

Review

A meta-analysis of the impact of empowerment-based psychological models on postoperative rehabilitation in breast cancer patients

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Abstract: Objective: To investigate the impact of empowerment-based psychological models on the postoperative recovery of patients with breast cancer through a meta-analysis.

Methods: A comprehensive search was conducted in China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP Information, and international databases like PubMed. The literature search was carried out from the establishment of the database up to July 3, 2025. Collect randomized controlled trials (RCTs) on the impact of the empowerment psychological model on the postoperative rehabilitation of breast cancer patients, and conduct a Meta - analysis using RevMan 5.3. **Results:** A total of 10 articles were incorporated in this study, covering 1432 patients, among which 716 patients were assigned to the observation group. The meta-analysis results revealed that versus the control group, the observation group showed lower anxiety scores [standardized mean difference (SMD) = -1.27, 95% confidence interval (CI) = (-1.69)–(-0.84), $P < 0.001$], lower depression scores [SMD = -1.33, 95% CI = (-1.68)–(-0.97), $P < 0.001$], higher resilience scores (SMD = 1.20, 95% CI = 0.55–1.85, $P < 0.001$), and higher self-efficacy scores (SMD = 1.35, 95% CI = 0.04–2.65, $P = 0.040$).

Conclusion: The empowerment-based psychological model can improve breast cancer patients' anxiety and depression after surgery, enhance their mental resilience and self-efficacy, and thus promote postoperative recovery.

Keywords: empowerment theory; nursing intervention; radical mastectomy; postoperative recovery

Breast cancer is one of the most prevalent malignancies in females across the globe [1]. Comprehensive treatment strategies for this condition include surgery, chemoradiotherapy, and targeted therapy, which all significantly improve patients' survival rates. With continuous progress made in its treatment patterns, the focus has shifted from survival to quality of life for patients. During surgery and subsequent treatment, patients usually suffer from pain, functional impairment, body changes, psychological trauma, and difficulties in adapting to daily life, affecting postoperative recovery and quality of life [2]. Therefore, the formulation of a systematic, multi-dimensional rehabilitation management strategy has become a crucial task for breast cancer nursing care currently. Over the past years, the empowerment-based psychological model has been extensively applied to the rehabilitation of multiple diseases [3–5] as an important theory and intervention method to promote proactive health management abilities. By enhancing patients' self-recognition, self-efficacy, and coping capacity, this model helps improve their mental states, rehabilitation confidence, and skills in disease management and self-

care. Relevant studies have suggested that empowerment-based interventions are conducive to ameliorating postoperative anxiety and depression and promoting self-management in cancer patients [6]. However, existing study findings are somewhat inconsistent, and the evaluation conclusions have not been systematically integrated, requiring consolidation of the evidence base for guiding clinical practice. For a holistic assessment of the actual effects of empowerment-based psychological models on the postoperative recovery of breast cancer patients, this study adopts a meta-analysis to systematically integrate the results of related randomized controlled trials (RCTs) and intervention studies at home and abroad. The aim is to probe the intervention effects on the quality of rehabilitation and mental health. The findings of our research are expected to provide evidence-based support for psychological rehabilitation nursing care in breast cancer patients after surgery and offer a valuable theoretical reference for the optimization of clinical nursing care pathways.

1. Materials and methods

1.1. General data

We search databases including China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP Information, and international databases like PubMed on the computer. The literature search was carried out from the establishment of the database up to 3 July 2025. Randomized controlled trials associated with the impact of empowerment psychological models on breast cancer patients' postoperative rehabilitation were collected. The Chinese search keywords included: (Empowerment Theory OR Empowerment-Based Psychological Intervention OR Empowerment-Based Mental Nursing OR Empowerment Models) AND (Breast Cancer OR Radical Mastectomy OR Breast-Conserving Therapy OR Mastectomy) AND (Postoperative Recovery OR Postoperative Nursing OR Rehabilitation Effect OR Psychological Rehabilitation). The English keywords were as follows: (Empowerment Theory OR Empowerment Psychological Intervention OR Empowerment Psychological Care OR Empowerment Models) AND (Breast Cancer OR Radical Mastectomy OR Breast-Conserving Surgery OR Mastectomy) AND (Postoperative Rehabilitation OR Postoperative Care OR Rehabilitation Effect OR Psychological Rehabilitation OR Quality of Life). The inclusion criteria included: (1) Published RCTs; (2) Adult female patients pathologically diagnosed as breast cancer and receiving surgical treatment (including radical operation, modified radical operation, and breast-conserving surgery); (3) The treatment group was subjected to a nursing care model based on empowerment theory following routine nursing care, whereas the control group received routine nursing care or non-empowerment-based routine psychological support. (4) At least one of the following postoperative recovery-correlated outcome indicators was reported: mental state, self-efficacy, self-management, quality of life, incidence of postoperative complications, range of motion (ROM) of the shoulder joint, lymphedema, and treatment compliance. (5) Quantitative data available for meta-analysis were reported. The exclusion criteria were: (1) Non-RCTs, like overviews, case reports, observational studies, qualitative research, etc.); (2) Non-breast cancer patients and patients who did not undergo surgical treatment were incorporated as the subjects; (3) Interventions were not

