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Research Article

Association between Perceived Control and Quality of Life among Patients with Breast Cancer: Structural Equation Analysis

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Objective. Perceived control refers to an individual's subjective perception, affective experience, or cognitive beliefs regarding their level of control. The objective of this study was to examine the relationship between perceived control and quality of life (QoL) among breast cancer (BC) patients using a structural equation model. *Method.* Participants ($N = 80$) completed questionnaire surveys on perceived control and QoL using the Cancer Experience and Efficacy Scale (CEES) and the Quality of Life Questionnaire Core 30 (EORTC QLQ-C30 V3.0), respectively. Structural equation modeling was employed to examine the associations between perceived control factors, including cancer experience and control efficacy, and QoL. *Results.* The QoL in BC patients was found to be significantly negatively correlated with physical symptoms, accounting for 51.6%. This indicates that the QoL of patients decreased by 51.6% with each unit increase in physical symptoms. In terms of perceived control among BC patients, socioeconomic strain exerted the greatest influence on cancer experience, accounting for 44.3%, followed by emotional strain and personal strain at 40.08% and 34.6%, respectively. Group efficacy had the highest impact on control efficacy at 43.0%, followed by individual efficacy and medical efficacy at 41.8% and 29.7%, respectively. QoL in BC patients decreased by 4.2% with every unit increase in cancer experience but improved by 3.5% with every unit increase in control efficacy. *Conclusion.* The structural equation model facilitates a comprehensive understanding of the interrelationships among various variables in perceived control and QoL among BC patients. The cancer experience in perceived control is negatively correlated with the QoL, whereas control efficiency demonstrates a positive correlation with QoL. Consequently, healthcare professionals should implement appropriate interventions to alleviate physical symptoms and enhance control efficiency, thereby improving both perceived control and QoL levels among BC patients. This trial is registered with ChiCTR2300069476.

1. Introduction

Breast cancer (BC) is prevalent malignancy in women, with a global incidence of 2.3 million cases and 685,000 deaths reported in 2020 [1]. In recent years, there has been a consistent increase in BC incidence rates in China [2]. Breast cancer is a complex disease characterized by distinct subtypes that vary in aggressiveness and response to treatment. These subtypes are classified based on specific characteristics of the cancer cells, including protein expression, hormone receptors, and genetic mutations [3]. There are four well-defined subtypes (luminal A, luminal B, HER-2-positive, and TNBC). The primary therapeutic approaches for breast cancer include surgical intervention combined with adjuvant such as chemotherapy, radiotherapy, endocrine therapy, and hormone therapy [4]. Advances in oncology have improved survival rates among BC patients [5]. However, postoperative BC patients often experience feelings of inferiority, depression, and other negative psychological effects due to mastectomy and fear of mortality

which adversely affect their adaptability [6]. Additionally, these patients commonly undergo long-term adjuvant therapies such as radiotherapy, chemotherapy, or endocrine therapy following surgery [4]. Numerous studies [7–9] have consistently demonstrated that these therapeutic interventions inevitably lead to adverse reactions, including nausea/vomiting, sensory impairment, and alopecia, thereby resulting in detrimental health consequences such as reduced survival duration, accelerated senescence, constrained daily functioning, increased financial burden, and diminished quality of life. Furthermore, during the adjuvant treatment of BC, patients commonly experience a range of physical and psychological distress, including fatigue, sleep disturbances, anxiety, feelings of hopelessness, and cognitive dysfunction [10]. Therefore, interventions should encompass not only prolonging survival but also addressing symptom management, alleviating side effects, enhancing physical and mental functioning status as well as improving daily activities.

According to previous studies [11–13] on psychosocial consequences of cancer therapy, QoL is considered a crucial clinical outcome. Most disease outcomes are subjectively assessed through QoL measures. Many scholars [14, 15] argue that QoL is a multidimensional and dynamic concept encompassing an individual's perception of physical, psychological, and social aspects of life. It can be influenced by the disease process and its treatment. QoL accurately reflects the survival status of BC patients and is an important indicator for measuring tumor recovery. A multitude of studies [16–20] have extensively investigated the association between economic burden, social support, physical symptoms, psychological distress, and QoL. Despite achieving satisfactory outcomes, these studies still lack a comprehensive analysis encompassing the majority of influencing factors. Numerous researchers have conducted a series of investigations aimed at enhancing the QoL among BC patients, including interventions such as psychological education [11], lifestyle modifications [21], physical activity promotion [22], and Internet or telephone-based interventions, [23, 24].

Perceived control refers to an individual's subjective perception, feeling, or belief in their ability to maintain or regain stable psychological and physical functioning during or after exposure to significant life events [25–27]. In the context of cancer patients, perceived control encompasses attitudes and beliefs related to the experience of cancer and disease management [28, 29]. The anticipated outcomes are not predetermined by external factors but rather depend on patients' own choices and behaviors. A heightened level of perceived control plays a crucial role in various aspects such as enhancing self-care abilities, mitigating negative emotions, facilitating disease adaptation, and improving QoL [30]. However, limited research has been conducted on the correlation between perceived control and quality of life among postoperative BC patients.

In this study, we employed structural equation modeling to examine the associations between perceived control (cancer experience and control efficiency) and QoL among postoperative BC patients in western China. The utilization of a structural equation model facilitates a comprehensive understanding of the interrelationships among various variables related to perceived control and QoL in BC patients. This study can serve as a valuable reference for investigating the impact of perceived control on QoL in BC patients.

2. Methods

2.1. Study Design and Setting. This cross-sectional study adopted a convenience sampling method. The study was conducted in the breast surgical department of the First Affiliated Hospital of Xinjiang Medical University, Urumqi, China. The protocol was reviewed and approved by the Human Research Ethics Committee of the First Affiliated Hospital of Xinjiang Medical University (NO: 202105-15). Data were collected by means of face-to-face interviews using a questionnaire survey after the participants signed an informed consent form.

