

Factors Associated with Self-Management Behavior in Patients with Breast Cancer-Related Lymphedema

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Purpose: To construct and validate a structural equation model (SEM) examining the factors associated with self-management behavior in patients with breast cancer (BC)-related lymphedema (BCRL), and to explore the direct and indirect relationships through which illness perception, psychological coherence, and perceived social support relate to self-management behavior.

Patients and Methods: Patients with BCRL who attended or were hospitalized in the breast surgery department of our hospital from January 2023 to January 2026 were identified. Medical records and previously completed questionnaire data, including demographic information, the Lymphedema Self-Management Behavior Questionnaire (LSMBQ) for BC patients, the Brief Illness Perception Questionnaire (BIPQ), the Sense of Coherence Scale-13 (SOC-13), and the Perceived Social Support Scale (PSSS), were retrospectively extracted and analyzed.

Results: A total of 236 eligible participants were included. The mean total scores were: LSMBQ, 54.48 ± 10.80 (moderate level), BIPQ, 43.96 ± 7.61 ; SOC-13, 63.30 ± 9.34 ; and PSSS, 40.47 ± 6.83 . The SEM demonstrated good fit. Social support and psychological coherence showed significant positive direct associations with self-management behavior, whereas illness perception showed a significant negative direct association. Social support was also indirectly associated with self-management behavior through psychological coherence and illness perception.

Conclusion: Self-management behavior in patients with BCRL was at a moderate level. Social support, psychological coherence, and illness perception were important associated factors. Healthcare professionals should consider enhancing patients' social support and psychological coherence to facilitate better self-management.

Keywords: breast cancer, lymphedema, self-management behavior, structural equation modeling

Introduction

Breast cancer (BC) is the most common malignancy and a leading cause of cancer-related death among women worldwide.¹ With the widespread adoption of early screening and advances in multidisciplinary treatment, the 5-year survival rate for BC patients has improved markedly.² However, postoperative complications have become increasingly prominent, among which upper-extremity lymphedema is one of the most common and debilitating. The reported incidence of BC-related lymphedema (BCRL) ranges from 10% to 40%, and it can develop months to years after surgery, with chronic, progressive, and often irreversible features.^{3,4} Lymphedema not only causes swelling, pain, and restricted movement of the affected limb but also increases the risk of infections such as cellulitis, severely affecting physical function, psychological well-being, social participation, and overall quality of life.⁵

Self-management behavior refers to the strategies patients adopt to cope with chronic conditions, including symptom monitoring, treatment side-effect management, healthy lifestyle maintenance, and emotional regulation.⁶ For patients

with BCRL, effective self-management encompasses limb protection, promotion of lymphatic drainage, dietary and exercise management, emotional regulation, and disease-related information management. These behaviors are crucial for delaying lymphedema progression, preventing complications, and improving prognosis.⁷ Nevertheless, clinical observations indicate that self-management levels among BCRL patients are often suboptimal. Many patients have limited disease understanding and poor adherence, leading to recurrent or worsening edema and a vicious cycle.⁸ Therefore, identifying factors associated with self-management behavior in BCRL patients is essential for developing targeted interventions.

Illness perception refers to the beliefs and views individuals form about a disease through cognitive and emotional responses when facing a health threat.⁹ Leventhal's self-regulation theory suggests that illness perception directly influences coping strategies and disease management behaviors.¹⁰ According to this framework, how patients understand and evaluate their illness may affect their responses to health threats and, subsequently, their engagement in management behaviors. Hence, illness perception may be a key cognitive factor associated with self-management in chronic conditions such as BCRL.

Psychological coherence, a global, enduring, and dynamic sense of confidence in facing stressors, comprises three dimensions: comprehensibility, controllability, and meaningfulness. It serves as an important protective resource for mental health.¹¹ For patients managing long-term illness, a stronger sense of coherence may help them better understand their condition, perceive greater control over disease-related problems, and maintain motivation for sustained self-management.

