Perceived social support and coping style as mediators between resilience and health-related Quality of Life in women newly diagnosed with breast cancer: A cross-sectional study

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Research

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Abstract

Background: Breast cancer may impair health-related quality of life (HRQoL). We examined the mediating roles of perceived social support (PSS) and coping style (CS) in the relationship between resilience and HRQoL in newly diagnosed breast cancer patients. **Methods:** Four-hundred thirty-one patients completed a survey at two hospitals in Shaanxi Province, China, using self-report measures assessing HRQoL, resilience, PSS, and CS. A one-sample t-test analyzed differences between resilience, PSS, and CS in breast cancer patients and the corresponding norm. Multivariate linear regression analyzed the independent predictors of HRQoL. The mediating roles of PSS and CS between resilience and HRQoL were investigated using structural equation modeling (SEM). **Results:** Participants had significantly lower scores for resilience and PSS and higher scores for the avoidance and resignation CSs than their corresponding norm. SEM analysis showed resilience had significant direct effects on PSS ($B = 0.59$, 95% CI [0.49, 0.68], $P = 0.003$), CS (confrontation: $B = 0.53$, 95% CI [0.44, 0.62], $P = 0.001$; resignation: $B = -0.66$, 95% CI [-0.74, -0.57], $P = 0.002$), and HRQoL (B range from 0.54–0.58). Resilience had significant indirect effects (B range from 0.09–0.27), and PSS and CS had significant direct effects on HRQoL ($P < 0.05$). **Conclusions:** Newly diagnosed breast cancer patients had lower resilience and PSS and higher negative CSs. PSS and CS appeared to mediate the influence of resilience on HRQoL. Multimodal intervention programs focusing on PSS and CS might increase the influence of resilience on HRQoL in breast cancer patients.

Background

As a major stressful life event, breast cancer diagnosis and treatment-related adverse effects could cause severe physical and psychological trauma to the patient, and eventually, result in damage to their health-related quality of life (HRQoL) [1, 2]. The improvement of breast cancer treatment strategies and an increased survival rate has made the psychosocial rehabilitation of patients increasingly important [3].

Resilience refers to an individual's ability to adapt and successfully cope with adversity [4]. This ability changes continuously with the interactions between the individual and the environment [4–6]. Resilience levels integrate physiological, psychological, and social functions that affect an individual's HRQoL after suffering from stressful events [7]. Women with breast cancer experience different degrees of psychological trauma during the process of diagnosis, treatment, and rehabilitation [5, 8, 9]. However, previous studies have focused primarily on negative psychological and behavioral responses such as anxiety and depression [8, 9], fear of progression/relapse [10, 11], decreased self-efficacy [12], poor perception of social support [13, 14], and negative coping strategies [15]. Few studies have examined the direct and indirect effects of resilience on the physical, psychological, and social functioning of women with breast cancer [7, 16, 17], and studies of women who have been newly diagnosed are even more limited.

HRQoL is an individual's self-perception of their physical, psychological, and social functioning [18]. It is an essential indicator for evaluating the overall therapeutic effect of cancer treatment and the overall

functional rehabilitation of patients during their lifetime [18]. Diseases and various negative stressors affect the HRQoL of breast cancer patients with varying degrees, especially in the field of psychosocial functioning [18]. Commonly reported factors that influence HRQoL include anxiety, depression, and despair [8, 9]; perceived social support (PSS) [13, 14]; and coping style (CS) [15]. Social support and CS are also important mediator variables of HRQoL [19, 20]. However, there is a lack of research evidence on how PSS and CS mediate the relationship between resilience and HRQoL in women newly diagnosed with breast cancer.

Theoretical basis

This study is based on the Neuman Systems Model (NSM), a theoretical framework for nursing that emphasizes the interaction between people and the environment, and the individual's response to stressors in the environment. The main components of this model include the stressor, the body's defense, and nursing interventions. When a stressor acts on the body, the body reacts defensively, and the purpose of a nursing intervention is to maintain and restore the balance of the body's system [21].

Each woman with breast cancer is an independent system; the disease and its treatment-related factors (stressors) will have various negative effects on the patient (system), and then cause changes in their psychological toughness (body defense). Through comprehensive consideration of the positive role of the patient's self-defense capabilities and the positive guiding effects of a patient's personal responses (i.e., CS and PSS), this study used the NSM as the theoretical basis to build an influencing factor model. Resilience was regarded as the body's defense, PSS and CS as the personal responses, and HRQoL as the patient-reported outcome (Figure 1). This model was used to examine the mediator roles of PSS and CS (i.e., mediator variables) in the relationship between resilience (i.e., independent variable) and HRQoL (i.e., outcome variable). To our knowledge, only one study has used the NSM as the theoretical basis for breast cancer patient research on nausea and vomiting caused by chemotherapy [22]. It has not been reported as the theoretical basis in research examining HRQoL in breast cancer patients.