based on empowerment theory, or empowerment was only a secondary or vague element; (4) Data related to this study's target outcome indicators were not reported, or data cannot be extracted or converted to be used in meta-analysis (for example, figures and tables are provided without specific numerical values); (5) Duplicate publications (with the most complete and latest versions included); (6) Meeting abstracts, academic dissertations (unless complete data can be obtained from public sources), and publications without full-text availability.

1.2. Methods

A standardized data extraction table was formulated to ensure the accuracy and consistency of the extracted data. The whole process was completed by two researchers in strict accordance with the inclusion and exclusion criteria. The two researchers independently extracted the information required after thoroughly reading the incorporated articles. Following the extraction, the researchers cross-verified the data they had extracted. For any discrepancies in the data entries, consensus was reached through discussion and negotiation; if they cannot be resolved, a third researcher was consulted for arbitration. The extracted contents encompassed: (1) Basic information of research: first author, year of publication, journal/source, study location (country/region), and type of study design. (2) Characteristics of study subjects: overall sample size, sample size of the treatment group/control group, average age of patients, cancer staging, type of surgery, time points of interventions (when they were initiated after surgery). (3) Details of interventions: The specific content, mode (individual/group/mixed), frequency, duration, and implementer (nurse/psychologist/multidisciplinary team) of empowerment-based interventions in the treatment group; the detailed content of interventions in the control group. (4) Methodological features: randomization method, allocation concealment method, blinding implementation (for subjects, intervention providers, and outcome assessors), as well as loss to follow-up/withdrawal and corresponding handling. (5) Outcome indicator data.

1.3. Observation indicators

The quality of literature was evaluated using the risk of bias assessment tool in accordance with the evaluation criteria of RCTs as recommended by the Cochrane Handbook for Systematic Reviews of Interventions. Seven core indicators were assessed for the incorporated studies from the methodological dimension: (1) Random sequence generation (selection bias control); (2) Allocation concealment (selection bias control); (3) Blinding for subjects and researchers (performance bias control); (4) Blinding of outcome evaluation (measurement bias control); (5) Data integrity (loss to follow-up bias control); (6) Selective reporting (reporting bias control); (7) Other potential bias. Each indicator was rated as "low risk", "high risk", or "unclear risk". Studies with ≥ 4 low-risk indicators were defined as high-quality evidence, while those with ≤ 3 low-risk indicators were classified as low-quality evidence. Literature screening and quality evaluation were independently performed by two researchers. The double-blind principle was followed to avoid subjective bias. The specific steps included: First, the researchers should complete preliminary

literature screening and data extraction based on the predefined criteria, without interfering with each other; after the evaluation is finished, the researchers compare their respective results. In terms of the evaluated items with discrepancies, they should review the original texts and discuss to reach a consensus; if discrepancies still exist following discussion, a third researcher should intervene to make a final decision.

1.4. Statistical analysis

A meta-analysis was carried out using Revman5.3 software. The risk ratio (RR) and 95% confidence interval (CI) were adopted for assessing binary variables. The standardized mean difference (SMD) and its 95% CI were used for assessing continuous variables. The heterogeneity among studies was examined using the chi-square test, while I^2 was employed to quantitatively assess the magnitude of heterogeneity. The greater the I^2 , the greater the magnitude. When $P > 0.1$ and $I^2 \leq 50\%$, no heterogeneity was not statistically significant among the studies, and a fixed effects model (FEM) was utilized for analysis; if $P \leq 0.1$ and $I^2 > 50\%$, heterogeneity was considered statistically significant among the studies, and a random effects model (REM) was harnessed for analysis; Since the psychological scales used in various studies are inconsistent (such as HAMA, SAS, CD-RISC, etc.), this study uses the standardized mean difference (SMD) instead of the mean difference (MD) to combine the effect sizes of different scales. when $P < 0.05$, differences were deemed to hold statistical significance.