Perceived social support reflects an individual's subjective perception and evaluation of support from others, and it is a significant environmental factor associated with coping styles and health behaviors.¹² Within the stress-and-coping framework, social support provides external resources that may alleviate disease-related stress, strengthen psychological resources, and facilitate adaptive coping. Thus, social support may be associated with self-management both directly and indirectly through psychological and cognitive relationships.

Previous research has shown that illness perception, psychological coherence, and social support are closely associated with self-management behaviors across various chronic diseases.^{13,14} More positive illness perceptions, stronger psychological resources, and higher perceived social support have generally been linked to better self-management in chronic illness populations.^{15,16} However, most existing studies have examined these psychosocial factors in isolation, and the potential relationships through which cognitive appraisal, internal psychological resources, and external social resources jointly contribute to self-management remain insufficiently understood. From the perspective of stress and coping theory, self-management behavior is not determined by a single factor but emerges from the interaction between how individuals interpret their illness, how they perceive their coping capacity, and what resources are available in their social environment. In this framework, illness perception represents cognitive appraisal, psychological coherence represents an internal coping resource, and perceived social support represents an external resource. Examining these dimensions within an integrated model may provide additional insight into the psychosocial relationships associated with self-management in BCRL patients.

Structural equation modeling (SEM) is a multivariate technique that analyzes covariance matrices to explore complex relationships among variables. It can simultaneously handle multiple dependent and independent variables, accommodate measurement errors, and estimate direct and indirect associations.¹⁷ Compared with traditional correlation or regression analyses, SEM can further clarify the potential relationships among multiple related factors and distinguish direct from indirect relationships within a theoretical framework. Therefore, SEM is well-suited for exploring how illness perception, psychological coherence, and perceived social support relate to self-management in BCRL. However, few studies have applied SEM to examine these relationships specifically in BCRL populations. Most prior work has focused on the bivariate associations between single variables and self-management, leaving the interconnected relationships involving cognitive, psychological, and social factors largely unexplored.

Based on this, the present study constructed an SEM incorporating the above variables within the stress-and-coping framework, aiming to examine the potential relationships through which cognitive factors, psychological resources, and social resources are associated with self-management behavior in patients with BCRL, and to inform the development of targeted nursing interventions.

Materials and Methods

Participants

Using a retrospective design, we identified patients with BCRL who attended or were hospitalized in the breast surgery department of our hospital between January 2023 and January 2026, through the hospital information system and existing follow-up databases. A total of 236 participants who met the criteria were included.

Inclusion criteria were: (1) postoperative patients clinically diagnosed with BCRL by a specialist physician or therapist according to the International Society of Lymphology criteria;¹⁸ (2) > 3 months after BC surgery; (3) aged ≥ 18 years; (4) had completed all study questionnaires during routine outpatient follow-up or hospitalization at the same assessment visit; and (5) had complete demographic and clinical data.

Exclusion criteria included: (1) recurrence, metastasis, or other malignancies; (2) active infection, deep vein thrombosis, severe arthritis, or other conditions affecting assessment or management of the affected limb; and (3) severe cardiac, pulmonary, hepatic, or renal dysfunction, cognitive impairment, or psychiatric disorders.

All questionnaire data included in this retrospective analysis had been collected prior to the initiation of the study. The questionnaires were administered by trained nurses using standardized instructions during routine clinical follow-up or hospitalization after BCRL diagnosis. Demographic and clinical information and completed questionnaire data were routinely recorded in the hospital database. No additional questionnaires were administered specifically for this study. For the present retrospective analysis, all eligible data were extracted from existing clinical records and anonymized before statistical analysis.

Sample Size Calculation

According to SEM sample size recommendations, 10–20 participants per observed indicator in the proposed measurement model are generally suggested. This study involved 15 observed indicators representing four latent constructs: three dimensions for illness perception, three for psychological coherence, three for perceived social support, and six for self-management behavior. Therefore, the minimum recommended sample size ranged from 150 to 300. The 236 eligible retrospective cases met this minimum requirement.