[Figure 1 near here]

The purpose of the study is to examine the mediator roles of PSS and CS in the relationship between resilience and HRQoL in women newly diagnosed with breast cancer. There are two hypotheses: (i) resilience, PSS, and CS are independent predictors of HRQoL; and (ii) PSS and CS mediate the relationship between resilience and HRQoL. The study's findings will provide new evidence for identifying the mediator roles of psychosocial factors in the relationship between resilience and HRQoL, and for developing multimodal intervention programs to improve HRQoL in women newly diagnosed with breast cancer.

Methods

Design, participants, and sampling

We used a cross-sectional study design. Convenience sampling was used to recruit women with breast cancer who had been admitted to the Tumor Hospital of Shaanxi Province or the First Affiliated Hospital of Xi'an Jiaotong University. Inclusion criteria were women newly diagnosed with breast cancer, aged 18 years or older, and Chinese speakers. The exclusion criteria were patients with other comorbid non-breast tumors, breast diseases, or cognitive disorders (screened by a blinded psychiatrist according to the criteria of the DSM-5.). The required sample size was estimated based on the metric of 5 to 10 participants per item in a validated instrument [23] to ensure sufficient power. Considering that the largest instrument used has 36 items, the appropriate sample size should be 180 to 360 patients.

Measurements

We used four existing instruments to assess HRQoL, resilience, PSS, and CS.

Functional Assessment of Cancer Therapy-Breast version 4.0

Patients' HRQoL was measured by the 36-item Chinese Functional Assessment of Cancer Therapy–Breast version 4.0 (FACT-Bv4.0). Each item is rated on a 5-point Likert scale (0 = not at all, 4 = very much). The items are divided into five subscales (i.e., social/family well-being [SWB], physical well-being [PWB], functional well-being [FWB], emotional well-being [EWB], and breast cancer-specific [BCS] concerns) [24]. The FACT-Bv4.0 total score (ranging from 0 to 144) is the sum of the five subscales scores, with a higher score indicating better HRQoL [25]. A validation study of the Chinese FACT-Bv4.0 resulted in higher reliability (Cronbach's α of the five subscales ranges from 0.59 to 0.85) and satisfactory validity [25]. In this study, the Cronbach's α for the overall scale was 0.93 and, for each of the five subscales, it was 0.85 (PWB), 0.91 (SWB), 0.86 (EWB), 0.89 (FWB), and 0.70 (BCS).

Connor–Davidson Resilience scale

The 25-item Chinese Connor–Davidson Resilience Scale (CD-RISC) was used to measure psychological resilience. Responses are indicated on a 5-point Likert-type scale, ranging from 0 (not true at all) to 4 (true nearly all the time). Items are divided into three subscales—tenacity, self-reliance, and optimism. The total score ranges from 0 to 100, with a higher score reflecting higher resilience [26]. The Chinese CD-RISC also has high reliability (Cronbach's α = 0.91) and satisfactory validity [26]. In this study, the Cronbach's α values were 0.95 (CD-RISC), 0.92 (tenacity), 0.77 (self-reliance), and 0.88 (optimism).

Multidimensional Scale of Perceived Social Support

The 12-item Chinese Multidimensional Scale of Perceived Social Support (MSPSS) measures perceived support from family, friends, and significant others. Items are rated on a 7-point Likert scale (1 = very strongly disagree, 7 = very strongly agree). The total score is the sum of all items, ranging from 12 to 84, with a higher score indicating higher PSS [27]. The Chinese MSPSS has been well validated in university students (Cronbach's $\alpha = 0.92$) [28] and in patients with methadone maintenance treatment (Cronbach's $\alpha = 0.92$) [29]. In this study, the Cronbach's α values were 0.93 (MSPSS), 0.91 (family support), 0.90 (friends support), and 0.93 (significant others support).

Medical Coping Mode questionnaire

The 20-item Chinese Medical Coping Mode questionnaire (MCMQ) was used to assess the CS of patients with breast cancer. It has three subscales, namely confrontation, avoidance, and resignation, with a higher subscale score indicating more confrontation, avoidance, or resignation, respectively [30]. The Chinese MCMQs have satisfactory psychometric properties (Cronbach's α was 0.76) [30]. In this study, the Cronbach's α for the three subscales were 0.70 (confrontation), 0.72 (avoidance), and 0.88 (resignation).

Data collection and analysis

Data were collected from March to December 2019. Patients were instructed to complete the questionnaires independently. If the patient had difficulties in reading or writing, a trained data collector read the items to the patient and recorded their responses.