2. Results

2.1. Literature extraction and quality assessment

A total of 20,775 publications were preliminarily retrieved, including 5401 English publications and 15,374 publications. Subsequent to several rounds of screening, 10 articles were ultimately incorporated. See **Figure 1**.

2.2. Basic features of the included literature and quality evaluation

Ten articles were included in the study, covering 1432 patients, of which 716 were allocated to the observation group and received empowerment-based nursing interventions. **Table 1** displays the basic characteristics of the 10 papers. They were subjected to bias risk evaluation as per the quality evaluation criteria for RCTs. Refer to **Table 1** and **Figures 2** and **3**.

2.3. Meta-analysis results

2.3.1. Anxiety

A total of 6 articles involved an analysis of anxiety scores. Due to the inconsistency of scales used in various studies, the SMD was adopted for analysis. The heterogeneity test demonstrated $P < 0.001$ and $I^2 = 89\%$, so a REM should be employed. As evidenced by the analysis results, the observation group exhibited lower anxiety scores than the control group [SMD = -1.27 , 95% CI = $(-1.69) - (-0.84)$, $P < 0.001$]. To further explore the sources of heterogeneity, subgroup

analysis was conducted according to the intervention methods (individual intervention vs. group/spouse intervention). The effect size of the group/spouse intervention subgroup was [SMD = -0.93, 95% CI = (-1.84) – (-0.02), I^2 = 81%, P < 0.001], and the effect size of the individual intervention subgroup was [SMD = -1.45, 95% CI = (-1.89) – (-1.01), I^2 = 93%, P = 0.001]. There was no statistically significant difference between the two groups (I^2 = 0.6%, P = 0.32). The funnel plot displayed no significant bias. See **Figures 4 and 5**.

