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*Original Article*

# The factors influencing psychological resilience in breast cancer patients undergoing mastectomy and the effects of mindfulness-based stress reduction on the patients' psychological resilience and anxiety

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**Abstract:** Objective: This paper aims to explore the factors influencing psychological resilience in breast cancer (BC) patients undergoing mastectomy, and aims to investigate the effects of mindfulness-based stress reduction (MBSR) on the patients' psychological resilience and anxiety. Methods: Eighty-eight BC patients admitted to the Mammary Surgery Department and who underwent mastectomies were recruited for this prospective study. The factors influencing psychological resilience in the patients were observed. Before the intervention, we studied the correlation of the patients' Psychological Resilience Scale (PRS) scores with their Self-Rating Anxiety Scale (SAS) scores. 44 of the patients were randomly selected to undergo routine nursing (the control group) and the other 44 patients underwent nursing with MBSR (the observation group), in order to compare the effects of MBSR on the patients' PRS and SAS scores and their sleep quality before and after the intervention. Results: According to a multivariate regression analysis, their ages, monthly income, payment methods for medical expenses, and SAS scores were the factors influencing the psychological resilience of the BC patients undergoing mastectomy ($P<0.05$). There was a negative correlation between the patients' PRS and SAS scores ($r=-0.310$, $P=0.003$). After the treatment, compared with the control group, the PRS scores rose and were higher in the observation group, but the SAS scores decreased and were lower in the group ($P<0.05$). After the treatment, the improvement in sleep quality in the observation group was better than it was in the control group ($P<0.05$). Conclusion: Age, low monthly income, and self-paying for medical expenses are the factors that affect the psychological resilience of BC patients undergoing mastectomies, and their psychological resilience is negatively correlated with their anxiety. MBSR can enhance the patients' psychological resilience, relieve their anxiety, and improve their sleep quality.

**Keywords:** Breast cancer, mastectomy, psychological resilience, mindfulness-based stress reduction, anxiety, influencing factors

## Introduction

Of all new-onset tumors, the number of patients with breast cancer (BC) accounts for 11.4%, and the number of deaths from the disease accounts for 6.6%, so it is one of the most common malignant tumors that threatens women's health and causes their deaths [1-3]. BC has an annually increasing incidence in females, and it is becoming more common in young people [4, 5].

According to previous studies, cancer patients are under tremendous pressure both physically and mentally during their diagnosis and treatment, and the great pressure the disease causes easily results in anxiety, depression, despair, and even suicidal tendencies. These mental issues have different degrees of influences on the patients' mental health and quality of life, and eventually lead to an increase in the mortality rate [6]. Since the breast is an external feature unique to women, BC patients, after a mastectomy, are more prone to suffer from psychological diseases such as anxiety and depression, due to changes in their external features [7]. The incidence of mental illness in BC patients is 10-20%, and this figure

is higher in those undergoing mastectomy [8]. Therefore, the psychological problems of BC patients are getting more clinical attention.

Psychological resilience refers to an individual's ability to maintain a good attitude in a difficult and dangerous environment, and it can be used to assess the patients' adaptability and attitude towards diseases [9, 10]. Additionally, it is negatively correlated with patients' anxiety [11]. A type of systematic psychotherapy, mindfulness-based stress reduction (MBSR) is markedly effective in relieving stress, regulating emotions, and helping patients adapt to clinical treatment, so it has been widely applied to treat BC patients in recent years [12, 13]. As reported by in earlier studies, the psychological resilience of BC patients is related to their ages, incomes, payment methods, and living in rural areas, but there is no correlative study on the influencing factors of psychological resilience in those patients after mastectomy at present [14]. In this study, the influencing factors were further observed, and the effects of MBSR on the patients' psychological resilience and anxiety were also explored.