Categorical variables were summarized using frequencies and percentages, while continuous variables were summarized using mean and standard deviation (SD). A one-sample t -test was utilized to compare the total score of the CD-RISC and MSPSS, and the three subscales scores of the MCMQ with the corresponding normative data. A multivariate linear regression analysis was performed to identify the influence of resilience, PSS, and CS on HRQoL when controlling for socio-demographics and clinical characteristics.

Structural equation modeling (SEM) was employed using the maximum likelihood bootstrapping method [30] to examine the mediating role of PSS and CS on the relationship between resilience and HRQoL. Standardized direct, indirect, and total effects, and R^2 with a corresponding 95% bias-corrected confidence interval were estimated based on 1 000 random samples (bootstrapping method subsample) generated by computer [31, 32]. The mediating roles were examined via three stages [33]: 1) significant direct effects of resilience (independent variable), PSS, and CS (mediators); 2) significant direct effects of resilience on HRQoL (outcome variable); and 3) significant indirect effects of resilience and direct effects of PSS and CS on HRQoL. The model fit was examined with χ^2 value (desired significance $P > 0.05$), adjusted goodness-of-fit index (AGFI; desired value ≥ 0.90), and root mean square error of approximation

(RMSEA; desired value < 0.08) [32]. The data were analyzed using SPSS 25.0 and AMOS 21.0 (IBM Corp., Armonk, NY). A value of $P < 0.05$ (two-tailed) was considered statistically significant.

Ethical statement

The Human Research Ethics Committee of Xi'an Jiaotong University reviewed and approved the study protocol (2018-9800). Written informed consent was obtained from each patient before administering the questionnaire survey. Furthermore, the study conforms to the standards contained in the Declaration of Helsinki, as amended.

Results

A total of 440 patients met the eligibility criteria and 431 (98.0%) completed the questionnaires with no missing data; 127 (29.5%) were from the Tumor Hospital of Shaanxi Province, and 304 (70.5%) were from the First Affiliated Hospital of Xi'an Jiaotong University. Nine patients were excluded due to comorbid non-breast tumors ($n = 3$), other breast disease ($n = 4$), and refusal to provide written informed consent ($n = 2$). Table 1 summarizes the socio-demographic, clinical characteristics, and results for the four questionnaires used in the data analysis of the sample. Table 2 shows the comparisons of resilience, social support, coping style, and corresponding norms.

[Table 1 near here]

[Table 2 near here]

After controlling for the socio-demographic and clinical characteristics, resilience, PSS, and CS (i.e., confrontation, resignation) significantly influenced HRQoL, with R^2 of 0.64 (Model A), 0.64 (Model B), and 0.66 (Model C; $P < 0.001$; Table 3).

[Table 3 near here]

Figure 2 illustrates the SEM analysis that further showed resilience had significant direct effects on PSS, CS, and HRQoL; resilience had significant indirect effects (B s ranged from 0.09 to 0.27. $P < 0.01$), and PSS and CS had significant direct effects on HRQoL ($P < 0.05$). The model fit indices were all satisfied (Figure 2).

[Figure 2 near here]

Discussion

After controlling for socio-demographic and clinical characteristics, statistical analyses demonstrated that women newly diagnosed with breast cancer had poor HRQoL, which was significantly influenced by

resilience, PSS, and CS (confrontation and resignation). Additionally, PSS and CS (confrontation and resignation) mediated the relationship between resilience and HRQoL.

Based on the NSM, we constructed three models to examine the mediator role of PSS and CS. The SEM analysis further identified the mediating roles of PSS and CS in the relationship between resilience and HRQoL. First, in the three SEM models, resilience had significant direct effects on PSS, CS (i.e., confrontation and resignation), and HRQoL. This supports the first and second stages of the mediator role analysis [33]. Second, resilience had significant indirect effects, and PSS and CS (confrontation and resignation) had significant direct effects on HRQoL, thus supporting the third stage of the mediator role analysis [33]. These findings support our second hypothesis that PSS and CS mediated the relationship between resilience and HRQoL. This indicates that higher PSS and the confrontation CS would strengthen the positive influence of resilience on HRQoL. Accordingly, interventions for improving PSS and enhancing the confrontation CS should be prioritized when developing HRQoL improvement programs. Previous studies have reported the mediating role of social support between resilience and HRQoL [34]. However, to the best of our knowledge, no previous studies have reported the mediating roles of CS, or PSS and CS in the relationship between resilience and HRQoL in similar samples of breast cancer patients [16, 35, 36]. Therefore, our findings provide new evidence for identifying the mediator roles of psychosocial factors in the relationship between resilience and HRQoL and for developing multimodal intervention programs that consider PSS and CS to improve the positive influences of resilience on HRQoL in women with newly diagnosed breast cancer.