2.2. Participants. In this study, we recruited a total of 80 BC patients who had undergone surgery through convenience sampling from July to December 2021 in the breast surgery ward in the hospital. Patient inclusion criteria are as follows: ① All patients were diagnosed with breast invasive ductal carcinoma (IDC) by surgical pathology and received modified radical mastectomy for the first time; ② combined with chemotherapy, radiotherapy, targeted drug therapy, endocrine therapy, etc.; ③ normal cognitive function and ability to cooperate with the study; ④ 30 ≤ age ≤ 82 years old; and ⑤ informed consent was obtained from all patients. Patient exclusion criteria are as follows: ① Patients with severe heart, brain, liver, and kidney function diseases; ② other cancers such as cervical cancer; ③ infectious diseases; ④ limb dysfunction; ⑤ mental diseases; ⑥ and pregnant or lactating women.

2.3. Questionnaires and Measurements

2.3.1. General Information Questionnaire. Designed by researchers according to research needs, mainly including demographic and sociological data: age, education level, marital status, nationality, medical payment methods, disease-related data, etc.

2.3.2. Perceived Control. The Cancer Experience and Efficacy Scale (CEES) [31], specifically designed for home cancer patients, was utilized to assess perceived control. This scale comprises two parts: cancer experience and control efficacy, encompassing a total of 6 dimensions and 29 items. The cancer experience dimension includes personal strain, socioeconomic strain, and emotional strain, whereas the control efficacy dimension encompasses personal efficacy, collective efficacy, and medical efficacy. A scoring method ranging from grade 5 was employed. Higher scores on the cancer experience dimension indicate greater reported negative experiences by patients, reflecting a lower level of perceived control. Conversely, higher scores on the control

efficacy dimension suggest enhanced coping abilities in dealing with the disease and reflect a higher level of perceived control.

2.3.3. Quality of Life (QoL).

QoL was evaluated using the Chinese version of the European Organization for Research and Treatment of Cancer QoL Questionnaire Core 30 (EORTC QLQ-C30) [32]. There are 30 items in total, including 15 items in five functional fields (physical function, role function, cognitive function, emotional function, and social function), 7 items in three symptom fields (fatigue, pain, nausea, and vomiting), 6 items in the single item (each as a field) assessment of other symptoms (dyspnea, insomnia, loss of appetite, constipation, diarrhea, and financial difficulties), and 2 items assessing general health status/ quality of life. The scoring method of items 1 to 28 is divided into four levels from "none, little, equivalent, and extraordinary" (from 1 to 4 points); items 29 and 30 are divided into 7 grades, which are 1–7 points according to the patient's answer. Higher scores indicate better quality of life in terms of global quality of life and functional dimensions; conversely, lower scores suggest better quality of life regarding symptom burden. All of the questionnaires were done by interview.

2.4. Data Analysis.

The descriptive and inferential statistics were analyzed using the SPSS (version 26.0). Statistical description and count data were described by relative numbers, and measurement data were described by $X \pm S$. t test was used for measurement data, and $P < 0.05$ was considered statistically significant.

2.5. Structural Equation Model.

A structural equation model is a statistical method used to analyze the relationships between multiple variables. In this study, AMOS 21.0 was used to construct a structural equation model (SEM) with the QoL of BC patients as the dependent variable, cancer experience as the independent variable, and the intermediary variable as the control efficacy. The pathways and size of the effects of cancer experience (including all its dimensions) and control efficacy (including all its dimensions) on QoL were discussed. The SEM was tested by the maximum likelihood method and gradually modified according to the correction index, and finally, a model diagram of the action path of influencing factors on the QoL of BC patients was formed. $P < 0.05$ was considered to be statistically significant.

3. Results

3.1. Comparison of General Data and Sociodemographic Characteristics of BC Patients.

The demographic characteristics, including age, nationality, education level, occupation, marital status, TNM stage, family membership, and personality traits of 80 postoperative women with BC are presented in Table 1. A considerable number of the participants were aged between 46 and 60 years (51.25%), were

high school and technical school (41.25%), were cadres and retirees (52.5%), were married (90%), were living with a spouse (85%), and were diagnosed with Stage II breast cancer (48.75%).

3.2. Structural Equation Model

3.2.1. Analysis of Discriminant Validity for the Model.

In this study, the discriminant validity of control efficacy, QoL, and cancer experience was assessed using the Furnell-Lack criterion. The diagonal values in Table 2 represent the square root of average variance extracted (AVE), which should be greater than the corresponding values in the lower triangle. Each root of AVE exceeds the correlation between dimensions, indicating excellent discriminant validity for the structural equation model employed. Consequently, our findings demonstrate that the structural equation model has good discriminant validity. Furthermore, a significant positive correlation was observed between control efficacy scores and QoL scores (0.196, $P < 0.05$). Meanwhile, there was a significant negative correlation between cancer experience scores and QoL scores ($r = -0.034$, $P < 0.05$). Please refer to Table 2 for detailed information.

3.2.2. Reliability and Validity of the Structural Equation Model.

The results showed that, except for AVE and Cronbach's alpha <0.5 for physical symptoms and AVE <0.5 for socioeconomic strain, the corresponding values of the other variables were all >0.5, which was satisfactory and reached the acceptable range (see Table 3 for details).

3.2.3. Matching and Prediction of the Model.

In this paper, the effect of the observed variable on the latent variable (Q^2) is calculated by the blindfolding function, and a larger Q^2 means a stronger predictive correlation. The results show that the predictive correlation between control efficacy and cancer experience was good. Among them, the comprehensive explanatory (R^2) of control efficacy and cancer experience in perceived control were 99.7% and 99.6%, respectively, and the QoL was 40.7%. See Table 4 for details.