Research Instruments

General Information Form

All instruments had been administered during routine clinical follow-up or hospitalization after BCRL diagnosis. All questionnaires were completed during the same assessment session using standardized procedures by trained nurses. The completed questionnaires were stored in the hospital database before this retrospective study. For the present study, questionnaire data together with demographic and clinical information were retrospectively extracted from medical records and research databases.

Sociodemographic data included age, educational level, occupational status, marital status, monthly household income, medical payment method, and place of residence.

Disease and treatment-related information were clinical stage, surgical approach, radiotherapy/chemotherapy received, duration of lymphedema, and affected limb.

Self-Management Behavior Scale

The Lymphedema Self-Management Behavior Questionnaire (LSMBQ) for BC patients, developed by Wei et al,¹⁹ assesses self-management behavior in patients with BCRL. It comprises 22 items across six domains: disease information management, diet and exercise management, affected limb protection management, lymph reflux promotion management, emotional management, and role management. The items are rated on a 5-point Likert system (never = 0, always = 4), with total scores ranging from 0 to 88. Higher scores indicate better adherence. Scores < 22 are classified as low, 22–66 as moderate, and > 66 as high.

Brief Illness Perception Questionnaire (BIPQ)

The BIPQ, developed by Broadbent et al²⁰ assesses cognitive representation, emotional representation, and disease understanding. Cognitive representation includes five items (consequences, timeline, personal control, treatment control, and identity); emotional representation includes concern and emotional response; and one item assesses disease

understanding. An open-ended item asks about causal attributions. Items 1–8 are rated from 0 to 10, with higher scores indicating more negative illness perceptions.

Sense of Coherence Scale-13 (SOC-13)

The SOC-13 measures three dimensions: comprehensibility, manageability, and meaningfulness.²¹ It uses a 7-point Likert scale, and total scores range from 13 to 91. Higher scores indicate a stronger sense of coherence. Scores 13–63 indicate low, 64–79 moderate, and 80–91 high levels.

Perceived Social Support Scale (PSSS)

This scale assesses perceived social support from family, friends, and others, with 12 items rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Total scores range from 12 to 84, with higher scores indicating better perceived support.²²

Statistical Methods

Data entry and analysis were conducted using SPSS 26.0 and R 4.5.1. Missing data were checked, and no missing values were found, so complete-case analysis was applied. Multivariate normality was evaluated using skewness and kurtosis. Potential influential observations were assessed using Cook's distance. Considering that all variables were self-reported, Harman's single-factor test was performed to evaluate common method bias. The reliability and validity of latent constructs were assessed using composite reliability (CR), average variance extracted (AVE), the Fornell-Larcker criterion, and the heterotrait-monotrait ratio (HTMT). Categorical data were described as frequencies and percentages, while continuous data as mean $\pm$ standard deviation. Pearson correlation analysis was employed to explore the relationships between self-management behavior, perceived social support, illness perception, and psychological coherence. SEM was used to examine the hypothesized relationships among the latent variables and to estimate the direct and indirect associations. Model estimation was conducted using maximum likelihood. Model fit was evaluated using χ^2/df ratio, goodness-of-fit index (GFI), comparative fit index (CFI), and root mean squared error of approximation (RMSEA). Modifications were based on modification indices and were retained only when theoretically justified and involving indicators within the same latent construct, to minimize overfitting. The indirect associations were examined using bias-corrected bootstrapping (5000 samples), with point estimates and 95% confidence intervals (CIs) for indirect effects. Statistical significance was set at $\alpha = 0.05$ (two-tailed).

Results

Participant Characteristics

A total of 236 eligible BCRL participants were included. Their demographic and disease-related characteristics are summarized in Table 1.