## Materials and methods

### *General information*

Eighty-eight BC patients admitted to the Mammary Surgery Department of Baoji Central Hospital and who underwent a mastectomy from March 2017 to April 2020 were recruited for this prospective study. 44 of the patients underwent routine nursing (the control group), and the other 44 patients underwent nursing with MBSR (the observation group). They were ranged in age between 26 and 70 years old, with an average age of 48.2±9.7. All the patients signed an informed consent form. This study was approved by the hospital's ethics committee.

### *Inclusion and exclusion criteria*

The inclusion criteria were as follows: (1) Patients who were diagnosed with BC and whose TNM staging standards referred to the *CACA Guidelines for Breast Cancer* [15], (2) Patients >18 years old, (3) Patients who underwent radical mastectomy, (4) Patients treated with chemotherapy and who recovered well half a month after the surgery. The exclusion criteria were as follows: (1) Patients with incomplete clinical data, (2) Patients with severe cardiac, hepatic, renal, or other diseases, (3) Patients who could not cooperate because of mental disorders or cerebrovascular diseases, (4) Patients who had difficulties in or who were inconvenient to follow up, (5) Patients who were also suffering from other cancers.

### *Methods*

*Collection of the general data and relevant information:* First, the general data and relevant information of the included patients were collected through questionnaires, which included age, educational backgrounds, living areas, family (monthly) incomes, payment methods, current marital status, tumor staging, and other basic and clinical data. The Psychological Resilience Scale (PRS, ≥80 points for good psychological resilience, <80 points for poor psychological resilience) and the Self-Rating Anxiety Scale (SAS, higher scores for more serious anxiety) were used to assess the patients' psychological resilience and anxiety states.

*Random grouping after administering the questionnaires*: 1. The routine nursing plans during the postoperative chemotherapy were as follows: (1) After their mastectomies, the patients were subjected to routine chemotherapy, during which their vital signs were measured. The nursing staff made rounds three times a day and promptly reported condition changes to the doctor. (2) The living environment was monitored, and the wards were kept clean and tidy and relatively comfortable. (3) Dietary guidance: The patients were informed of their food intake requirements according to their different situations, so as to avoid eating spicy and irritating. (4) Guidance on chemotherapeutic drugs: The staff informed the patients of the drugs' dosages, times, and adverse reactions. 2. In addition to the routine nursing, the patients in the observation group underwent MBSR for psychological intervention. (1) Sitting silently: The patient assumed a sitting position on the floor or bed, and the patients perceived their own breathing, gradually shifted their attention to their abdomen to feel its ups and downs, and then shifted their attention to the thoughts and emotions in the brain, and finally shifted it to their breathing. This process was

**Table 1.** A comparison of the factors influencing psychological resilience in breast cancer patients undergoing mastectomy

| Item | Number of cases | PRS scores | t/F | P |
|---|---|---|---|---|
| Age (years) | | | | |
| 18-40 | 19 | 68.26±6.91 | 9.021 | <0.001 |
| 41-60 | 48 | 75.60±9.28$^{aa}$ | | |
| ≥61 | 21 | 80.48±10.47$^{aaa,b}$ | | |
| Address | | | | |
| City | 52 | 77.94±10.10 | 3.303 | 0.001 |
| Rural | 36 | 71.19±8.34 | | |
| Monthly income | | | | |
| ≤5,000 | 29 | 72.71±9.26 | 3.563 | 0.001 |
| >5,000 | 59 | 80.21±9.51 | | |
| Educational background | | | | |
| Elementary school and below | 35 | 71.03±9.93 | 6.928 | <0.001 |
| Junior high | 26 | 74.73±7.98 | | |
| University | 12 | 78.08±9.23$^{c}$ | | |
| Above university | 15 | 83.33±8.52$^{ccc,dd}$ | | |
| Marital status | | | | |
| Unmarried | 30 | 74.83±11.42 | 0.338 | 0.798 |
| Married | 50 | 75.46±9.56 | | |
| Divorced | 5 | 77.40±3.51 | | |
| Widowed | 3 | 76.33±9.81 | | |
| Medical expenses payment method | | | | |
| Own expense | 39 | 71.18±8.45 | 6.459 | 0.002 |
| Medical insurance | 46 | 78.50±10.10$^{ee}$ | | |
| Business insurance | 3 | 76.33±9.07$^{e}$ | | |
| Tumor staging | | | | |
| Phase I | 7 | 72.00±9.27 | 1.177 | 0.313 |
| Phase II | 65 | 77.98±9.15 | | |
| Phase III | 16 | 76.19±10.83 | | |
| Occupations | | | | |
| Have | 58 | 70.70±9.54 | 3.197 | 0.002 |
| No | 30 | 77.50±9.41 | | |
| SAS scores | | | | |
| <50 | 31 | 79.56±9.45 | 2.740 | 0.008 |
| ≥50 | 57 | 73.65±9.78 | | |