3.3. Characteristics of the Model.

The model was iterated 1000 times using the PLS path modeling method in this study, wherein the external approximation of latent variables was computed and estimates were obtained for external weight/load and path coefficients. The internal model represented the path coefficient, while the external model denoted the factor loading. Structural equation modeling was employed to analyze variables such as QoL, control efficacy, and cancer experience. QoL encompassed six dimensions: physical function, role function, emotional function, social function, financial difficulties, and physical symptoms. Control efficacy comprised three dimensions: medical efficacy, personal efficacy, and collective efficacy. The cancer experience consisted of three dimensions: emotional strain, personal strain, and socioeconomic strain.

TABLE 1: General information of patients with breast cancer ($n = 80$).

Variable	Index	Count	Constituent ratio (%)
Age	30~45 years	17	21.25
	45~60 years	41	51.25
	60 years and above	22	27.50
Ethnic groups	Han	58	72.50
	Minority	22	27.50
Education level	Below junior middle school	26	32.50
	High school and technical school	33	41.25
	College and above	21	26.25
Occupation	Unemployed	14	27.50
	Farmer	9	11.25
	Liberal professions	7	8.75
	Cadres and retirees	42	52.50
Marital status	Married	72	90.00
	Single/divorced/widowed	8	10
Ways of detecting	Physical examination	31	38.75
	Self-checking	49	61.25
Mode of payment	Employee medical insurance	42	52.50
	Medical insurance for urban residents	17	21.25
	New rural cooperative medical insurance	5	6.25
	Self-paying and other	16	20.00
TNM stage	I	25	31.25
	II	39	48.75
	III	4	5.00
	IV	11	13.75
	Unknown	1	1.25
Household permanent resident	With spouse	68	85.00
	Living alone	9	11.25
	With sons and daughters	3	3.75
Family membership	Close	57	71.25
	Ordinary	19	23.75
	Estranged	4	5.00
Family history	No	71	88.75
	Yes	9	11.25
Character	Moderate personality	30	37.50
	Introversion	41	51.25
	Extroversion	9	11.25

The results revealed that physical symptoms significantly influenced the QoL in BC, 51.6% of the variance with negative directionality. This implies that an increase in physical symptoms would lead to a decrease in QoL of 51.6%. Nausea and vomiting, insomnia, loss of appetite, and pain were identified as the primary contributors to physical symptoms, explaining 58.4%, 47.2%, 45.0%, and 43.1% of their respective variances. In terms of perceived control among BC patients, emotional strain exerted the most substantial impact on their cancer experience (44.8%), followed by socioeconomic strain (44.3%) and personal strain (34.6%). Collective efficacy demonstrated the greatest influence on control efficacy (43%), while personal efficacy and medical efficacy accounted for 41.8% and 29.7%, respectively. As can be seen from Figure 1, the structural equation model analysis depicted a clear correlation between perceived control and QoL in BC patients; higher levels of perceived control were associated with better QoL outcomes

for these individuals. Specifically, cancer experience within the perceived control exhibited a negative correlation with QoL, whereas control efficacy displayed a positive correlation with QoL.

4. Discussion

In this study, to mitigate the potential confounding effects of disease subtype, treatment modality, and other complications on the study outcomes, all enrolled participants were surgically diagnosed with breast invasive ductal carcinoma (IDC) and underwent an initial modified radical mastectomy. IDC, as a common type of breast cancer, is characterized by the continuous growth and spread of malignant cells in the breast duct and gradually invade the surrounding normal tissues [33]. The causes of the disease are various, including the imbalance of genetic factors and abnormal breast tissue. Clinical manifestations: patients may have

TABLE 2: Correlations between the variables of perceived control and QoL in BC patients.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) Personal efficacy	**0.725**														
(2) Personal strain	−0.088	**0.754**													
(3) Medical efficacy	0.526	0.044	**0.850**												
(4) Emotional strain	−0.114	0.407	−0.129	**0.673**											
(5) Emotional (EF)	−0.135	−0.027	−0.256	0.065	**1.000**										
(6) Control efficiency	0.866	−0.074	0.810	−0.184	−0.229	**1.000**									
(7) Physical symptom	−0.107	0.016	−0.104	0.145	−0.049	−0.102	**0.515**								
(8) QoL	0.095	0.007	0.216	−0.120	−0.172	0.196	−0.524	**1.000**							
(9) Cancer experience	−0.086	0.806	−0.013	0.789	−0.015	−0.113	0.070	−0.034	**1.000**						
(10) Social (SF)	−0.079	−0.062	−0.108	−0.021	0.129	−0.072	0.121	−0.279	−0.043	**1.000**					
(11) Socioeconomic strain	0.005	0.665	0.064	0.543	−0.072	0.001	0.032	0.010	0.894	−0.002	**0.674**				
(12) Financial difficulty (FI)	−0.063	−0.033	−0.178	−0.163	0.069	−0.163	−0.168	−0.148	−0.103	0.263	−0.047	**1.000**			
(13) Role (RF)	−0.130	0.091	−0.174	0.133	0.118	−0.141	−0.200	0.100	0.139	−0.019	0.117	0.057	**1.000**		
(14) Physical (PF)	−0.164	−0.152	−0.316	0.050	0.115	−0.256	0.093	−0.236	−0.116	0.060	−0.192	0.093	0.032	**1.000**	
(15) Collective efficacy	0.676	−0.112	0.681	−0.226	−0.229	0.916	−0.065	0.219	−0.164	−0.014	−0.045	−0.200	−0.086	−0.228	**0.762**

The significance of bold values $P < 0.05$.

TABLE 3: Reliability and validity of the structural equation model for correlation between perceived control and QoL in BC patients.

