicating adequate convergent validity of the measurement model. In addition, all critical ratios

exceeded 1.96 and were significant at the .001 level, demonstrating that all factor loadings were statistically significant.

Table 5

Direct Path Coefficients in the Structural Model

Path	Standardized Coefficient	Unstandardized Coefficient	Standard Error	Critical Ratio	<i>p</i>	Result
Sense of Coherence → Stress-Related Benefit Finding	.62	.384	.048	8.02	.001	Supported
Sense of Coherence → Positive Attitude Toward Life	.34	.226	.052	4.35	.001	Supported
Stress-Related Benefit Finding → Positive Attitude Toward Life	.48	.514	.056	9.18	.001	Supported
Sense of Coherence → Post-Traumatic Growth	.24	.186	.058	3.21	.001	Supported
Stress-Related Benefit Finding → Post-Traumatic Growth	.38	.478	.062	7.71	.001	Supported
Positive Attitude Toward Life → Post-Traumatic Growth	.41	.482	.059	8.17	.001	Supported

The results presented in Table 5 indicate that all direct paths in the structural model were statistically significant at the .001 level. Sense of coherence had a positive and significant effect on stress-related benefit finding, indicating that individuals with a stronger sense of coherence have a

greater capacity to derive positive meaning and benefits from stressful circumstances.

Sense of coherence also had a positive and significant effect on positive attitudes toward life, indicating that greater psychological coherence is associated with a more optimistic

attitude toward life. Moreover, stress-related benefit finding had a strong positive effect on positive attitudes toward life, suggesting that recognizing potential benefits embedded in difficult circumstances can significantly improve individuals' attitudes toward life.

Sense of coherence also had a significant direct effect on post-traumatic growth, demonstrating the direct role of this construct in facilitating psychological growth following the

experience of breast cancer. Furthermore, both stress-related benefit finding and positive attitudes toward life had positive and significant effects on post-traumatic growth. These findings indicate that both positive cognitive processing of stressful experiences and a positive attitude toward life are important predictors of post-traumatic growth among breast cancer survivors.

Table 6

Direct, Indirect, and Total Effects in the Structural Model

Path	Direct Effect	Indirect Effect	Total Effect	Type of Effect
Sense of Coherence → Post-Traumatic Growth	.24**	.47**	.71**	Partial
Sense of Coherence → Stress-Related Benefit Finding → Post-Traumatic Growth	—	.24**	—	Mediation
Sense of Coherence → Positive Attitude Toward Life → Post-Traumatic Growth	—	.14**	—	Mediation
Sense of Coherence → Benefit Finding → Positive Attitude → Post-Traumatic Growth	—	.09**	—	Serial Mediation
Stress-Related Benefit Finding → Post-Traumatic Growth	.38**	.20**	.58**	Partial
Benefit Finding → Positive Attitude Toward Life → Post-Traumatic Growth	—	.20**	—	Mediation
Positive Attitude Toward Life → Post-Traumatic Growth	.41**	—	.41**	Full

The results presented in Table 6 indicate that sense of coherence had a positive and significant direct effect on post-traumatic growth (direct effect = .24). In addition, the indirect effect of sense of coherence on post-traumatic growth through the mediating variables of stress-related benefit finding and positive attitudes toward life was also significant (indirect effect = .47). Consequently, the total effect of sense of coherence on post-traumatic growth was .71, indicating the strong role of this construct in explaining post-traumatic growth. Because both the direct and indirect effects were simultaneously significant, the relationship between sense of coherence and post-traumatic growth was characterized by partial mediation.

The results also indicate that stress-related benefit finding affected post-traumatic growth indirectly through positive attitudes toward life (indirect effect = .20), while its direct effect remained significant (direct effect = .38). Therefore, positive attitude toward life played a partial mediating role in the relationship between stress-related benefit finding and post-traumatic growth. In contrast, positive attitude toward life affected post-traumatic growth only through its direct effect (total effect = .41), and no indirect effect was reported. Accordingly, this variable is interpreted in the model as a direct predictor of post-traumatic growth.