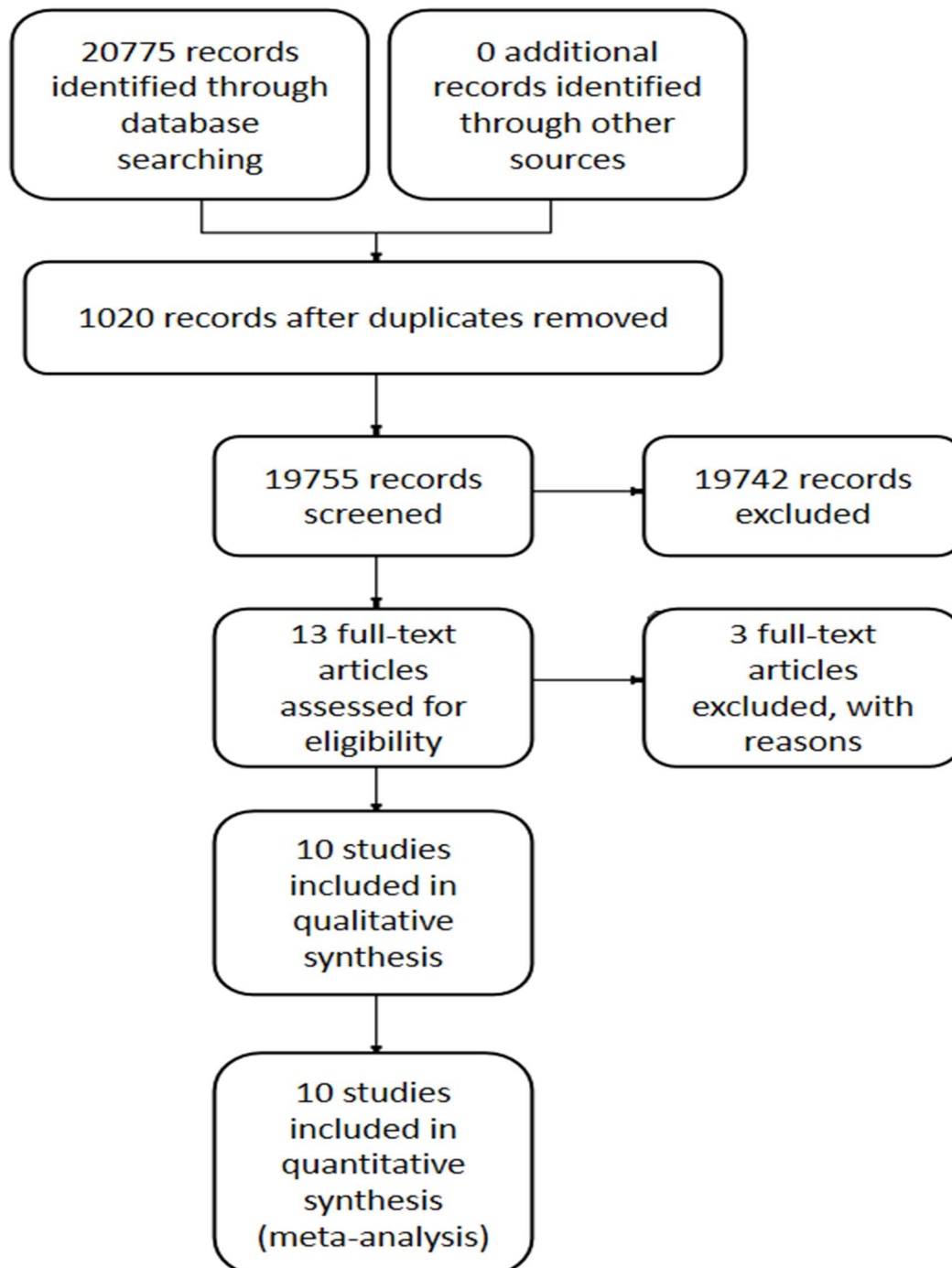


Figure 1. The literature search was carried out from the establishment of the database up to 3 July 2025.

Table 1. Basic features of incorporated studies.

Subjects	Number of cases (T/C)	Interventions		Study type	Primary outcome indicators
		Observation group	Control group		
Liu [7]	239/239	Empowerment-based psychological care model	Routine nursing care	RCT	Anxiety
Zhou, et al. [8]	43/43	Empowerment education-based psychological care	Routine nursing care	RCT	Anxiety and depression
Ye et al. [9]	40/41	Empowerment theory guidance	Routine nursing care	RCT	Anxiety, depression, and self-efficacy
Wang et al. [10]	48/47	Empowerment theory-based multi-dimensional care	Routine nursing care	RCT	Anxiety, depression, and resilience
Zhao et al [11]	50/50	Empowerment theory-guided behavior-changing care	Routine nursing care	RCT	Resilience
Jiang et al. [12]	51/51	Empowerment theory-guided behavior-changing care	Routine nursing care	RCT	Anxiety and depression
Yang et al. [13]	40/40	Empowerment theory-based behavior-changing care	Routine nursing care	RCT	Resilience
Shi et al. [14]	120/120	Empowerment-based psychological care	Routine nursing care	RCT	Anxiety, depression, and resilience
Liu et al. [15]	45/45	Empowerment-theory-based multi-dimensional psychological counseling	Routine nursing care	RCT	Self-efficacy
Wang et al. [16]	40/40	Empowerment-based incentive care	Routine nursing care	RCT	Depression, self-efficacy, and resilience