Table 1 General Demographic and Disease Characteristics of Study Subjects

General Information	Classification	Number of Cases (n)	Percentage (%)
Age	<50	76	32.2%
	≥ 50	160	67.8%
Body mass index	<18.5	18	7.6%
	18.5–23.9	131	55.5%
	≥ 24	87	36.9%
Educational level	Primary school and below	77	32.6%
	Junior high school	83	35.2%
	High school and above	76	32.2%
Marital status	Unmarried	4	1.7%
	Married	223	94.5%
	Divorced/widowed	9	3.8%

(Continued)

Table 1 (Continued).

General Information	Classification	Number of Cases (n)	Percentage (%)
Place of residence	Countryside	144	61.0%
	Town	92	39.0%
Per capita monthly household income (yuan)	≤3000	35	14.8%
	3001~5000	114	48.3%
	>5000	87	36.9%
Occupational status	On the job	191	80.9%
	Non-employed	45	19.1%
Operation time	<3 months	71	30.1%
	3-6 months	75	31.8%
	≥6 months	90	38.1%
Surgical approach	Modified radical mastectomy	132	56.0%
	Breast-conserving therapy	74	31.3%
	Other	30	12.7%
Tumor stage	Stage I	98	41.5%
	Stage II	88	37.3%
	Stage III	37	15.7%
	Stage IV	13	5.5%
Affected limb	Left	228	96.6%
	Right	8	3.4%
Radiotherapy	No	170	72.0%
	Yes	66	28.0%

Scores of Study Variables

Descriptive statistics for self-management behavior and related factors are presented in Table 2. According to the stress-and-coping framework, self-management behavior may be shaped by the interaction between patients' cognitive appraisal, psychological resources, and available social resources. Therefore, the descriptive characteristics of these variables were first examined to provide an empirical basis for subsequent SEM analysis. The total LSMBQ score was 54.48 ± 10.80 , indicating a moderate level. Among dimensions, limb protection scored highest (16.05 ± 3.04), while emotional management scored lowest (6.69 ± 1.58), suggesting a weakness in psychological adjustment. For illness

Table 2 Scores of Each Study Variable

Variable	Items	Cases	Total Score of Dimensions
Self-management behavior	Disease information management	3	7.46±1.78
	Diet and exercise management	3	7.11±1.61
	Affected limb protection management	6	16.05±3.04
	Lymph reflux promotion management	3	7.19±1.61
	Emotional management	3	6.69±1.58
	Role Management	4	9.98±2.16
Brief illness perception questionnaire	Cognitive representation	5	27.71±4.36
	Emotional representation	2	10.93±2.15
	Disease understanding	1	5.32±1.65
Sense of Coherence	Comprehensibility	5	24.78±4.43
	Manageability	5	19.66±2.78
	Meaningfulness	4	18.86±2.80
Perceived social support	Family support	4	14.51±2.54
	Friends support	4	13.56±2.41
	Other support	4	12.40±2.48

perception, the total BIPQ score was 43.96 ± 7.61 ; cognitive representation scored highest (27.71 ± 4.36) and disease understanding scored lowest (5.32 ± 1.65), indicating that patients were relatively aware of their symptoms but needed a deeper understanding of the disease. The total SOC-13 score was 63.30 ± 9.34 , with comprehensibility scoring highest (24.78 ± 4.43), and manageability and meaningfulness showing similar scores, suggesting moderate stress-coping capacity. For social support, the total PSSS score was 40.47 ± 6.83 , with family support highest (14.51 ± 2.54) and other support lowest (12.40 ± 2.48), indicating that family was the primary support source. Overall, the score distributions were reasonable and provided a reliable basis for subsequent SEM analysis.

Correlation Among Self-Management Behavior, Illness Perception, Psychological Coherence, and Social Support

Pearson correlation analysis (Table 3) showed that self-management behavior was significantly positively correlated with social support ($r = 0.443$, $P < 0.01$) and psychological coherence ($r = 0.434$, $P < 0.01$), and significantly negatively correlated with illness perception ($r = -0.368$, $P < 0.01$). Social support was positively correlated with psychological coherence ($r = 0.360$, $P < 0.01$) and negatively with illness perception ($r = -0.293$, $P < 0.01$). Psychological coherence was negatively correlated with illness perception ($r = -0.255$, $P < 0.01$). These patterns were consistent with the hypothesized relationships proposed within the stress-and-coping framework and provided preliminary support for further examination of the direct and indirect relationships among latent variables using SEM.