Table 7

Bootstrap Test of the Significance of Mediating Effects

Mediating Path	Indirect Effect	Standard Error	Lower Bound (95% CI)	Upper Bound (95% CI)	Result
Sense of Coherence → Benefit Finding → Post-Traumatic Growth	.236	.042	.158	.324	Significant
Sense of Coherence → Positive Attitude → Post-Traumatic Growth	.139	.038	.071	.219	Significant
Sense of Coherence → Benefit Finding → Positive Attitude → Post-Traumatic Growth	.088	.024	.045	.139	Significant
Benefit Finding → Positive Attitude → Post-Traumatic Growth	.197	.036	.131	.273	Significant

The bootstrap results presented in Table 7 indicate that all examined mediating pathways were statistically significant because the 95% confidence intervals for the indirect effects

did not include zero. The indirect effect of sense of coherence on post-traumatic growth through stress-related

benefit finding was significant, confirming the mediating role of stress-related benefit finding in this relationship.

The mediating pathway from sense of coherence to post-traumatic growth through positive attitudes toward life was also significant. Furthermore, the results confirmed the significance of the serial mediating pathway of sense of coherence → stress-related benefit finding → positive attitude toward life → post-traumatic growth. This finding indicates that sense of coherence contributes to post-

traumatic growth first by increasing stress-related benefit finding and subsequently by strengthening positive attitudes toward life.

Finally, the mediating role of positive attitudes toward life in the relationship between stress-related benefit finding and post-traumatic growth was also significant. Overall, the bootstrap findings support both single-stage and serial mediation by stress-related benefit finding and positive attitudes toward life within the structural model of the study.

Table 8

Comparison of Fit Indices for the Initial and Modified Models

Fit Index	Recommended Value	Initial Model	Modified Model	Improvement	Interpretation
Absolute Fit Indices					
χ^2	—	248.56	186.42	↓ 62.14	Significant improvement
df	—	87	84	↓ 3	—
χ^2/df	< 3	2.86	2.22	↓ .64	Improved
GFI	> .90	.88	.91	↑ .03	Reached acceptable level
AGFI	> .85	.84	.88	↑ .04	Reached acceptable level
RMSEA	< .08	.068	.055	↓ .013	Improved
SRMR	< .08	.062	.051	↓ .011	Improved
Comparative Fit Indices					
CFI	> .90	.89	.93	↑ .04	Reached acceptable level
NFI	> .90	.87	.90	↑ .03	Reached acceptable level
IFI	> .90	.89	.93	↑ .04	Reached acceptable level
TLI (NNFI)	> .90	.87	.92	↑ .05	Reached acceptable level
Parsimony Fit Indices					
PNFI	> .50	.72	.74	↑ .02	Acceptable
PCFI	> .50	.75	.78	↑ .03	Acceptable
Information Criteria					
AIC	Lower is better	324.56	268.42	↓ 56.14	Substantial improvement
BIC	Lower is better	398.73	335.28	↓ 63.45	Substantial improvement
CAIC	Lower is better	425.73	359.28	↓ 66.45	Substantial improvement
Overall Fit					
Hoelter .05	> 200	186	228	↑ 42	Reached acceptable level
Hoelter .01	> 200	198	243	↑ 45	Reached acceptable level

The results of Table 9 indicate that the modified model demonstrated a more adequate overall fit to the study data than the initial model. Examination of the absolute fit indices showed that, after theoretically justified modifications were applied, the discrepancy between the model and the observed data decreased and the overall correspondence between the conceptual structure and the empirical data improved. This suggests that the implemented modifications increased the accuracy of the model in representing the relationships among the study variables.

The comparative fit indices also showed that the modified model performed better than the initial model, indicating that, relative to the baseline model, it had a greater ability to account for and reproduce the covariance structure of the data. In other words, the modified model corresponded more

closely to the actual pattern of relationships among the variables and demonstrated greater explanatory efficiency.

In addition, the parsimony fit indices indicated that the modified model achieved satisfactory fit while maintaining relative simplicity and avoiding unnecessary complexity. This reflects an appropriate balance between model fit and economy in the number of estimated parameters.

The information criteria also indicated that the modified model was more efficient than the initial model and provided a more suitable structure for explaining the data with less information loss. Finally, the overall fit indices further demonstrated adequate sample sufficiency and explanatory power for the modified model, supporting its acceptance as the final model of the study.