The results with regard to poor HRQoL showed that functional well-being had the lowest score among the five subscales. This demonstrates that newly diagnosed women with breast cancer had the most prominent decrease in functional health. The emotional, social/family, and physical well-being subscales were also affected negatively during the disease course. The findings were consistent with prior research [7, 18] that indicated breast cancer patients had difficulties with physical, psychological, and social functioning.

Although the breast cancer-specific subscales for additional concerns had the highest scores among the five subscales, which is consistent with our previous studies [37, 38], more attention should be devoted to the lower health domain scores in physical, social/family, emotional, and functional well-being that might be the result of concerns about potential future surgery and adjuvant therapy in clinical care for newly diagnosed patients.

The patients had lower resilience and PSS, and higher negative CSs (i.e., avoidance and resignation) than that of the corresponding norm. These findings were consistent with previous studies [5, 13–16]. Closer inspection of the CD-RISC, MSPSS, and MCMQ subscales suggests that some patients were tenacious, perceived strong family support, and selected confrontation as their CS while dealing with the disease. Strong family support may be beneficial to improve the patient's resilience. Considering the significance of family networks in China, it is necessary to further focus on enhancing family resilience for the patients in breast cancer care [39, 40]. However, patients with lower optimism and higher negative CS (i.e.,

avoidance and resignation) scores are a concerning group. The aforementioned findings suggest that psychosocial interventions should focus on improving poor resilience and changing the negative CSs of women newly diagnosed with breast cancer [41–43].

The finding that resilience, PSS, and CS (i.e., confrontation and resignation) had significant influences on HRQoL is consistent with previous research [44–46], and partially supports our first hypothesis that psychosocial factors are independent predictors of HRQoL. However, the avoidance CS did not significantly influence HRQoL. This may be because newly diagnosed patients chose the confrontation CS to deal with their health problems, as the confrontation CS score is closer to that of the norm. Although it has been reported that negative CSs are negatively associated with HRQoL [47], the insignificant impacts of avoidance in women with newly diagnosed breast cancer in this study needs further examination.

This study has some limitations. First, the self-reported data of HRQoL, resilience, PSS, and CS lack objectivity. Information on related behaviors and physical health changes are recommended in future work. Second, the relationships among the above variables were possibly inflated due to response bias. Third, this cross-sectional study design could not support causal relationships among variables. Thus, their relationship trajectories during the long-term rehabilitation process should be further explored in longitudinal studies. Fourth, the mediator role of PSS and CS was analyzed based on the NSM, thus, the results might be different without the NSM, which need to be further explored in future work. Finally, the study was conducted in Xi'an, thus limiting the generalization of the findings to all women newly diagnosed with breast cancer. A multicenter design is recommended to enhance generalizability.

Conclusion

The patients in our study had relatively poor HRQoL, lower resilience and PSS, and higher avoidance and resignation CSs. Resilience, PSS, and CS had significant direct effects on HRQoL, with PSS and CS mediating the influence of resilience on HRQoL. A multimodal intervention program focusing on PSS and CS needs to be developed to improve the positive influence of resilience on HRQoL in breast cancer patients.

Abbreviations

PSS - Perceived Social Support

AGFI Adjusted Goodness-of-Fit Index

BCS - Breast Cancer-Specific

CD-RISC - Connor–Davidson Resilience Scale

CS - Coping Style

EWB - Emotional Well-Being

FACT-Bv4.0 - Functional Assessment of Cancer Therapy–Breast version 4.0

FWB - Functional Well-Being

HRQoL - Health-Related Quality of Life

MCMQ - Medical Coping Mode questionnaire

MSPSS - Multidimensional Scale of Perceived Social Support

NSM - Neuman Systems Model

PWB - Physical Well-Being

RMSEA - Root Mean Square Error of Approximation

SD - Standard Deviation

SEM - Structural Equation Modeling

SWB - Social Well-Being

Declarations

Ethics approval and consent to participate: The Human Research Ethics Committee of Xi'an Jiaotong University reviewed and approved the study protocol (2018-9800). Written informed consent was obtained from each patient before administering the questionnaire survey. Furthermore, the study conforms to the standards contained in the Declaration of Helsinki, as amended.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Author Contributions: KZ and XL designed the study. LL, WZ, XB, MZ, and DH collected the data. KZ analyzed and interpreted the data, and prepared the manuscript draft. KZ and XL revised the manuscript. All authors read and approved the final manuscript.