Table 3 Correlation Analysis of Illness Perception, Psychological Coherence, Social Support, and Self-Management Behavior in BCRL Patients

	Self-Management Behavior	Social Support	Psychological Coherence	Illness Perception
Self-management behavior	1	0.443**	0.434**	-0.368**
Social support	0.443**	1	0.360**	-0.293**
Psychological coherence	0.434**	0.360**	1	-0.255**
Illness perception	-0.368**	-0.293**	-0.255**	1

Note: ** indicates $P < 0.01$.

SEM Fitting and Modification

Before evaluating the structural model, preliminary analyses confirmed the suitability of SEM. The observed variables showed acceptable normality. All 236 participants had complete data, and no missing values were identified. Cook's distance analysis showed that the maximum value was 0.0138, indicating no influential cases. In addition, Harman's single-factor test showed that the first unrotated factor accounted for 38.68% of the total variance, below the 50% threshold, suggesting that common method bias was unlikely to be a serious concern.

The initial SEM fit indices (Table 4) were: $\chi^2/df = 2.618$ (< 3.000), RMSEA = 0.078 (< 0.080), CFI = 0.960, NFI = 0.937, IFI = 0.960, TLI = 0.950, GFI = 0.925, and AGFI = 0.906 (all > 0.900). These indicated good fit. Based on the modification indices, one theoretically justified residual covariance was added between disease information management and lymph reflux promotion

Table 4 Goodness of Fit Test of Structural Equation Model for Factors Associated with Self-Management Behavior

Fitting Index	χ^2/df	RMSEA	CFI	NFI	IFI	TLI	GFI	AGFI
Evaluation Criteria	< 3.000	< 0.080	> 0.900	> 0.900	> 0.900	> 0.900	> 0.900	> 0.900
Initial model	2.618	0.078	0.96	0.937	0.96	0.95	0.925	0.906
Corrected model	1.928	0.043	0.979	0.957	0.979	0.971	0.946	0.925

management, both indicators within the self-management construct. The modified model showed improved fit: $\chi^2/df = 1.928$, RMSEA = 0.043, CFI = 0.979, NFI = 0.957, IFI = 0.979, TLI = 0.971, GFI = 0.946, and AGFI = 0.925. All indices exceeded the criteria, indicating that the modified model fit well and could effectively reflect the relationships among latent variables.

Path Analysis of Factors Associated with Self-Management Behavior

The final SEM path diagram is shown in Figure 1. The measurement model indicated that social support was measured by family, friend, and other support; psychological coherence by comprehensibility, manageability, and meaningfulness; illness perception by cognitive representation, emotional representation, and disease understanding; and self-management behavior by the six domains. The reliability and validity of latent constructs were further examined. CR values ranged from 0.909 to 0.958, and AVE values from 0.769 to 0.811, indicating satisfactory reliability and convergent validity. Discriminant validity was supported by the Fornell-Larcker criterion and HTMT (all HTMT < 0.85). All factor loadings were significant.

In the path analysis (Table 5), social support ($\beta = 0.277$, $P < 0.001$) and psychological coherence ($\beta = 0.276$, $P < 0.001$) showed significant positive direct associations with self-management behavior, while illness perception showed a significant negative direct association ($\beta = -0.216$, $P < 0.001$). The 95% CIs for these path coefficients did not include 0, indicating stable estimates. Furthermore, social support was indirectly associated with self-management through psychological coherence and illness perception, and psychological coherence was indirectly associated through illness perception. These results suggest that social support, psychological coherence, and illness perception may represent key interrelated factors associated with self-management behavior in BCRL patients.