Variables	Cronbach's alpha	rho_A	Reliability of combination	The average amount of extracted variation (AVE)
Personal efficacy	0.772	0.779	0.846	0.526
Personal strain	0.747	0.753	0.840	0.569
Medical efficacy	0.808	0.812	0.886	0.723
Emotional strain	0.740	0.764	0.826	0.454
Emotional (EF)	1.000	1.000	1.000	1.000
Control efficiency	1.000	1.000	1.000	1.000
Physical symptom	0.086	0.065	0.589	0.265
QoL	1.000	1.000	1.000	1.000
Cancer experience	1.000	1.000	1.000	1.000
Social (SF)	1.000	1.000	1.000	1.000
Socioeconomic strain	0.756	0.777	0.831	0.455
Financial difficulty (FI)	1.000	1.000	1.000	1.000
Role (RF)	1.000	1.000	1.000	1.000
Physical(PF)	1.000	1.000	1.000	1.000
Collective efficacy	0.819	0.821	0.874	0.581

TABLE 4: Matching and prediction of the structural equation model for perceived control and QoL in breast cancer patients.

Variables	SSO	Sum squared residual (SSE)	Q^2 ($= 1 - \text{SSE/SSO}$)	R^2
Control efficiency	137	2.466	0.982	0.997
QoL	137	104.189	0.239	0.407
Cancer experience	137	2.871	0.979	0.996

breast lumps, skin depression, nipple depression, nipple discharge, and other symptoms [34]. The therapeutic methods of IDC include surgical resection, radiation therapy, and chemotherapy. In addition to enduring the physical pain of the disease and the harshness of the treatment modality, patients also face significant psychological distress and a sense of hopelessness. Therefore, it is crucial to enhance the disease management capacity of BC patients and facilitate their adaptability to the illness.

The research findings suggest that physical symptoms, such as fatigue, pain, and vomiting, have a substantial impact on the QoL of BC patients residing in western China. Furthermore, these patients demonstrate impaired functioning across multiple domains including physical function, role function, cognitive function, emotional function, and social function. Previous studies [35, 36] have indicated that symptoms, as influential factors on the QoL in cancer patients, can induce physiological and psychological alterations. For instance, chemotherapy-induced nausea and vomiting [37], being the most prevalent adverse reaction among patients, may result in appetite loss, acid-base imbalance, decreased immunity during treatment, and heightened negative emotions such as anxiety. Consequently, this not only diminishes patients' QoL but also impacts their adherence to treatment. Simultaneously, patients experiencing nausea, vomiting, and other symptoms often exhibit gastrointestinal mucosal barrier damage. Consequently, a decrease in appetite frequently occurs, leading to malnutrition [38]. Furthermore, cancer pain not only induces nervous dysfunction but also inflicts psychological harm upon patients [39]. The cumulative experiences mentioned above contribute to an increased psychological

burden among patients, including feelings of anxiety, fear, anger, and other negative emotions. In addition, these experiences also amplify the adverse impact on individual perceived control ability [40]. Consequently, physical symptoms emerge as the primary factors influencing both the level of perceived control and QoL in cancer patients. In essence, the presence of a greater number of physical symptoms exacerbates the experience of cancer while simultaneously diminishing QoL. Therefore, healthcare professionals should implement appropriate interventions aimed at alleviating physical symptoms and enhancing QoL in this patient population.

The findings of this study suggest that emotional stress significantly impacts the cancer experience, with the dimension of emotional stress having the most pronounced negative effect on QoL. In contrast, patients' perceived control does not play a significant role in comparison to their cancer experience. However, collective efficacy, primarily derived from family support and the surrounding social environment, plays a crucial role in enhancing control efficiency and positively influencing QoL throughout the comprehensive therapeutic process [28]. However, the effect of cancer experience on quality of life was slightly higher than the control efficiency in this study. This indicates that the perceptual control level of the BC patients in western China was low. This may be attributed to their comparatively lower levels of education and income compared to other regions. Previous studies [41, 42] have demonstrated a significant correlation between higher education and employment status with enhanced perceived control. Additionally, the financial burden associated with disease treatment and the necessity of family members' involvement
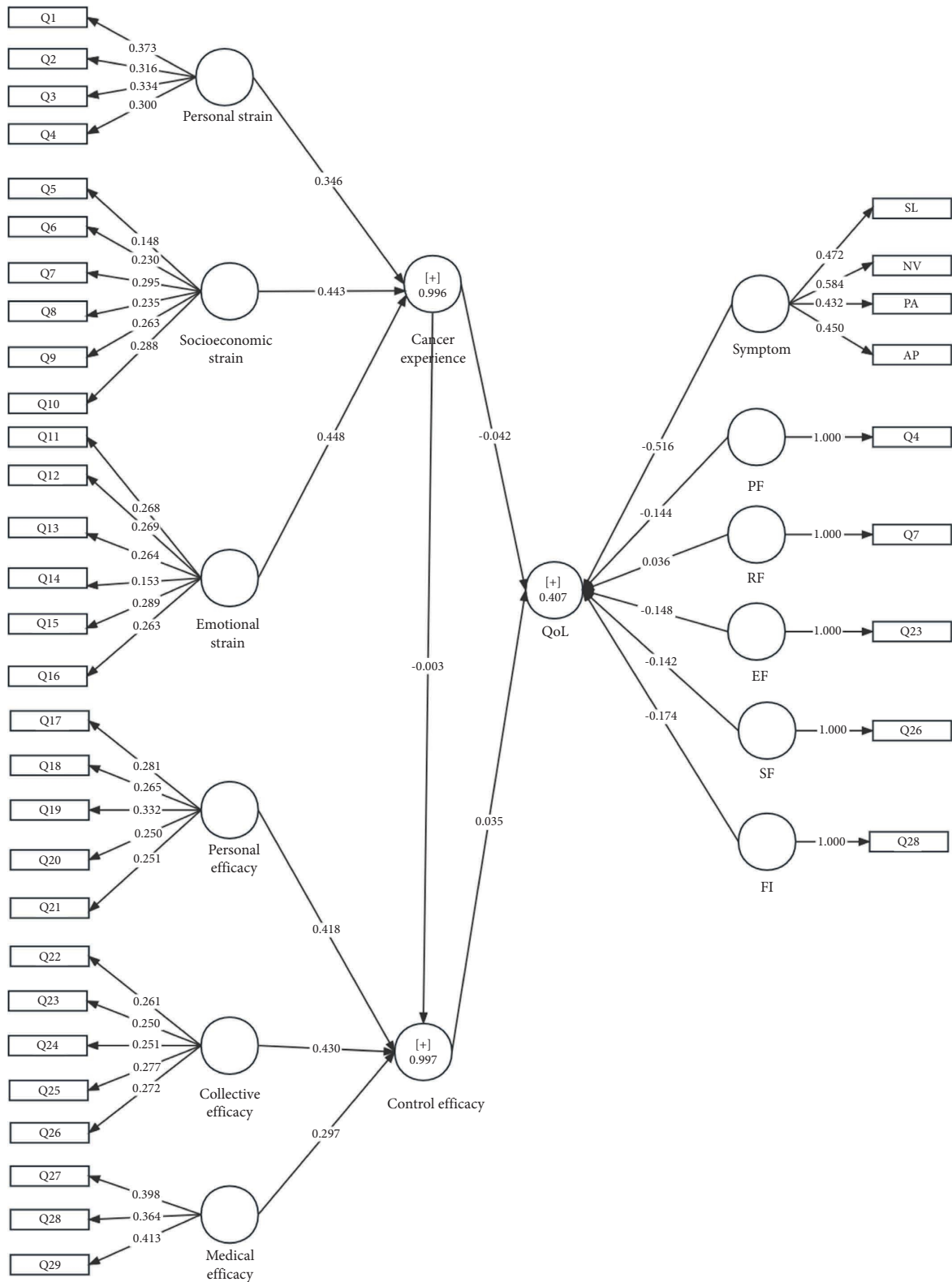
FIGURE 1: Association between perceived control and quality of life in patients with breast cancer.