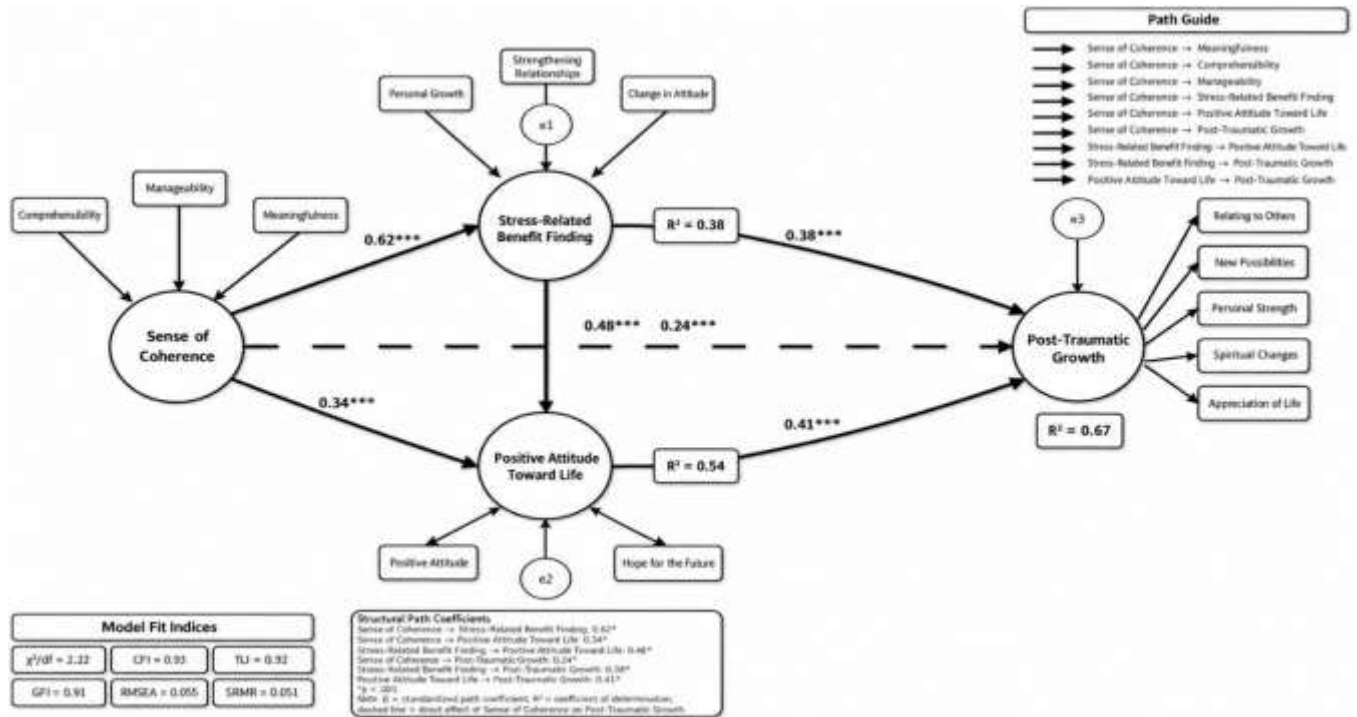
Overall, the results presented in this table indicate that the modifications substantially improved model fit and that the

modified model provides a more accurate and valid representation of the relationships among sense of

coherence, stress-related benefit finding, positive attitudes toward life, and post-traumatic growth.

Figure 1

Modified Structural Model of the Study



4. Discussion

The present study examined the relationship between sense of coherence and post-traumatic growth among breast cancer survivors, with stress-related benefit finding and positive changes in attitudes toward life considered as mediating mechanisms. The structural model showed that sense of coherence had a positive and significant direct effect on post-traumatic growth and also exerted significant indirect effects through stress-related benefit finding and positive attitudes toward life. In addition, stress-related benefit finding significantly predicted both positive attitudes toward life and post-traumatic growth, while positive attitudes toward life had a significant direct effect on post-traumatic growth. Bootstrap analysis further confirmed the significance of the specific indirect paths from sense of coherence to post-traumatic growth through stress-related benefit finding, through positive attitudes toward life, and through the serial pathway involving both mediators. The modified model demonstrated satisfactory fit indices and provided a stronger representation of the relationships among the variables than the initial model. Taken together,

these findings support a process-oriented account of psychological adaptation following breast cancer in which a coherent orientation toward life facilitates positive cognitive appraisal, enhances constructive attitudes toward life, and ultimately contributes to greater post-traumatic growth.