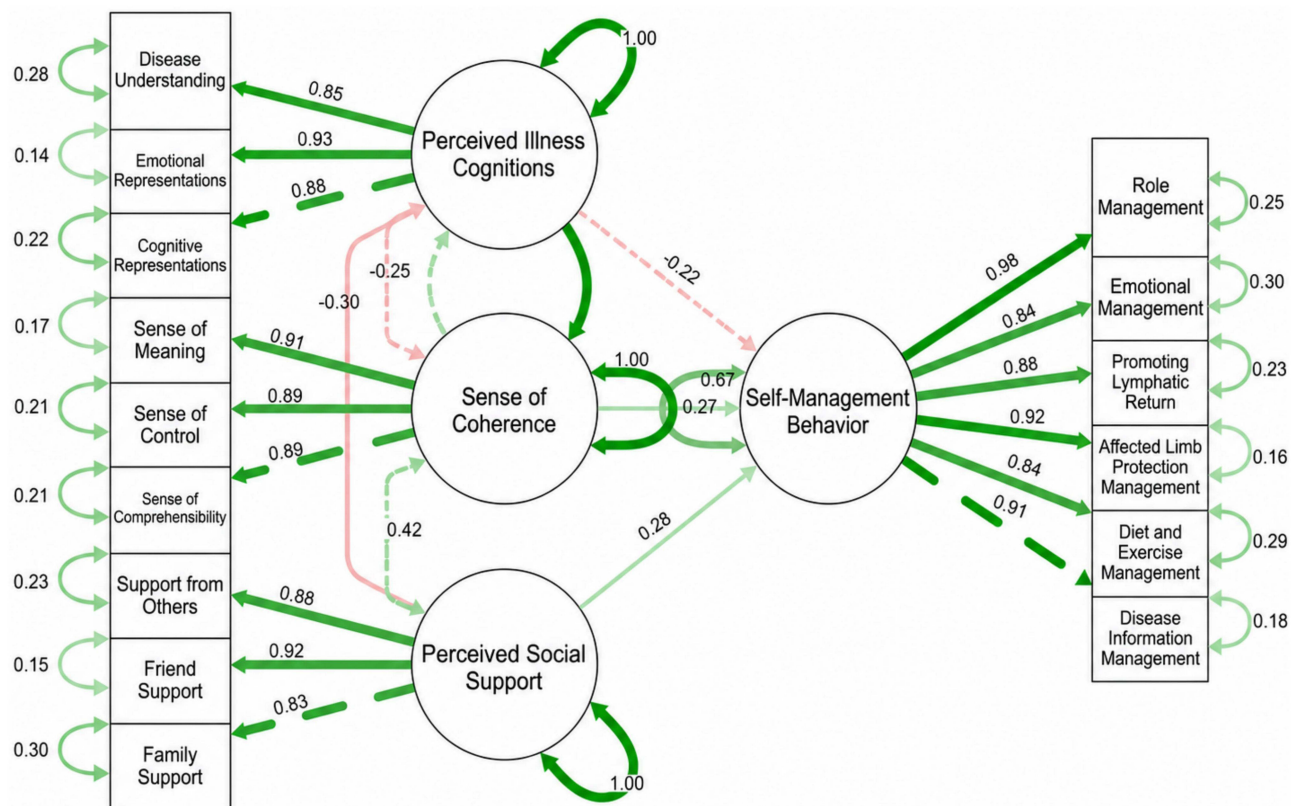


Figure 1 Path diagram of the structural equation model.

Table 5 Estimation Results of Path Coefficients in Structural Equation Modeling

Regression Path	β	S.E.	P	95% CI Lower	95% CI Upper	C.R.
PSSS→SM	0.277	0.063	<0.001	0.150	0.403	4.289
SOC→SM	0.276	0.064	<0.001	0.153	0.402	4.380
BIPQ→SM	-0.216	0.061	<0.001	-0.335	-0.098	-3.576

Abbreviations: SM, Self-management; PSSS, Perceived Social Support Scale; SOC, Sense of Coherence Scale; BIPQ, Brief Illness Perception Questionnaire.