in the treatment process contribute to patients perceiving themselves as burdens on their families [43]. Therefore, educational level and income serve as crucial predictors of breast cancer patients' perceived control.

Perceived control, as a psychological construct, plays a pivotal role in the lives of individuals, influencing cognitive, emotional, and behavioral functions [44]. Previous studies [30, 45] have demonstrated that patients' perceived
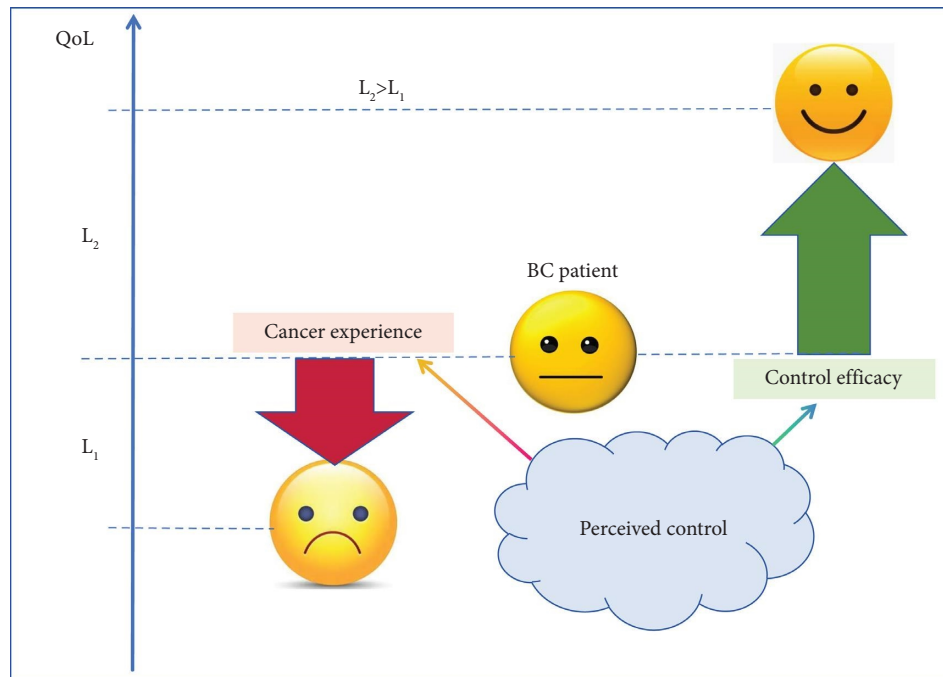
FIGURE 2: Heatmaps depicting the association between perceived control and QoL among BC patients in this study. (L_1 and L_2 are negative and positive influence on QoL).

control exerts greater influence than other forms of support in facilitating women with BC to cope with biopsychosocial pain after surgery or adjuvant treatment. When patients possess effective self-regulation skills, they consistently adapt their personal behaviors to better manage the discomfort associated with the disease. Barez et al. [46] demonstrated that enhancing patients' perceived control ability significantly alleviates symptom burden and leads to improved clinical outcomes. Aburuz and Al-Dweik [47] also highlighted that heightened perceived control can mitigate complications and enhance overall results. Therefore, effectively augmenting control efficacy and regulating the cancer experience are pivotal to improving the QoL of BC patients.

Perceived control has been demonstrated to be modifiable and can be enhanced [30]. Multiple studies have indicated that [48–50] when patients acquire more comprehensive information regarding the disease and its treatment, their level of control over the process and treatment increases, along with their familiarity with treatment procedures and nursing, ultimately strengthening their sense of control and confidence in managing the disease. It suggests that we should enhance the coping ability of patients so they have a better psychological state and reduce the negative effects caused by the negative experience of cancer. The findings derived from the application of structural equation modeling were visually represented through heatmaps, as illustrated in Figure 2. The positive impact of control efficacy on QoL surpasses the negative consequences of cancer experience. Therefore, medical staff should implement effective interventions such as psychoeducational counseling [51, 52], which play a more crucial role than simply providing information in enhancing perceived control. This approach enables patients to develop a comprehensive understanding of the disease and fosters their belief in overcoming it. Moreover, an enhanced comprehension of the disease can contribute to improving control effectiveness. Consequently, enhancing perceived control represents an effective strategy for optimizing QoL in BC patients with lower cognitive levels.