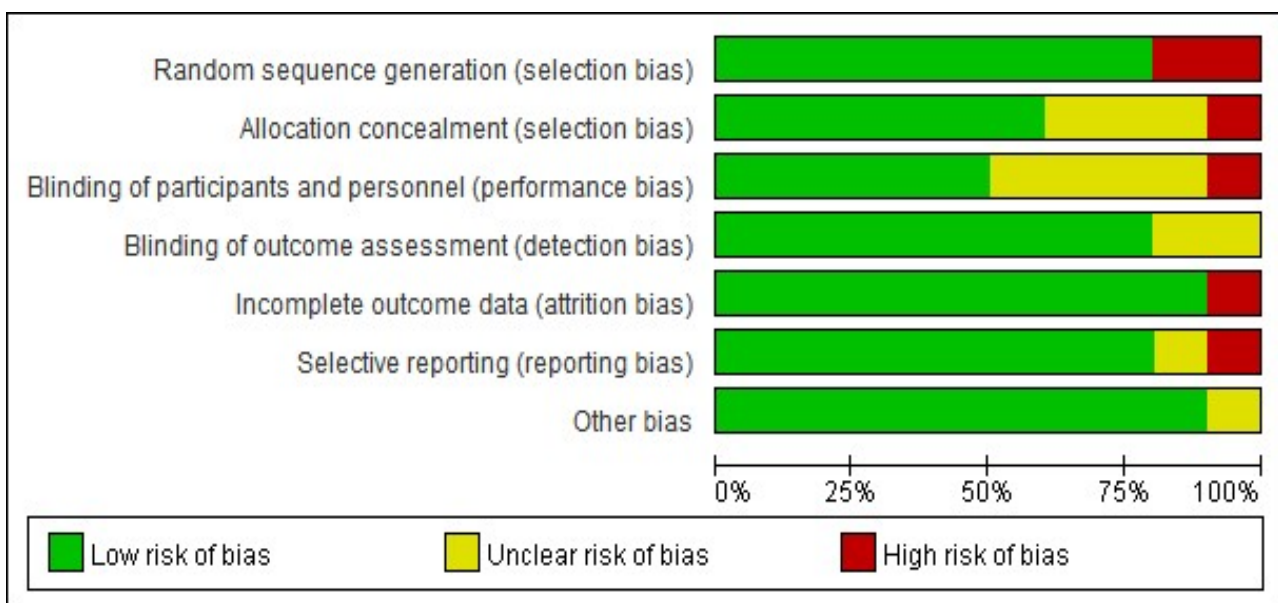


Figure 2. Risk of bias of the included literature.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Jiang R 2024	+	+	+	+	+	+	+
Liu WJ 2017	+	?	+	+	+	+	+
Liu QY 2023	+	+	-	?	+	+	?
Shi QQ 2022	+	+	?	+	+	+	+
Ye QX	+	+	+	+	+	+	+
Zhou M 2024	-	-	?	+	+	+	+
Wang MH 2021	+	+	?	+	+	+	+
Wang XX 2025	-	?	?	?	+	+	+
Zhao L 2024	+	?	+	+	+	-	+
Yang LR 2023	+	+	+	+	-	?	+

Figure 3. Quality of incorporated literature.

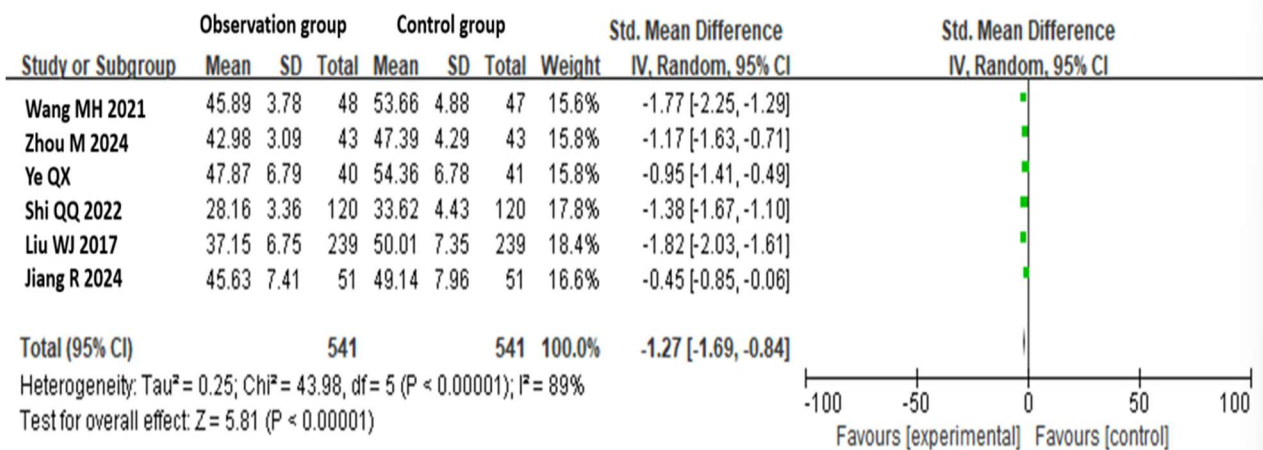


Figure 4. REM meta-analysis results of anxiety scores in the two groups.