Discussion

This study constructed and validated an SEM to examine factors associated with self-management behavior in patients with BCRL and to explore the routes through which illness perception, psychological coherence, and perceived social support relate to self-management. The results showed that self-management behavior was at a moderate level. Perceived social support, psychological coherence, and illness perception emerged as important associated factors, operating through interconnected direct and indirect relationships.

The mean self-management score (54.48 ± 10.80) indicated a moderate level. Among dimensions, limb protection management scored relatively high, whereas emotional management scored lowest. This suggests that patients adhered well to concrete operational behaviors such as limb protection, possibly because healthcare professionals frequently emphasize these in postoperative rehabilitation education. However, emotional management, a critical component of self-management, appeared to be a weak area. This may be due to the multiple psychological pressures BCRL patients face, including fear of recurrence, body image changes, and social role adaptation. A meta-analysis by Maass et al²³ reported that the prevalence of anxiety and depression among BC survivors was 33.3% and 66.1%, respectively, significantly higher than that in the general population. Patients may focus more on observable physical symptoms (eg, limb swelling) while neglecting internal emotional regulation, lacking both awareness and skills. Therefore, healthcare professionals should strengthen psychological assessment and integrate emotional management into comprehensive lymphedema care, using cognitive-behavioral therapy, mindfulness training, or other interventions to improve emotional regulation and overall self-management.

Social support showed a significant positive direct association with self-management behavior, and also indirect associations through psychological coherence and illness perception. These findings suggest that social support may be an important contextual resource whose relationship with self-management partly involves psychological resources and disease-related cognition. The direct positive role of social support has been confirmed in previous studies; for example, Gallagher et al²⁴ found that higher social support was associated with better self-care adherence in heart failure patients, and Tao et al²⁵ reported similar findings for exercise adherence in BC patients. Rather than simply confirming the direct association between social support and health behaviors reported in previous studies, these findings suggest that the role of social support may depend partly on how patients internally interpret and respond to disease-related challenges. The present study further revealed indirect relationships, consistent with social cognitive theory, which posits that external environmental factors (eg, social support) may be associated with individuals' cognitive and emotional states and thereby relate to behavior.²⁶ Higher social support may be associated with greater confidence and perceived control in coping with stress²⁷ and foster more positive illness perceptions,²⁸ which may partly explain its association with self-management. Notably, family support scored highest among support dimensions, indicating that family was the primary support source. Clinically, interventions should leverage family support while also expanding support from friends and healthcare professionals to build a diversified network. However, family-based interventions should consider cultural background, family structures, and individual preferences, as the availability and perceived value of family support may vary across populations and healthcare contexts.

Psychological coherence was positively associated with self-management behavior, both directly and indirectly through illness perception. This highlights its potential role as an internal psychological resource. Antonovsky's salutogenic model²¹ suggests that individuals with higher coherence are more likely to perceive stressors as comprehensible, manageable, and meaningful, and thus adopt adaptive coping behaviors. Studies in BC patients have similarly

found positive correlations between psychological coherence and self-management.²⁹ Patients with higher comprehensibility better understand the necessity of self-management; those with higher manageability believe in their ability to control disease progression through their actions; and those with higher meaningfulness find value in the management process, sustaining motivation even in difficulties.³⁰ The indirect relationship through illness perception indicates that higher psychological coherence may be associated with less negative illness perceptions, which in turn may relate to better self-management.³¹ This suggests that clinical interventions should not only strengthen psychological resources but also consider their potential influence on disease-related cognitions.