The first major finding was that sense of coherence had a direct positive and statistically significant effect on post-traumatic growth. This result suggests that breast cancer survivors who perceive life events as more comprehensible, manageable, and meaningful are more likely to report positive psychological transformation after their illness experience. This finding is theoretically plausible because cancer often disrupts assumptions about safety, predictability, bodily integrity, and the future, whereas sense of coherence provides an organizing framework that can help individuals cognitively structure such disruption. When illness is perceived as understandable rather than chaotic, when available personal and social resources are viewed as sufficient for coping, and when the struggle itself is seen as meaningful, survivors may be more capable of integrating the experience into a revised but coherent sense of self. The present finding is consistent with evidence showing that

sense of coherence is associated with resilience and habitual optimism in cancer patients, suggesting that it functions as an important psychological resource during illness and recovery (Hinz et al., 2023). It also aligns with findings indicating that sense of coherence and self-efficacy contribute to lower death anxiety among cancer patients, reinforcing the idea that coherence may support adaptive interpretation of existential threat (Lee et al., 2023). Similarly, differences in psychological coherence across cancer patients, individuals with psychosomatic disorders, and healthy groups further support the clinical significance of this construct in coping with disease-related adversity (Shabani et al., 2025).

The positive relationship between sense of coherence and post-traumatic growth can also be understood through the salutogenic perspective. A strong sense of coherence does not imply an absence of distress; rather, it reflects an individual's ability to organize and respond to stress in a way that preserves psychological functioning. In breast cancer survivors, this may translate into a greater capacity to reinterpret treatment, bodily changes, fear of recurrence, and uncertainty as difficult but manageable experiences rather than as evidence of irreversible psychological breakdown. The relevance of this interpretation is reinforced by research showing that sense of coherence can influence broader stress-related processes and health-related behavior. Structural modeling evidence has demonstrated that stronger coherence may buffer occupational and family stress and contribute to healthier behavioral patterns, suggesting that coherence functions as an organizing resource across multiple domains of adaptation (Moon & Seo, 2024). In patients undergoing chemotherapy, therapy-related symptoms have also been linked to sense of coherence through psychosocial resources such as hope and social support, indicating that coherence is embedded within a broader adaptive system rather than operating as an isolated personality characteristic (Wang et al., 2024). These findings help explain why sense of coherence remained a significant direct predictor of post-traumatic growth even after the mediating variables were included in the present model.

A second important finding was that stress-related benefit finding significantly mediated the relationship between sense of coherence and post-traumatic growth. This means that part of the effect of sense of coherence on growth can be explained by the tendency to identify positive meanings, gains, or personally valuable changes arising from the cancer experience. Survivors with higher coherence may be more likely to cognitively process their illness in a way that

reveals personal strengths, improved relationships, revised priorities, or a deeper appreciation of life. Such benefit finding can transform a threatening event into a psychologically meaningful experience without denying its negative aspects. The significant indirect pathway observed in the current study therefore suggests that coherence may create the cognitive conditions required for positive reappraisal, while benefit finding represents one of the mechanisms through which this internal resource is translated into growth. This interpretation is compatible with current conceptualizations of post-traumatic growth in cancer, which emphasize cognitive processing, meaning reconstruction, altered self-perception, and the integration of adversity into a revised life narrative (Wenji et al., 2026).

The importance of benefit finding is also consistent with intervention research suggesting that post-traumatic growth can be strengthened when survivors are supported in reflecting on values, coping resources, positive change, and future direction. Life-coaching interventions have been shown to promote post-traumatic growth and well-being among breast cancer survivors, likely in part because they encourage the identification of strengths, goals, and personally meaningful outcomes following illness (Tock et al., 2025). Telemedicine-based psychosocial interventions have likewise demonstrated beneficial effects on post-traumatic growth alongside reductions in fear of cancer recurrence and improvements in mindfulness, suggesting that structured cognitive and emotional processing can alter the survivor's interpretation of the cancer experience (Su et al., 2026). Online peer-support approaches may also create conditions in which survivors recognize shared experience, identify personal gains, and reconstruct meaning through interpersonal comparison and mutual validation (Ruiz-Romeo et al., 2026). These studies support the present finding that benefit finding is not merely an incidental correlate of growth but can function as a meaningful psychological pathway linking coherence to positive post-traumatic outcomes.