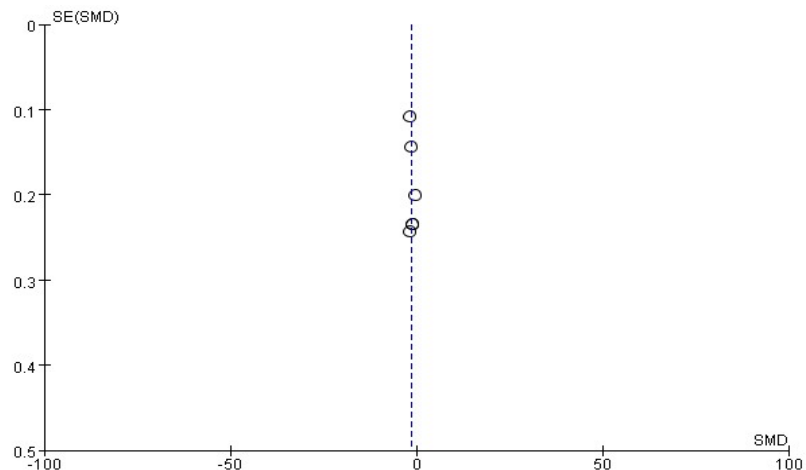


Figure 5. Funnel plot of anxiety scores in the two groups.

2.3.2. Depression

Six studies analyzed depression scores. As the scales adopted in the studies were not the same, the SMD was taken for analysis. As shown by the heterogeneity test, $P < 0.001$, and $I^2 = 76\%$. Therefore, a REM was included in the analysis. The results unveiled that the observation group had lower depression scores compared with the control group [SMD = -1.33 , 95% CI = $(-1.68) - (-0.97)$, $P < 0.001$]. The funnel plot displayed no substantial bias. To further explore the sources of heterogeneity, subgroup analysis was carried out according to the intervention methods (individual intervention vs. group/spouse intervention). The effect size of the group/spouse intervention subgroup was [SMD = -1.07 , 95% CI = $(-1.36) - (-0.78)$, $I^2 = 44\%$, $P = 0.17$], and the effect size of the individual intervention subgroup was [SMD = -1.45 , 95% CI = $(-1.89) - (-1.01)$, $I^2 = 81\%$, $P = 0.006$]. There was no statistically significant difference between the two groups ($I^2 = 61.8\%$, $P = 0.11$). Refer to **Figures 6** and **7**.

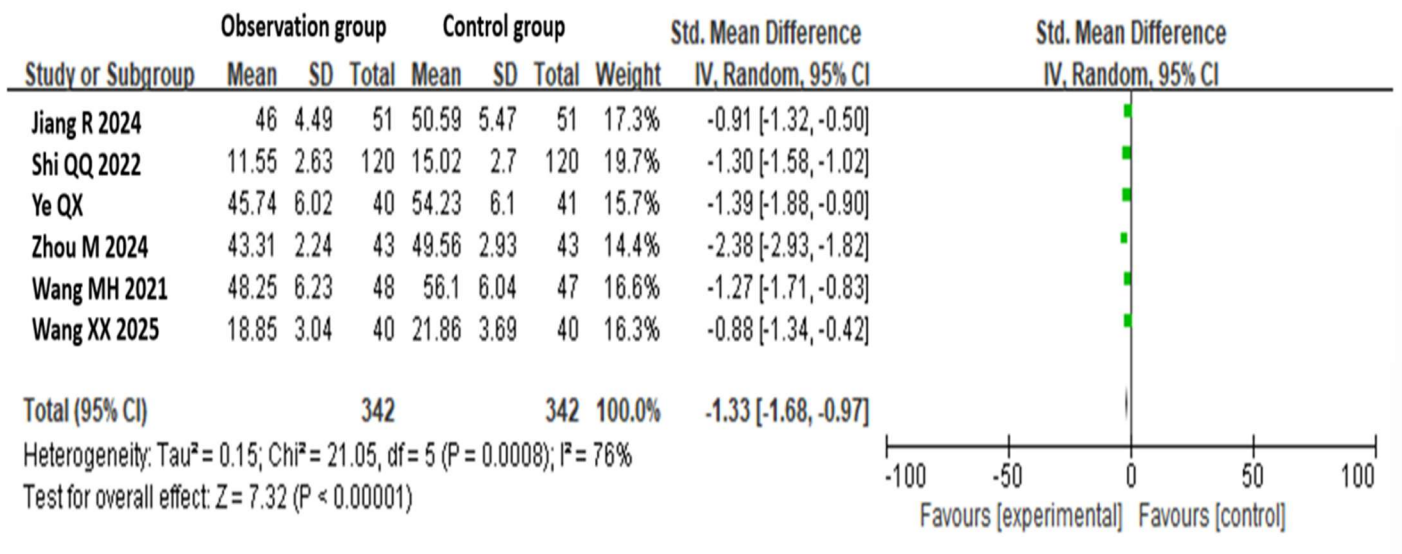


Figure 6. REM meta-analysis results of depression scores in the two groups.