4.1. Study Limitations. The current study has three limitations. First, the cross-sectional design of this study makes it challenging to establish a temporal relationship between perceived control and QoL among hospitalized BC patients; thus, the long-term impact of perceived control on QoL remains unclear. Second, the relatively small sample size in this study ($N = 80$) may result in substantial final deviations; considering that structural equation modeling typically requires a sample size larger than 200 [53], future studies aim to expand their sample sizes accordingly. Lastly, our assessment was limited to using only perceived control (CEES) and EORTC QLQ-C30 measures; therefore, future studies should consider incorporating multiple symptom-related measures as well.

4.2. Clinical Implications. The study found that BC patients who had better control efficiency had lower levels of cancer experience and higher QoL. Additionally, control efficiency mediated the relationship between cancer experience and QoL. These findings suggest that medical staff should implement appropriate interventions to improve patients' perceived control, leading to an enhancement in their QoL.

This study provides valuable insights for the clinical management of perceived control ability and QoL in BC patients undergoing surgery, which holds significant clinical significance.

5. Conclusions

This study investigated the association between perceived control and QoL in BC patients, as well as the predictive factors for QoL in women with BC residing in western China. The structural equation model allows for a better understanding of the interrelationships among various variables in the perceived control and QoL of BC patients. As hypothesized, there was a significant association observed between patients' levels of perceived control and their QoL. The positive impact of control efficacy on QoL surpasses the negative consequences of cancer experience. In future studies, with the increasing number of cancer patients, the loss of control sense in the face of cancer should arouse the attention of medical staff, thereby implementing appropriate interventions aimed at alleviating physical symptoms and enhancing their sense of control efficiency. These measures can ultimately contribute towards improving both perceived control levels and overall QoL among such patients [54, 55].

Data Availability

The qualitative data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Rabigul Rahman conceptualized the study, proposed the methodology, performed formal analysis, performed investigation, wrote the original draft, administered the project, and reviewed and edited the study. Haiyan Wang collected the data, proposed the methodology, visualized the study, investigated the study, administered the project, and supervised the study. Maynur Mahsut performed statistical analysis and data analysis, performed validation, and supervised the study. Hongmei Xiang collected the data, curated the data, interpreted the data, and investigated the study. Xiaoyan Zhang collected the data, curated the data, interpreted the data, and investigated the study.

Acknowledgments

References

[1] World Health Organization (Who), "News," 2022, https://www.who.int/news/item/27-10-2022-who-and-md-anderson-launch-a-new-partnership-to-reduce-the-global-burden-of-women-s-cancers.

[2] H. Lu, L. Hou, and R. Liu, "Application of Gesture Analogy Method in postoperative nursing care of patients with breast cancer," *Asian Journal of Surgery*, vol. 45, no. 1, pp. 629-630, 2022.

[3] S. Löb, E. Linsmeier, S.-L. Herbert et al., "Prognostic effect of HER2 evolution from primary breast cancer to breast cancer metastases," *Journal of Cancer Research and Clinical Oncology*, vol. 149, no. 8, pp. 5417–5428, 2023.

[4] A. J. Kerr, D. Dodwell, P. McGale et al., "Adjuvant and neoadjuvant breast cancer treatments: a systematic review of their effects on mortality," *Cancer Treatment Reviews*, vol. 105, Article ID 102375, 2022.

[5] I.-H. Shih, C.-Y. Lin, and S.-Y. Fang, "Prioritizing care for women with breast cancer based on survival stage: a study examining the association between physical symptoms, psychological distress and unmet needs," *European Journal of Oncology Nursing*, vol. 48, Article ID 101816, 2020.

[6] P. C. Lundberg and N. Phoosuwan, "Life situations of Swedish women after mastectomy due to breast cancer: a qualitative study," *European Journal of Oncology Nursing: The Official Journal of European Oncology Nursing Society*, vol. 57, Article ID 102116, 2022.

[7] M. Zhu, S. Sun, Y. Zhang et al., "Effects of the appearance care on psychosocial outcomes for breast cancer: a systematic review and meta-analysis," *Supportive Care in Cancer: Official Journal of the Multinational Association of Supportive Care in Cancer*, vol. 30, 2022.

[8] J. C. P. Vilardaga, H. M. Fisher, J. G. Winger et al., "Pain, depressive symptoms, and self-efficacy for pain management: examination in African-American women with breast cancer," *Supportive Care in Cancer*, vol. 30, no. 8, pp. 6633–6640, 2022.

[9] H. Setyowibowo, W. Yudiana, J. A. Hunfeld et al., "Psychoeducation for breast cancer: a systematic review and meta-analysis," *The Breast*, vol. 62, pp. 36–51, 2022.

[10] X. He, M. S. Ng, X. Wang et al., "A dance program to manage A fatigue-sleep disturbance-depression symptom cluster among breast cancer patients receiving adjuvant chemotherapy: a feasibility study," *Asia-Pacific journal of oncology nursing*, vol. 8, no. 3, pp. 337–339, 2021.

[11] Q. Lu, L. Chen, L. J. Shin et al., "Improvement in quality of life and psychological well-being associated with a culturally based psychosocial intervention for Chinese American breast cancer survivors," *Supportive Care in Cancer*, vol. 29, no. 8, pp. 4565–4573, 2021.

[12] J. H. Hong, M. E. Lachman, S. T. Charles et al., "The positive influence of sense of control on physical, behavioral, and psychosocial health in older adults: an outcome-wide approach," *Preventive Medicine*, vol. 149, Article ID 106612, 2021.