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References

1. Oh PJ, Cho JR. Changes in fatigue, psychological distress, and quality of life after chemotherapy in women with breast cancer: A prospective study. *Cancer Nurs*. 2020;43(1):e54–e60. doi: 10.1097/NCC.0000000000000689
2. Shim E-J, Jeong D, Moon HG, Noh D-Y, Jung S-Y, Lee E, et al. Profiles of depressive symptoms and the association with anxiety and quality of life in breast cancer survivors: A latent profile analysis. *Qual Life Res*. 2020;29(2):421–9. doi: 10.1007/s11136-019-02330-6
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. *CA Cancer J Clin*. 2020;70(1):7–30. doi: 10.3322/caac.21590
4. Tu PC, Yeh DC, Hsieh HC. Positive psychological changes after breast cancer diagnosis and treatment: The role of trait resilience and coping styles. *J Psychosoc Oncol*. 2020;38(2):156–70. doi: 10.1080/07347332.2019.1649337
5. Padilla-Ruiz M, Ruiz-Román C, Pérez-Ruiz E, Rueda A, Redondo M, Rivas-Ruiz F. Clinical and sociodemographic factors that may influence the resilience of women surviving breast cancer: Cross-sectional study. *Support Care Cancer*. 2019;27(4):1279–86. doi: 10.1007/s00520-018-4612-4
6. Huang Y, Huang Y, Bao M, Zheng S, Du T, Wu K. Psychological resilience of women after breast cancer surgery: A cross-sectional study of associated influencing factors. *Psychol Health Med*. 2019;24(7):866–78. doi: 10.1080/13548506.2019.1574353.
7. Edward KL, Chipman M, Giandinoto JA, Robinson K. Quality of life and personal resilience in the first two years after breast cancer diagnosis: Systematic integrative review. *Br J Nurs*. 2019;28(10):s4–s14. doi: 12968/bjon.2019.28.10.S4
8. Hashemi S-M, Rafiemanesh H, Aghamohammadi T, Badakhsh M, Amirshahi M, Sari M, et al. Prevalence of anxiety among breast cancer patients: A systematic review and meta-analysis. *Breast Cancer*. 2020;27(2):166–78. doi: 10.1007/s12282-019-01031-9

9. Pilevarzadeh M, Amirshahi M, Afsargharehbagh R, Rafiemanesh H, Hashemi SM, Balouchi A. Global prevalence of depression among breast cancer patients: A systematic review and meta-analysis. *Breast Cancer Res Treat.* 2019;176(3):519–33. doi: 10.1007/s10549-019-05271-3
10. Cruickshank S, Steel E, Fenlon D, Armes J, Banks E, Humphris G. Specialist breast cancer nurses' views on implementing a fear of cancer recurrence intervention in practice: A mixed methods study. *Support Care Cancer.* 2020;28(1):201–10. doi: 10.1007/s00520-019-04762-9
11. Niu L, Liang Y, Niu M. Factors influencing fear of cancer recurrence in patients with breast cancer: Evidence from a survey in Yancheng, China. *J Obstet Gynaecol Res.* 2019;45(7):1319–27. doi: 10.1111/jog.13978
12. Akin S, Kas Guner C. Investigation of the relationship among fatigue, self-efficacy and quality of life during chemotherapy in patients with breast, lung or gastrointestinal cancer. *Eur J Cancer Care* 2019;28(1):e12898. doi: 10.1111/ecc.12898
13. Oh GH, Yeom C-W, Shim E-J. The effect of perceived social support on chemotherapy-related symptoms in patients with breast cancer: A prospective observational study. *J Psychosom Res.* 2020;130:109911. doi: 10.1016/j.jpsychores.2019.109911
14. Mishra VS, Saranath D. Association between demographic features and perceived social support in the mental adjustment to breast cancer. *Psychooncology.* 2019;28(3):629–34. doi: 10.1002/pon.5001
15. Gall TL, Bilodeau C. The role of positive and negative religious/spiritual coping in women's adjustment to breast cancer: A longitudinal study. *J Psychosoc Oncol.* 2020;38(1):103–17. doi: 10.1080/07347332.2019.1641581
16. Lai HL, Hung CM, Chen CI, Shih ML, Huang CY. Resilience and coping styles as predictors of health outcomes in breast cancer patients: A structural equation modelling analysis. *Eur J Cancer Care* 2020;29(1):e13161. doi: 10.1111/ecc.13161
17. Fradelos EC, Latsou D, Mitsi D, Tsaras K, Lekka D, Lavdaniti M, et al. Assessment of the relation between religiosity, mental health, and psychological resilience in breast cancer patients. *Contemp Oncol.* 2018;22(3):172–7. doi: 10.5114/wo.2018.78947
18. Hashemi S-M, Balouchi A, Al-Mawali A. Health-related quality of life of breast cancer patients in the Eastern Mediterranean region: A systematic review and meta-analysis. *Breast Cancer Res Treat.* 2019;174(3):585–96. doi: 10.1007/s10549-019-05131-0
19. Ahadzadeh AS, Sharif SP. Uncertainty and quality of life in women with breast cancer: Moderating role of coping styles. *Cancer Nurs.* 2018;41(6):484–90. doi: 10.1097/NCC.0000000000000552
20. Zhang H, Zhao Q, Cao P, Ren G. Resilience and quality of life: Exploring the mediator role of social support in patients with breast cancer. *Med Sci Monit.* 2017;23:5969–79. doi: 10.12659/msm.907730
21. Neuman B. The Neuman systems model in research and practice. *Nurs Sci Q.* 1996;9(2):67–70. doi: 10.1177/089431849600900207