Note: Compared with the 18-40 year olds, $^{aa}$P<0.01, $^{aaa}$P<0.001; compared with the 41-60 year olds, $^{b}$P<0.05; compared with elementary school and below, $^{c}$P<0.05, $^{ccc}$P<0.001; compared with junior high school, $^{dd}$P<0.01; compared with self-funded, $^{e}$P<0.05, $^{ee}$P<0.01. PRS: psychological resilience scale; SAS: self-rating anxiety scale.

performed repeatedly. (2) Body scanning: The patients concentrated on their heads, backs, feet, and breathing in sequence. (3) Mindfulness-based yoga training: The patients relaxed their minds and did mindfulness-based meditation while doing yoga training, in order to relax the body by stretching it. (4) Walking meditation: The application of mindfulness to daily walking activities required the patients to focus on their feet and to feel the contact between the soles of their feet and the ground during walking. Both during hospitalization and at home, the training time was 2-3 hours daily. During their hospitalization, the patients were instructed to perform MBSR training, and while at home, they were supervised and urged by the WeChat group to complete the training, which lasted for 6 weeks [16].

*Outcome measures*

(1) One-way analyses of variance (ANOVA) and multivariate logistic regression analyses were conducted on the factors influencing the psychological resilience in the BC patients after mastectomy. (2) Before the intervention, the correlation of the PRS scores and SAS scores was determined. (3) The PRS and SAS scores were compared between before and after the MBSR nursing intervention. (4) The Pittsburgh Sleep Quality Index (PSQI) scores were compared before and after the intervention. Lower scores indicate better sleep quality [17].

*Statistical methods*

SPSS 17.0 was used for the data analysis. Continuous variables were expressed as the

**Table 2.** Assignment table of independent variables in the factors influencing psychological resilience

| Factors | Independent variable | Assignment |
|---|---|---|
| Age (year) | X1 | ≤60 years =1, >60 years =0 |
| Address | X2 | rural =1, city =0 |
| Monthly income | X4 | ≤5,000=1, >5,000=0 |
| Educational background | X5 | High school and below =1, University and above =0 |
| Medical expenses payment method | X6 | Own expense =1, Medical insurance or Business insurance =0 |
| Profession | X7 | Have =1, no =0 |
| SAS scores | X8 | ≥50 scores =1, 50 scores =0 |

Note: SAS: self-rating anxiety scale.

**Table 3.** Multivariate logistic regression analysis of the psychological resilience in breast cancer patients undergoing mastectomy

| Factors | β | SE | Wald | OR (95% CI) | P |
|---|---|---|---|---|---|
| Age (years) | 1.834 | 0.798 | 6.621 | 0.156 (0.045-0.642) | 0.015 |
| Address | 0.803 | 0.802 | 1.073 | 2.278 (0.493-10.677) | 0.289 |
| Monthly incomes | 0.3107 | 0.854 | 12.834 | 0.065 (0.023-0.223) | <0.001 |
| Educational background | 1.162 | 0.711 | 2.721 | 3.233 (0.811-12.523) | 0.123 |
| Medical expenses payment method | 1.726 | 0.721 | 5.905 | 5.123 (1.412-22.722) | 0.024 |
| Profession | 0.178 | 0.752 | 0.064 | 0.834 (0.189-3.567) | 0.789 |
| SAS scores | 1.983 | 0.843 | 6.892 | 0.178 (0.079-0.689) | 0.006 |

Note: SAS: self-rating anxiety scale.