[13] I. O. Gabriel and P. M. Mayers, "Effects of a psychosocial intervention on the quality of life of primary caregivers of women with breast cancer," *European Journal of Oncology Nursing*, vol. 38, pp. 85–91, 2019.

[14] H. J. G. Abrahams, M. F. M. Gielissen, C. A. H. H. V. M. Verhagen, and H. Knoop, "The relationship of fatigue in breast cancer survivors with quality of life and factors to address in psychological interventions: a systematic review," *Clinical Psychology Review*, vol. 63, pp. 1–11, 2018.

[15] N. R. Taghian, C. L. Miller, L. S. Jammallo, J. O'Toole, and M. N. Skolny, "Lymphedema following breast cancer treatment and impact on quality of life: a review," *Critical Reviews In Oncology-Hematology*, vol. 92, no. 3, pp. 227–234, 2014.

[16] F.-K. Sun, C.-Y. Lu, Y. C. Yao, and C.-Y. Chiang, "Social functioning, depression, and quality of life among breast cancer patients: a path analysis," *European Journal of Oncology Nursing*, vol. 62, Article ID 102237, 2023.

[17] B. Lan, D. Lv, M. Yang, X. Sun, L. Zhang, and F. Ma, "Psychological distress and quality of life in Chinese early-stage breast cancer patients throughout chemotherapy," *Journal of the National Cancer Center*, vol. 2, no. 3, pp. 155–161, 2022.

[18] L. Hejl, J. Raft, L. Leufflen et al., "Quality of life, anxiety, and postoperative complications of patients undergoing breast cancer surgery as ambulatory surgery compared to non-ambulatory surgery: a prospective non-randomized study," *Journal of gynecology obstetrics and human reproduction*, vol. 50, no. 2, Article ID 101779, 2021.

[19] J. H. Park, S. H. Y. Bae, Y. S. Jung, and Y. M. Jung, "The role of depression in the relationship between cognitive decline and quality of life among breast cancer patients," *Supportive Care in Cancer*, vol. 27, no. 7, pp. 2707–2714, 2019.

[20] G. K. Celik, H. Çakır, and E. Kut, "Mediating role of social support in resilience and quality of life in patients with breast cancer: structural equation model analysis," *Asia-Pacific journal of oncology nursing*, vol. 8, no. 1, pp. 86–93, 2021.

[21] C. Zheng, L.-X. Yu, H.-Y. Jia et al., "Relationship between lifestyle habits and health-related quality of life of recently diagnosed breast cancer patients: a comparison between younger and older women in China," *Frontiers in Public Health*, vol. 9, Article ID 767151, 2021.

[22] N. Zagalaz-Anula, M. J. Mora-Rubio, E. Obrero-Gaitán, and R. Del-Pino-Casado, "Recreational physical activity reduces breast cancer recurrence in female survivors of breast cancer: a meta-analysis," *European Journal of Oncology Nursing*, vol. 59, Article ID 102162, 2022.

[23] K. E. Post and J. Flanagan, "Web based survivorship interventions for women with breast cancer: an integrative review," *European Journal of Oncology Nursing*, vol. 25, pp. 90–99, 2016.

[24] J. Li, Y. Liu, J. Jiang, X. Peng, and X. Hu, "Effect of telehealth interventions on quality of life in cancer survivors: a systematic review and meta-analysis of randomized controlled trials," *International Journal of Nursing Studies*, vol. 122, Article ID 103970, 2021.

[25] H. S. Donovan, E. M. Hartenbach, and M. W. Method, "Patient-provider communication and perceived control for women experiencing multiple symptoms associated with ovarian cancer," *Gynecologic Oncology*, vol. 99, no. 2, pp. 404–411, 2005.

[26] W. Mansell, "The perceptual control model of psychopathology," *Current opinion in psychology*, vol. 41, pp. 15–20, 2021.

[27] J. Bauml, C. J. Langer, T. Evans, S. N. Garland, K. Desai, and J. J. Mao, "Does perceived control predict Complementary and Alternative Medicine (CAM) use among patients with lung cancer? A cross-sectional survey," *Supportive Care in Cancer*, vol. 22, no. 9, pp. 2465–2472, 2014.

[28] L. Wadsworth, I. Wessman, C. Beard, and T. Bjorgvinsson, "Levels of perceived control and treatment response in a brief partial hospital setting," *Neurology Psychiatry and Brain Research*, vol. 34, pp. 1–8, 2019.

[29] K. A. Wallston, B. S. Wallston, S. Smith, and C. J. Dobbins, "Perceived control and health," *Current Psychology*, vol. 6, no. 1, pp. 5–25, 1987.

[30] M. Hammash, S. M. McEvedy, J. Wright et al., "Perceived control and quality of life among recipients of implantable cardioverter defibrillator," *Australian Critical Care*, vol. 32, no. 5, pp. 383–390, 2019.

[31] W. K. Hou, "Intrapersonal and interpersonal dimensions of cancer perception: a confirmatory factor analysis of the cancer experience and efficacy scale (CEES)," *Supportive Care in Cancer*, vol. 18, no. 5, pp. 561–571, 2010.

[32] M. A. Sprangers, M. Groenvold, J. I. Arraras et al., "The European Organization for Research and Treatment of Cancer breast cancer-specific quality-of-life questionnaire module: first results from a three-country field study," *Journal of Clinical Oncology*, vol. 14, no. 10, pp. 2756–2768, 1996.

[33] S. Chen, L. Yang, and Y. Li, "Clinicopathological features of 166 cases of invasive ductal breast carcinoma and effect of primary tumor location on prognosis after modified radical mastectomy," *Emergency medicine international*, vol. 2022, Article ID 3158956, 6 pages, 2022.