22. Bourdeanu L, Dee V. Assessment of chemotherapy-induced nausea and vomiting in women with breast cancer: A Neuman Systems Model framework. *Res Theory Nurs Pract*. 2013;27(4):296–304. doi: 10.1891/1541-6577.27.4.296
23. Yan H. *Medical Statistics*, 3rd ed. Beijing: People's Medical Publishing House; 2015.
24. Wan C, Zhang D, Yang Z. Validation of the simplified Chinese version of the FACT-B for measuring quality of life for patients with breast cancer. *Breast Cancer Res Treat*. 2007;106(3):413–8. doi: 10.1007/s10549-007-9511-1
25. Brady MJ, Cella DF, Mo F, Bonomi AE, Tulsky DS, Lloyd SR, et al. Reliability and validity of the Functional Assessment of Cancer Therapy-Breast quality-of-life instrument. *J Clin Oncol*. 1997;15(3):974–86. doi: 10.1200/JCO.1997.15.3.974
26. Yu XN, Lau JT, Mak WW, Zhang J, Lui WW, Zhang J. Factor structure and psychometric properties of the Connor-Davidson Resilience Scale among Chinese adolescents. *Compr Psychiatry*. 2011;52(2):218–24. doi: 10.1016/j.comppsy.2010.05.010
27. Chen Y, Ma H, Chen Z, Jia Y, Wang X, Chen J. Reliability and validity of Chinese version of multidimensional scale of perceived social support in elderly people with chronic disease. *J Nurs*. 2018;25(18):5–8. doi: 10.16460/j.issn1008-9969.2018.18.005
28. Guan NC, Seng LH, Hway AY, Hui KO. Factorial validity and reliability of the Malaysian simplified Chinese version of Multidimensional Scale of Perceived Social Support (MSPSS-SCV) among a group of university students. *Asia Pac J Public Health*. 2015;27(2):225–31. doi: 10.1177/1010539513477684
29. Zhou K, Li H, Wei X. Reliability and validity of the multidimensional scale of perceived social support in Chinese mainland patients with methadone maintenance treatment. *Compr Psychiatry*. 2015;60:182–8. doi: 10.1016/j.comppsy.2015.03.007
30. Shen X, Jiang Q. Report on application of Chinese version of MCMQ in 701 patients. *Chin J Behav Med Sci*. 2000;9(1):18–20.
31. Zhang P. *Statistical analysis based on bootstrap method*. J Yibin University. 2011;11:31–3.
32. Wu ML. *Structural equation modeling: AMOS operation and application*, 2nd ed. Chongqing: Chongqing University Press; 2010
33. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical consideration. *J Pers Soc Psychol*. 1986;51(6):1173–82. doi: 10.1037//0022-3514.51.6.1173
34. Wang Z, Xu J. Association between resilience and quality of life in Wenchuan earthquake Shidu parents: The mediating role of social support. *Community Ment Health J*. 2017;53(7):859–63. doi: 10.1007/s10597-017-0099-6
35. Lee JH, Kim HY. Symptom distress and coping in young Korean breast cancer survivors: The mediating effects of social support and resilience. *J Korean Acad Nurs*. 2018;48(2):241–53. doi: 10.4040/jkan.2018.48.2.241