The study also found that sense of coherence significantly predicted positive attitudes toward life and that positive attitudes toward life significantly mediated the relationship between sense of coherence and post-traumatic growth. This result suggests that survivors with stronger coherence are more likely to maintain or reconstruct hopeful, purposeful, and value-consistent attitudes toward life, which in turn support positive transformation after cancer. The experience of breast cancer can intensify awareness of mortality and challenge previous assumptions regarding meaning, control,

and future plans. Under these circumstances, a coherent orientation may help individuals preserve a sense of direction and perceive life as worthwhile despite adversity. The resulting positive attitude toward life may then facilitate renewed investment in relationships, goals, and meaningful activities, all of which are closely related to post-traumatic growth. This interpretation is consistent with phenomenological evidence showing that meaning of life and attitudes toward death become central psychological concerns among individuals facing cancer and serious illness (Bakhsh Alizadeh Irani et al., 2021). It is also supported by evidence that meaning-centered interventions can improve death-related attitudes and distress tolerance among women with breast cancer, indicating that existential orientation is a modifiable component of psychological adjustment (Talebi et al., 2024).

The relationship between attitudes toward life and adaptive outcomes is further supported by research showing that life attitudes and belief systems contribute to resilience and psychological toughness in cancer patients, with emotional regulation playing an important mediating role (Ghorbani et al., 2023). From this perspective, positive attitudes toward life may represent more than generalized optimism; they may reflect a broader restructuring of values, future orientation, hope, acceptance, and perceived purpose. Such attitudes can provide a motivational basis for continued engagement with life after treatment and may therefore strengthen the survivor's capacity for post-traumatic growth. The present results also showed that positive attitudes toward life had one of the strongest direct effects on post-traumatic growth in the model, reinforcing the possibility that survivors who are able to reconstruct a hopeful and meaningful life orientation are more likely to report psychological gains after cancer.

Another important finding was that stress-related benefit finding had a significant positive effect on positive attitudes toward life and that the serial mediation pathway from sense of coherence to benefit finding, then to positive attitudes toward life, and finally to post-traumatic growth was statistically significant. This finding provides a more detailed explanation of how psychological adaptation may unfold over time. A survivor with a strong sense of coherence may first interpret the cancer experience in a more organized and manageable way. This orientation may facilitate the recognition of positive consequences or lessons derived from illness. Those perceived benefits may then reshape broader attitudes toward life, increasing appreciation, hope, purpose, and future orientation. These

changes may ultimately culminate in higher levels of post-traumatic growth. The serial pathway is theoretically consistent with models of growth that view positive transformation as the product of active cognitive reconstruction rather than as an immediate consequence of adversity (Wenji et al., 2026). It also corresponds with intervention evidence suggesting that psychological growth can be enhanced through structured processes that foster reflection, mindfulness, support, and future-oriented meaning construction (Su et al., 2026; Tock et al., 2025).

The finding that stress-related benefit finding also had a direct effect on post-traumatic growth, while retaining a significant indirect effect through positive attitudes toward life, indicates partial mediation. This suggests that benefit finding contributes to growth both directly and indirectly. Directly, identifying gains in personal strength, relationships, priorities, or self-understanding may itself constitute an important component of positive transformation. Indirectly, those perceived gains may alter the survivor's overall orientation toward life, leading to greater hope, purpose, and emotional engagement. This pattern is clinically meaningful because it implies that interventions need not focus exclusively on reducing negative symptoms. Helping survivors identify meaningful changes associated with the illness experience, while also supporting the reconstruction of positive life attitudes, may simultaneously strengthen multiple pathways leading to growth. The significant contribution of psychosocial support to post-traumatic growth observed in survivorship studies is compatible with this interpretation (Ruiz-Romeo et al., 2026).