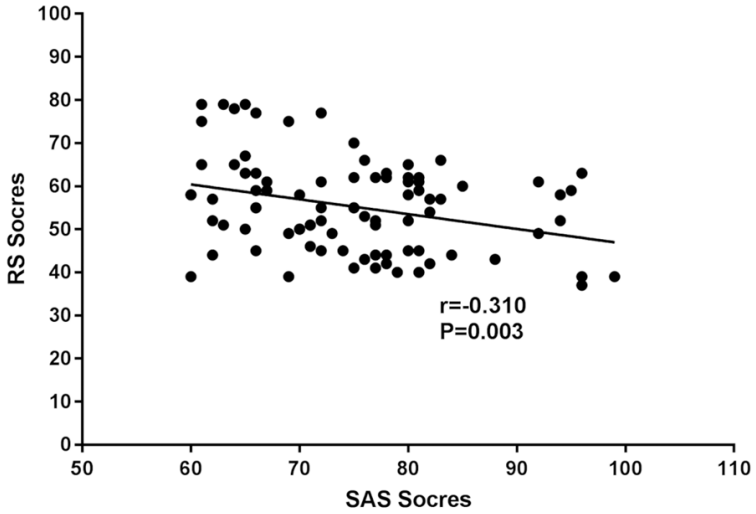


**Figure 1.** The correlation of the PRS scores with the SAS scores. PRS: psychological resilience scale; SAS: self-rating anxiety scale.

means ± standard deviation ($\bar{x}$ ± sd). The data that did not conform to a normal distribution were expressed as M (P25, P75), and those that conformed to normal distribution and homogeneity of variance were compared using independent samples t tests and expressed as t. The comparisons between groups were conducted using independent samples t tests, and the comparisons within groups before and after the intervention were conducted using paired t tests, and the comparisons between multiple groups were conducted using one-way ANOVA combined with post hoc Bonferroni tests. Those that did not conform to normal distribution and homogeneity of variance were compared using rank sum tests and expressed as $\chi^2$. The count data were compared using Pearson chi-square tests and expressed as chi-square. Pearson correlation analyses were used for the correlation of two variables, and a logistic regression analysis was used to determine the factors influencing the psychological resilience of BC patients after mastectomy. The variables with differences in one-way ANOVA were selected and screened by Ward.

**Table 4.** A comparison of the general patient information

| Item | Observation group (n=44) | Control group (n=44) | $\chi^2$/t | P |
|---|---|---|---|---|
| Age (years) | | | | |
| 18-40 | 8 | 11 | 0.605 | 0.739 |
| 41-60 | 25 | 23 | | |
| ≥61 | 11 | 10 | | |
| Address | | | | |
| City | 28 | 24 | 0.752 | 0.386 |
| Rural | 16 | 20 | | |
| Monthly income | | | | |
| ≤5,000 | 13 | 16 | 0.463 | 0.493 |
| >5,000 | 31 | 28 | | |
| Educational background | | | | |
| Elementary school and below | 20 | 15 | 2.868 | 0.412 |
| Junior high | 12 | 14 | | |
| University | 7 | 5 | | |
| Above university | 5 | 10 | | |
| Marital status | | | | |
| Unmarried | 17 | 13 | 1.387 | 0.709 |
| Married | 23 | 27 | | |
| Divorced | 2 | 3 | | |
| Widowed | 2 | 1 | | |
| Medical expenses payment method | | | | |
| Own expense | 21 | 18 | 0.651 | 0.722 |
| Medical insurance | 22 | 24 | | |
| Business insurance | 1 | 2 | | |
| Tumor staging | | | | |
| Phase I | 4 | 3 | 0.531 | 0.767 |
| Phase II | 31 | 34 | | |
| Phase III | 9 | 7 | | |
| Occupation | | | | |
| Have | 30 | 28 | 0.202 | 0.653 |
| No | 14 | 16 | | |
| PRS scores | 74.00±8.98 | 75.86±10.53 | 0.898 | 0.372 |
| SAS scores | 55.25±10.58 | 55.27±11.21 | 0.010 | 0.992 |

Note: PRS: psychological resilience scale; SAS: self-rating anxiety scale.