36. Dooley LN, Slavich GM, Moreno PI, Bower JE. Strength through adversity: Moderate lifetime stress exposure is associated with psychological resilience in breast cancer survivors. *Stress Health*. 2017;33(5):549–57. doi: 10.1002/smi.2739
37. Zhou K, Wang W, An J, Li M, Li J, Li X. Effects of progressive upper limb exercises and muscle relaxation training on upper limb function and health-related quality of life following surgery in women with breast cancer: A clinical randomized controlled trial. *Ann Surg Oncol*. 2019;26(7):2156–65. doi: 10.1245/s10434-019-07305-y
38. Zhou K, Wang W, Zhao W. Benefits of a WeChat-based multimodal nursing program on early rehabilitation in postoperative women with breast cancer: A clinical randomized controlled trial. *Int J Nurs Stud*. 2020;106:103565. doi: 10.1016/j.ijnurstu.2020.103565
39. Li Y, Qiao Y, Luan X, Li S, Wang K. Family resilience and psychological well-being among Chinese breast cancer survivors and their caregivers. *Eur J Cancer Care*. 2019;28(2):e12984. doi: 10.1111/ecc.12984
40. Li Y, Wang K, Yin Y, Li Y, Li S. Relationships between family resilience, breast cancer survivors' individual resilience, and caregiver burden: A cross-sectional study. *Int J Nurs Stud*. 2018;88:79–84. doi: 10.1016/j.ijnurstu.2018.08.011
41. Wu Z, Liu Y, Li X, Li X. Resilience and associated factors among Mainland Chinese women newly diagnosed with breast cancer. *PLoS One*. 2016;11(12):e0167976. doi: 10.1371/journal.pone.0167976
42. Lam WW, Bonanno GA, Mancini AD, Ho S, Chan M, Hung WK, et al. Trajectories of psychological distress among Chinese women diagnosed with breast cancer. *Psychooncology*. 2010;19(10):1044–51. doi: 10.1002/pon.1658
43. Li L, Li S, Wang Y, Yi J, Yang Y, He J, Zhu X. Coping profiles differentiate psychological adjustment in Chinese women newly diagnosed with breast cancer. *Integr Cancer Ther*. 2017;16(2):196–204. doi: 10.1177/1534735416646854
44. Wang Y, Zhao Y, Xie S, Wang X, Chen Q, Xia X. Resilience mediates the relationship between social support and quality of life in patients with primary glaucoma. *Front Psychiatry*. 2019;10:22. doi: 10.3389/fpsy.2019.00022
45. Wu M, Yang Y, Zhang D. Association between social support and health-related quality of life among Chinese rural elders in nursing homes: The mediating role of resilience. *Qual Life Res*. 2018;27(3):783–92. doi: 10.1007/s11136-017-1730-2
46. Pan CJ, Liu HC, Liang SY, Liu CY, Wu WW, Cheng SF. Resilience and coping strategies influencing the quality of life in patients with brain tumor. *Clin Nurs Res*. 2019;28(1):107–24. doi: 10.1177/1054773817714562
47. Toscano A, Blanchin M, Bourdon M, Bonnaud Antignac A, Sebillle V. Longitudinal associations between coping strategies, locus of control and health-related quality of life in patients with breast cancer or melanoma. *Qual Life Res*. 2020;29(5):1271–9. doi: 10.1007/s11136-019-02401-8

Tables

Table 1. Participants' socio-demographic, clinical characteristics, and summary results for the four questionnaires ($N = 431$)

	Mean $\pm$ SD	<i>n</i> (%)
Socio-Demographic Characteristics		
Age (years; mean $\pm$ SD ^a ; range: 27-77)	48.26 $\pm$ 10.40	
Education Level		
Primary & Below		90 (20.9)
Secondary		278 (64.5)
Tertiary		63 (14.6)
Marital status		
Married		425 (98.6)
Other Marital Status		6 (1.4)
Has Children		
Yes		416 (96.5)
No		15 (3.5)
Employment Status		
Unemployed		170 (39.4)
Retired		54 (12.5)
Employed		207 (48.1)
Average monthly income over the past 12 months (Chinese Yuan)		
<3000		170 (39.4)
3000-6000		194 (45.0)

6001-9000	52 (12.1)
>9000	15 (3.5)
Place of Residence	
Urban	207 (48.0)
Rural	224 (52.0)
Chronic Disease (disease course > 6 months)	
Yes	28 (6.5)
No	403 (93.5)
Clinical Characteristics	
Illness Stage	
0-I	134 (31.1)
II	203 (47.1)
III	66 (15.3)
IV	28 (6.5)
Metastasis	
No Metastasis	285 (66.1)
Axillary	119 (27.6)
Other Metastasis	27 (6.3)
Surgical Style	
No Surgery	146 (33.9)
Modified Radical Mastectomy	203

	(47.1)
Simple Mastectomy	60 (13.9)
Breast Conservation	23 (5.3)
Adjuvant Therapy	
Conventional Chemotherapy	381 (88.4)
Neoadjuvant Chemotherapy	26 (6.0)
Radio Therapy	151 (35.0)
Endocrine Therapy	231 (53.6)
Targeted Therapy	47 (10.9)
HRQoL^b	
Physical Well-Being	17.75 ± 4.91
Social/Family Well-Being	17.66 ± 5.95
Emotional Well-Being	14.29 ± 4.48
Functional Well-Being	13.24 ± 5.04
Breast-Cancer-Specific	24.81 ± 3.97
Subscales for additional concerns	
FACT-Bv4.0 ^c Total Score	87.74 ± 18.69
Resilience	
Tenacity	27.51 ± 8.19
Self-Reliance	16.84 ± 4.42
Optimism	10.37 ± 3.06
CD-RISC ^d Total Score	54.72 ± 14.71
Perceived Social Support	