The findings should also be interpreted in the broader context of breast cancer survivorship. Breast cancer remains a condition in which psychological outcomes are influenced not only by treatment and disease characteristics but also by awareness, social context, coping resources, and access to supportive care. Research on breast cancer awareness has demonstrated considerable variability in knowledge and related factors among women, emphasizing the importance of sociocultural and educational context in shaping responses to the disease (Ullah et al., 2021). Although awareness was not directly examined in the present study, such contextual factors may influence how survivors interpret diagnosis and recovery, the resources available to them, and their opportunity to develop coherent and growth-oriented responses. Similarly, psychosocial interventions that improve access to support, particularly through remote or peer-based formats, may be especially important for

sustaining adaptive processes during survivorship (Ruiz-Romeo et al., 2026; Su et al., 2026).

5. Conclusion

Overall, the final structural model supports a multidimensional explanation of post-traumatic growth in breast cancer survivors. Sense of coherence appears to function as a foundational adaptive resource, while stress-related benefit finding and positive attitudes toward life operate as intermediate cognitive and existential mechanisms. The significant direct and indirect paths indicate that growth is unlikely to result from a single psychological factor. Rather, it appears to emerge from an interconnected process involving cognitive organization of the illness, extraction of positive meaning, reconstruction of life orientation, and integration of these changes into a revised sense of self. The satisfactory fit of the modified model further suggests that these pathways provide a coherent representation of the observed data. This pattern is consistent with the growing emphasis in psychosocial oncology on resilience, meaning, coherence, mindfulness, supportive relationships, and positive psychological transformation as legitimate components of survivorship care (Hinz et al., 2023; Su et al., 2026; Wang et al., 2024). The results therefore extend previous findings by demonstrating that these constructs can be understood within a single mediational framework rather than only as separate correlates of adjustment.

6. Limitations and Suggestions

Several limitations should be considered when interpreting the findings. First, the cross-sectional correlational design does not permit definitive conclusions regarding temporal or causal relationships among sense of coherence, benefit finding, positive attitudes toward life, and post-traumatic growth, even though the structural model was theoretically specified. Second, convenience and voluntary sampling from a single treatment center may limit the generalizability of the findings to breast cancer survivors in other geographical, cultural, socioeconomic, or clinical contexts. Third, all variables were assessed using self-report instruments, which may have increased the risk of common-method variance, social desirability, and recall bias. Fourth, the study did not control for potentially influential clinical variables such as cancer stage, treatment modality, time since diagnosis, recurrence history, comorbid conditions, or ongoing medication. Finally, post-traumatic growth may

coexist with significant psychological distress, and the present study did not simultaneously model negative outcomes such as depression, anxiety, fear of recurrence, or post-traumatic stress symptoms.

Future studies should employ longitudinal designs to examine whether sense of coherence prospectively predicts changes in benefit finding, attitudes toward life, and post-traumatic growth across different stages of survivorship. Multicenter studies with probability-based or stratified sampling would strengthen external validity and allow comparison across cultural and clinical contexts. Future research could also examine alternative structural models, including moderated mediation, to determine whether variables such as social support, hope, emotion regulation, resilience, age, treatment type, disease stage, or time since recovery alter the strength of the identified pathways. Incorporating clinician-rated indicators, qualitative interviews, and behavioral measures alongside self-report instruments would also provide a more comprehensive assessment of adaptation. It would further be useful to examine whether the same mediational model applies to other cancer populations or to survivors of other life-threatening illnesses and traumatic medical experiences.

The findings support the development of psychosocial programs for breast cancer survivors that explicitly target sense of coherence, benefit finding, and positive attitudes toward life. Counseling and psychoeducational interventions can help survivors organize the illness experience into a comprehensible narrative, identify internal and external coping resources, and restore a sense of meaning and manageability. Therapeutic approaches may also incorporate structured exercises that facilitate recognition of personal gains, strengthened relationships, revised priorities, and new life goals without minimizing the suffering associated with cancer. Programs designed for survivorship clinics could integrate meaning-centered techniques, cognitive reappraisal, hope enhancement, goal setting, peer support, and future-oriented planning. Screening survivors for low coherence, difficulty identifying benefits, or persistent negative attitudes toward life may also help clinicians identify individuals who could benefit from more intensive psychological support aimed at facilitating adaptive recovery and post-traumatic growth.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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