With the inclusion standard of 0.05 and the exclusion standard of 0.1, the risk of psychological resilience decline was expressed as the calibrated odds ratio (OR value). When P<0.05, a difference was considered statistically significant.

## Results

*A comparison of the factors influencing psychological resilience in BC patients undergoing mastectomy*

The average PRS score of the BC patients undergoing mastectomy was 74.93±9.72 points. According to the one-way ANOVA, age, address, monthly income, educational background, medical expenses payment methods, employment status, and the SAS scores were all factors influencing psychological resilience (P<0.05). See **Table 1**.

*Multivariate logistic regression analysis of the psychological resilience in BC patients undergoing mastectomy*

According to the multivariate regression analysis, age, monthly income, payment medical expenses payment methods, and SAS scores

**Table 5.** A comparison of the PRS and SAS scores after the treatment

| Item | PRS scores | SAS scores |
|---|---|---|
| Before the treatment | | |
| Observation group (n=44) | 74.00±8.98 | 55.25±10.58 |
| Control group (n=44) | 75.86±10.53 | 55.27±11.21 |
| t | 0.898 | 0.010 |
| P | 0.372 | 0.992 |
| After the treatment | | |
| Observation group (n=44) | 81.56±9.25*** | 49.65±9.02*** |
| Control group (n=44) | 77.26±9.62 | 53.89±10.34 |
| t | 2.137 | 2.050 |
| P | 0.035 | 0.043 |

Note: Compared with the same group before treatment, ***P<0.001. PRS: psychological resilience scale; SAS: self-rating anxiety scale.

were the factors influencing psychological resilience (P<0.05). See **Tables 2** and **3**.

*The correlation of the PRS scores with the SAS scores*

The SAS scores of BC patients after mastectomy were (55.26±10.97) points, and they negatively correlated with the PRS scores (r=-0.310, P=0.003). See **Figure 1**.

*A comparison of the general patient information*

There were no differences between the observation and control groups in terms of age, address, monthly income, educational background, marital status, medical expenses payment methods, tumor staging, employment status, PRS scores, or SAS scores (P>0.05). See **Table 4**.

*Comparison of the PRS and SAS scores after the treatment*

After the treatment, compared with the control group, the PRS scores rose and were higher in the observation group, and the SAS scores decreased and were lower in this group (all P<0.05). See **Table 5**.

*A comparison of the PSQI scores before and after the intervention*

After the intervention, the PSQI scores decreased in both groups (P<0.05), but they were better in the observation group than they were in the control group (P<0.05). See **Table 6**.

## Discussion

BC is the most common tumor in women, and its incidence is increasing every year and becoming higher in young people [18]. The most effective therapeutic method of the disease is still surgery, which significantly delays its progression and prolongs patients' lives [19]. Mastectomy, a kind of surgery involving a resection of the breast, usually has a big impact on women's postoperative psychology, so determining the best way to effectively relieve the negative emotions and enhance the psychological endurance of BC patients undergoing mastectomy has become a new direction of clinical research [20, 21]. Psychological resilience is a positive psychological quality, formed under the joint action of internal and external protective factors. According to previous studies, higher psychological resilience scores indicate that the patients can better adapt to the treatment, face their disease positively, and adapt to their current living environment [22]. There are many factors that affect psychological resilience, and different diseases and patients have different influencing factors [23, 24]. In this study, we found that age, monthly income, and medical expenses payment methods were the independent factors that affected the psychological resilience of BC patients after mastectomy. Previous studies have shown that young cancer patients are more prone to suffer from anxiety, depression, and suicidal tendencies [25]. Due to greater age and life experience, the psychological resilience of elderly patients is higher than it is in young patients, and this is also true in BC patients. Younger patients have lower psychological endurance, which leads to a decline in their psychological resilience [26]. Monthly income and medical expenses payment methods are challenges that patients face during treatment. The medical expenses are still a huge expenditure, so patients with low monthly incomes and self-paid expenses are under huge economic pressure. Some patients choose to give up treatment because of the medical expenses, which undoubtedly has a great impact on their psychology [27]. Another study shows that age,