Family support	24.16 ± 3.24
Friends support	20.76 ± 4.00
Significant others support	20.52 ± 4.17
MSPSS ^e total score	65.45 ± 9.40
Coping Style	
Confrontation	19.87 ± 3.73
Avoidance	16.70 ± 1.90
Resignation	9.57 ± 2.87

- ^a SD: standard deviation
- ^b health-related quality of life
- ^c Functional Assessment of Cancer Therapy–Breast version 4.0
- ^d Connor-Davidson Resilience scale
- ^e Multidimensional Scale of Perceived Social Support

Table 2. Comparisons of resilience, social support, coping styles, and corresponding norms (*N* = 431)

	Score	Norm	MD ^a	95% CI ^b	<i>P</i>
	Mean $\pm$ SD				
Resilience		(<i>N</i> = 560) ^e			
CD-RISC ^c Total Score	54.72 $\pm$ 14.71	65.4 $\pm$ 13.9	-10.68	-12.59, -8.77	<0.001
Perceived Social Support		(<i>N</i> = 1589) ^f			
MSPSS ^d total score	65.45 $\pm$ 9.40	68.91 $\pm$ 11.99	-3.46	-4.68, -2.24	<0.001
Coping Style		(<i>N</i> = 701) ^g			
Confrontation	19.87 $\pm$ 3.73	19.48 $\pm$ 3.81	0.39	-0.10, 0.87	0.12
Avoidance	16.70 $\pm$ 1.90	14.44 $\pm$ 2.97	2.25	2.01, 2.50	<0.001
Resignation	9.57 $\pm$ 2.87	8.81 $\pm$ 3.17	0.76	0.39, 1.13	<0.001

^a mean difference

^b confidence interval

^c Connor-Davidson Resilience scale

^d Multidimensional Scale of Perceived Social Support

^e Adapted from: Ren Y, Zhou Y, Ma C, et al. Influence of psychological resilience on job satisfaction of nurses. Chin Nurs Res. 2014;28(1C): 293-4.

^f Adapted from: Wang Y, Liu C. The mediating effects of social support and coping style between nurses' personality characteristics and mental health. Chin J Nurs Educ. 2019;16(7): 536-40.

^g Adapted from: Shen X, Jiang Q. Report on application of Chinese version of MCMQ in 701 patients. Chin J Behav Med Sci. 2000;9(1):18-20.

Table 3. Independent predictors of health-related quality of life ($N = 431$)

Independent Variables	B (95% CI) ^d	P
Model A^a		
Resilience	0.75 (0.59, 0.92)	<0.001
Perceived Social Support	0.29 (0.06, 0.51)	0.014
Coping Style (Confrontation)	0.60 (0.01, 1.19)	0.046
Model B^b		
Resilience	0.81 (0.66, 0.97)	<0.001
Perceived Social Support	0.28 (0.05, 0.51)	0.016
Coping Style (Avoidance)	0.82 (-0.07, 1.71)	0.070
Model C^c		
Resilience	0.64 (0.47, 0.81)	<0.001
Perceived Social Support	0.22 (0.002, 0.45)	0.048
Coping Style (Resignation)	-1.68 (-2.48, -0.89)	<0.001

A multivariate linear regression analysis was performed after controlling for the following dummy variables: education level (ref. primary and below), marital status (ref. married), has children (ref. yes), employment status (ref. unemployed), average monthly income over the past 12 months (Chinese Yuan) (ref. <3000), place of residence (ref. urban), chronic disease (ref. yes), illness stage (ref. 0-I), metastasis (ref. no metastasis), surgical style (ref. no surgery), adjuvant therapy (ref. conventional chemotherapy), and continuous characteristics (age).

^a $R = 0.80$, $R^2 = 0.64$, $F = 14.33$, $P < 0.001$.

^b $R = 0.80$, $R^2 = 0.64$, $F = 14.25$, $P < 0.001$.

^c $R = 0.81$, $R^2 = 0.66$, $F = 15.76$, $P < 0.001$.

^d confidence interval

Figures

Figure 1

Theoretical framework of the mediating factor model regarding health-related quality of life

Figure 2

Mediator roles of perceived social support and coping style. Indirect effect: Model (a): $B = 0.15$, 95% CI [0.08, 0.23], $P = 0.002$; Model (b): $B = 0.09$, 95% CI [0.03, 0.15], $P = 0.005$; Model (c): $B = 0.27$, 95% CI [0.19, 0.36], $P = 0.002$. Total effect of each of the three models: $B = 0.72$, 95% CI [0.65, 0.78], $P = 0.002$. (AGFI: adjusted goodness-of-fit index; reference value: ≥ 0.90 . df: degree of freedom. RMSEA: root mean square error of approximation; reference value: < 0.08 . χ^2 value (desired significance $P > 0.05$). 95% CI: 95% confidence interval. B: standardized regression weights.)