Illness perception showed a significant negative direct association with self-management behavior, consistent with Leventhal's self-regulation theory.¹⁰ Negative illness perceptions are often associated with passive coping. Broadbent et al have shown that illness perception is an important factor associated with self-management and prognosis across chronic diseases. In BCRL patients, those who perceive lymphedema as uncontrollable and threatening often exhibit passive or avoidance behaviors. When patients believe that the disease will have serious consequences (high cognitive representation), they may feel helpless and abandon active management; when they lack understanding of the disease (low disease understanding), they may not know what to do; when they have strong emotional reactions (high emotional representation), negative emotions may be associated with difficulties in rational decision-making and behavior execution.³¹ In this study, cognitive representation scored highest while disease understanding scored lowest, indicating that patients were aware of symptoms and consequences but lacked understanding of the disease's nature (eg, mechanisms and controllability). Petrie et al³² emphasized that disease understanding is a key cognitive component affecting self-management. Only when patients truly understand the controllability of the disease and the necessity of self-management will they actively engage in management behaviors. Therefore, health education should focus on improving patients' understanding of the disease's nature and helping them develop a scientific and rational illness perception.

In terms of clinical implications, the findings suggest that improving self-management behavior may require attention not only to individual behavioral skills but also to the psychological and cognitive processes involved in patients' responses to chronic disease challenges. Healthcare professionals should incorporate psychological assessment into routine care, help patients acquire effective emotional regulation strategies, and compensate for weaknesses in emotional management. Given that family support was the main source of support, interventions should leverage the family's core role while expanding support from friends and professionals to create a diversified network. For psychological resource development, interventions should aim to enhance comprehensibility (through education), manageability (through successful experiences), and meaningfulness (through value-guided reflection). Finally, illness cognition interventions should help patients correct misconceptions and negative emotional reactions, which may contribute to more adaptive self-management.

Study Limitations

This study has several limitations. First, the retrospective cross-sectional design can only establish associations at a single time point, not causality. Future longitudinal studies are needed to examine the temporal and causal relationships among illness perception, psychological coherence, social support, and self-management behavior. Second, although the sample size met the minimum SEM requirement, larger multicenter samples would improve model stability and generalizability. Third, participants were recruited from only one tertiary hospital in one region of China, which may limit generalizability to other populations or healthcare settings. The prominent role of family support observed here may partly reflect Chinese cultural and family structures, and the findings may not be directly transferable to other cultural contexts. Fourth, self-report measures may be subject to recall and social desirability biases; although Harman's test did not indicate substantial common method bias, residual bias from a single data source cannot be entirely excluded. Future studies using objective assessments (eg, wearable devices) or multi-source data (eg, family reports) are warranted. Finally, we only examined three psychosocial factors; other variables such as self-efficacy, health literacy, and healthcare accessibility may also play important roles and should be included in future models.

Conclusion

This study constructed and evaluated an SEM to examine factors associated with self-management behavior in patients with BCRL. The model showed good fit and suggested a comprehensive pattern of associations among variables. Social

support and psychological coherence had significant positive direct associations with self-management, whereas illness perception had a significant negative direct association. Social support was also indirectly associated with self-management through psychological coherence and illness perception. These findings extend previous research by illustrating how external resources, internal psychological resources, and cognitive factors may jointly relate to self-management. Based on the observed associations, healthcare providers may consider addressing patients' emotional management, family support, psychological coherence, and illness perception in routine care, with adaptations to cultural background, healthcare resources, and individual needs. However, given the cross-sectional design, the potential value of these approaches remains to be confirmed in future longitudinal or interventional studies. Future multicenter, longitudinal studies with larger samples and additional potential variables are warranted to further validate the model and examine the temporal relationships among these variables.

Data Sharing Statement

The data used and/or analyzed during the current study are available from the corresponding author.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by the Medical Ethics Committee of The Quzhou Affiliated Hospital of Wenzhou Medical University (Quzhou People's Hospital) (Approval No. 2026-069). Due to the retrospective design and the use of de-identified medical records, follow-up databases, and previously completed questionnaires, the requirement for written informed consent from participants was waived by the Ethics Committee. All patient data were anonymized prior to analysis to ensure confidentiality.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflict of interest.

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