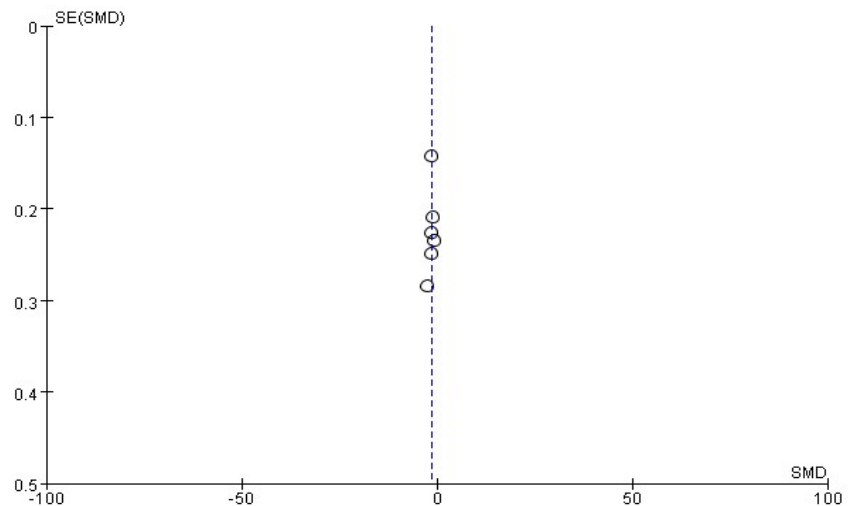


Figure 7. Funnel plot of depression scores in the two groups.

2.3.3. Resilience

Resilience scores were evaluated in 5 studies. The scales utilized by the studies were not consistent, so the SMD was introduced in the analysis. As revealed by the heterogeneity test, $P < 0.001$, and $I^2 = 92\%$. Thus, a REM model was utilized for analysis. The findings demonstrated higher resilience scores in the observation group as opposed to the control group (SMD = 1.20, 95% CI = 0.55 – 1.85, $P < 0.001$). No evident bias was noted in the funnel plot. Refer to **Figures 8** and **9**. To further explore the sources of heterogeneity, subgroup analysis was conducted based on the intervention methods (individual intervention vs. group/spouse intervention). The effect size of the group/spouse intervention subgroup was [SMD = -0.87 , 95% CI = $0.62 - 1.13$, $I^2 = 32\%$, $P = 0.23$], and the effect size of the individual intervention subgroup was [SMD = 1.80 , 95% CI = $(-0.51) - 4.11$, $I^2 = 97\%$, $P < 0.001$]. There was no statistically significant difference between the two groups ($I^2 = 0\%$, $P = 0.44$).