[34] Y. Liu and T. Yu, "Clinicopathological characteristics and prognosis of triple-negative breast cancer invasive ductal carcinoma with ductal carcinoma in situ," *Journal of Cancer Research and Clinical Oncology*, vol. 149, no. 13, pp. 11181–11191, 2023.

[35] M. Al Qadire, M. Alsaraireh, K. Alomari et al., "Symptom clusters predictive of quality of life among Jordanian women with breast cancer," *Seminars in Oncology Nursing*, vol. 37, no. 2, Article ID 151144, 2021.

[36] M. J. Dodd, M. H. Cho, B. A. Cooper, and C. Miaskowski, "The effect of symptom clusters on functional status and quality of life in women with breast cancer," *European Journal of Oncology Nursing*, vol. 14, no. 2, pp. 101–110, 2010.

[37] J.-Y. Tan, J. Liu, L. K. Suen, A. Molassiotis, and T. Wang, "Development and validation of an evidence-based auricular acupressure intervention for managing chemotherapy-induced nausea and vomiting in breast cancer patients," *Complementary Therapies in Medicine*, vol. 52, Article ID 102502, 2020.

[38] K. Pongthavornkamol, P. Lekdamrongkul, P. Pinsuntorn, and A. Molassiotis, "Physical symptoms, unmet needs, and quality of life in Thai cancer survivors after the completion of primary treatment," *Asia-Pacific journal of oncology nursing*, vol. 6, no. 4, pp. 363–371, 2019.

[39] M. Yamanaka and K. Suzuki, "Evaluation of appropriateness of A nursing intervention program to promote pain self-management for adult outpatients with cancer pain," *Asia-Pacific journal of oncology nursing*, vol. 8, no. 1, pp. 33–39, 2021.

[40] G. Gokce Ceylan and Z. Gok Metin, "Symptom status, body perception, and risk of anxiety and depression in breast cancer patients receiving paclitaxel: a prospective longitudinal study," *Supportive Care in Cancer*, vol. 30, no. 3, pp. 2069–2079, 2022.

[41] M. Eklund and M. Bäckström, "The role of perceived control for the perception of health by patients with persistent mental illness," *Scandinavian Journal of Occupational Therapy*, vol. 13, no. 4, pp. 249–256, 2006.

[42] G. Gabay, "Perceived control over health, communication and patient-physician trust," *Patient Education and Counseling*, vol. 98, no. 12, pp. 1550–1557, 2015.

[43] K. Meneses, A. Azuero, L. Hassey, P. McNees, and M. Pisu, "Does economic burden influence quality of life in breast cancer survivors?" *Gynecologic Oncology*, vol. 124, no. 3, pp. 437–443, 2012.

[44] C. Patterson, L. Moxham, E. Taylor et al., "Perceived control among people with severe mental illness: a comparative study," *Archives of Psychiatric Nursing*, vol. 30, no. 5, pp. 563–567, 2016.

[45] A. J. Elliot, C. J. Mooney, F. J. Infurna, and B. P. Chapman, "Perceived control and frailty: the role of affect and perceived health," *Psychology and Aging*, vol. 33, no. 3, pp. 473–481, 2018.

[46] M. Bárez, T. Blasco, J. Fernández-Castro, and C. Viladrich, "Perceived control and psychological distress in women with breast cancer: a longitudinal study," *Journal of Behavioral Medicine*, vol. 32, no. 2, pp. 187–196, 2009.

[47] M. E. AbuRuz and G. Al-Dweik, "Depressive symptoms, perceived control and quality of life among patients undergoing coronary artery bypass graft: a prospective cohort study," *Bone Marrow Concentrate Nursing*, vol. 21, no. 1, p. 87, 2022.

[48] N. Kugbey, A. Meyer-Weitz, and K. Oppong Asante, "Access to health information, health literacy and health-related quality of life among women living with breast cancer: depression and anxiety as mediators," *Patient Education and Counseling*, vol. 102, no. 7, pp. 1357–1363, 2019.

[49] K. Sjovall, G. Strombeck, A. Lofgren, P. O. Bendahl, and B. Gunnars, "Adjuvant radiotherapy of women with breast cancer- information, support and side-effects," *European Journal of Oncology Nursing*, vol. 14, no. 2, pp. 147–153, 2010.

[50] T. L. Hart, S. Blacker, A. Panjwani, L. Torbit, and M. Evans, "Development of multimedia informational tools for breast cancer patients with low levels of health literacy," *Patient Education and Counseling*, vol. 98, no. 3, pp. 370–377, 2015.

[51] M. D G. Salvetti, S. C. T. Donato, C. S. Machado, N. G. de Almeida, D. V. Dos Santos, and G. P. Kurita, "Psychoeducational nursing intervention for symptom management in cancer patients: a randomized clinical trial," *Asia-Pacific journal of oncology nursing*, vol. 8, no. 2, pp. 156–163, 2021.

[52] J. B. Weis, K. Gschwendtner, J. M. Giesler, L. Adams, and M. A. Wirtz, "Psychoeducational group intervention for breast cancer survivors: a non-randomized multi-center pilot study," *Supportive Care in Cancer*, vol. 28, no. 7, pp. 3033–3040, 2019.

[53] E. Martynova, S. G. West, and Y. Liu, "Review of principles and practice of structural equation modeling," *Structural Equation Modeling: A Multidisciplinary Journal*, vol. 25, no. 2, pp. 325–329, 2018.

[54] A. Brédart, J.-L. Kop, A. De Pauw et al., "Effect on perceived control and psychological distress of genetic knowledge in women with breast cancer receiving a BRCA1/2 test result," *The Breast*, vol. 31, pp. 121–127, 2017.

[55] A. V. Ranchor, J. Wardle, A. Steptoe, I. Henselmans, J. Ormel, and R. Sanderman, "The adaptive role of perceived control before and after cancer diagnosis: a prospective study," *Social Science and Medicine*, vol. 70, no. 11, pp. 1825–1831, 2010.