**Table 6.** A comparison of the PSQI scores before and after the intervention

| Item | Before treatment | | After treatment | |
|---|---|---|---|---|
| | Observation group (n=44) | Control group (n=44) | Observation group (n=44) | Control group (n=44) |
| Sleep quality | 2.09±0.49 | 2.07±0.47 | 1.28±0.19*,# | 1.62±0.23* |
| Falling asleep time | 2.12±0.39 | 2.13±0.45 | 1.29±0.21*,# | 1.65±0.31* |
| Sleeping time | 2.27±0.53 | 2.25±0.52 | 1.35±0.26*,# | 1.61±0.28* |
| Sleep efficiency | 2.18±0.49 | 2.19±0.49 | 1.48±0.31*,# | 1.79±0.41* |
| Sleep disorder | 2.21±0.49 | 2.24±0.52 | 1.39±0.26*,# | 1.73±0.29* |
| Hypnotics | 2.17±0.37 | 2.15±0.38 | 1.46±0.23*,# | 1.73±0.19* |
| Depression | 2.59±0.59 | 2.58±0.54 | 1.36±0.21*,# | 1.79±0.31* |
| Day dysfunction | 2.81±0.59 | 2.83±0.56 | 1.28±0.26*,# | 1.85±0.37* |
| PSQI total score | 18.79±1.05 | 18.82±1.13 | 11.28±0.51*# | 14.24±0.61* |

Note: PSQI: Pittsburgh Sleep Quality Index. Compared with the same group before the treatment, *P<0.05; Compared to the control group after the treatment, #P<0.05.

incomes, payment methods, and living in rural areas are the related factors that affect the psychological resilience of BC patients [14], which is consistent with the findings of this study.

Improving the psychological resilience of BC patients is conducive to relieving their negative emotions and coping with the disease positively [8]. The improvement is closely related to the support of the positive factors, and correlates with the elimination of negative emotions [28]. In this study, there was a negative correlation between the psychological resilience levels and the SAS scores, suggesting that the improvement can help patients eliminate negative emotions. We also found that MBSR was helpful in enhancing the patients' psychological resilience, eliminating their anxiety, and improving their sleep quality. In the research on treating 322 BC patients with MBSR, 6 weeks later, the patients' psychological problems such as anxiety and depression were relieved, and their quality of life was improved [29]. According to previous studies, due to psychological stress, the incidence of sleep disturbances in BC patients is higher than it is in other patients [30], and the application of MBSR for 6 weeks can significantly improve the patients' sleep quality [31]. However, another study shows that the effects of this therapy on the improvement of sleep quality are insignificant [32]. Some researchers have also found that interventions with this therapy for 6 weeks can improve the patients' immunity and reduce their inflammatory cytokine levels [33, 34]. This study reveals that MBSR can relieve patients' anxiety and improve their psychological resilience and sleep quality.

Shortcomings and prospects: The sample size in this study was small, so we can further conduct multi-center studies to enlarge it. Moreover, the factors affecting patients' psychological resilience and the therapeutic significance and value of MBSR can be further explored.

In summary, age, low monthly income, and self-paying are the independent factors that affect the psychological resilience of BC patients undergoing mastectomy, and the psychological resilience is negatively correlated with their anxiety. MBSR can enhance patients' psychological resilience, relieve their anxiety, and improve their sleep quality.

## Disclosure of conflict of interest

None.

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