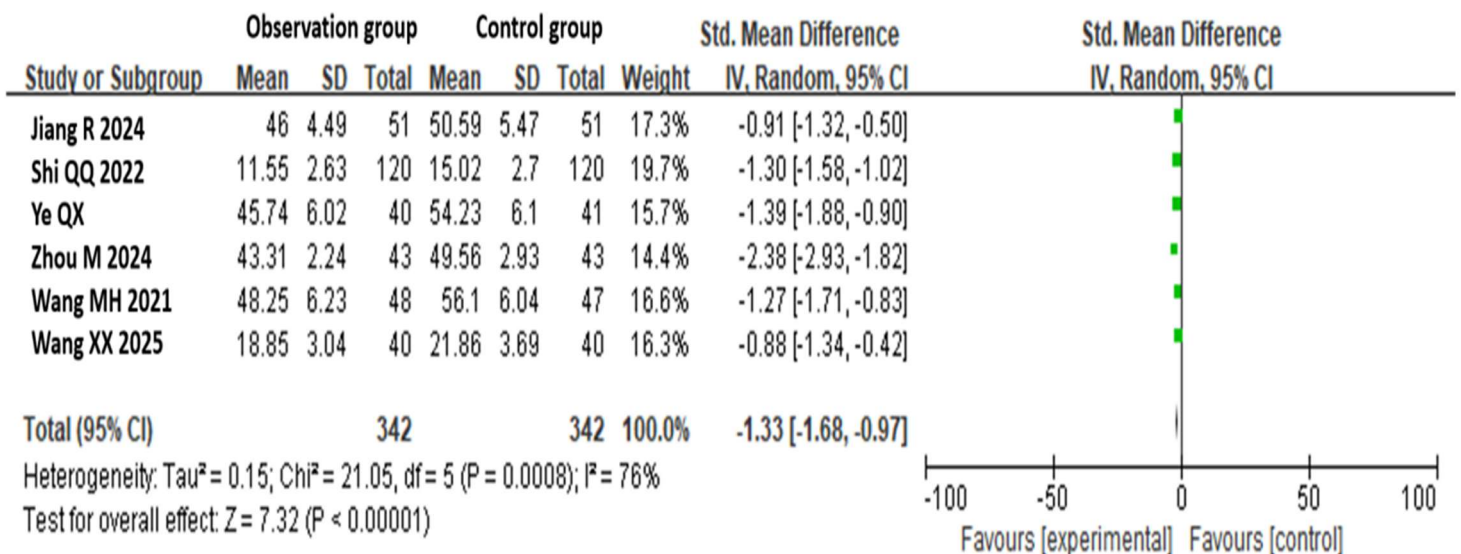


Figure 8. REM meta-analysis results of resilience scores in the two groups.

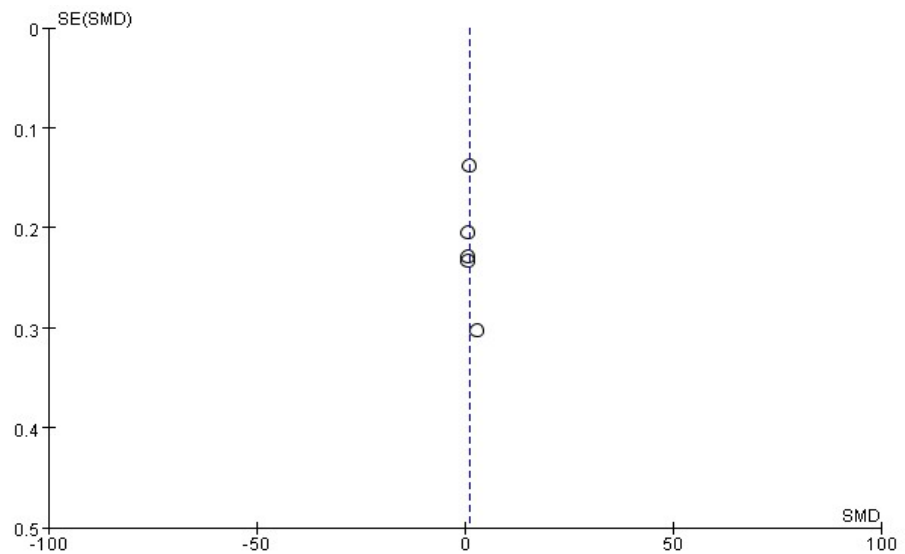


Figure 9. Funnel plot of resilience scores in the two groups.

2.3.4. Self-efficacy

Three publications involved the analysis of self-efficacy scores. Due to the inconsistency of scales adopted in different studies, the SMD was introduced for analysis. The heterogeneity test revealed $P < 0.001$ and $I^2 = 95\%$, necessitating the use of a REM for analysis. It was found that self-efficacy scores were higher in the observation group versus the control group (SMD = 1.35, 95% CI = 0.04 – 2.65, $P = 0.040$). No substantial bias was found in the funnel plot. See **Figures 10** and **11**. To further explore the sources of heterogeneity, subgroup analysis was conducted according to the intervention methods (individual intervention vs. group/spouse intervention). The effect size of the group/spouse intervention subgroup was [SMD = 0.63, 95% CI = 0.18 – 1.08, $P = 0.006$]. (The subgroup of group/spouse intervention only includes one study [16], so the within-group heterogeneity cannot be calculated.) The effect size of the individual intervention subgroup was [SMD = 1.73, 95% CI = (–0.60) – 4.05, $I^2 = 97\%$, $P < 0.001$]. As the group/spouse intervention subgroup only contained a single study, the comparison of differences between subgroups lacked sufficient statistical power. The results showed that there was no statistically significant difference between the subgroups ($P = 0.36$).

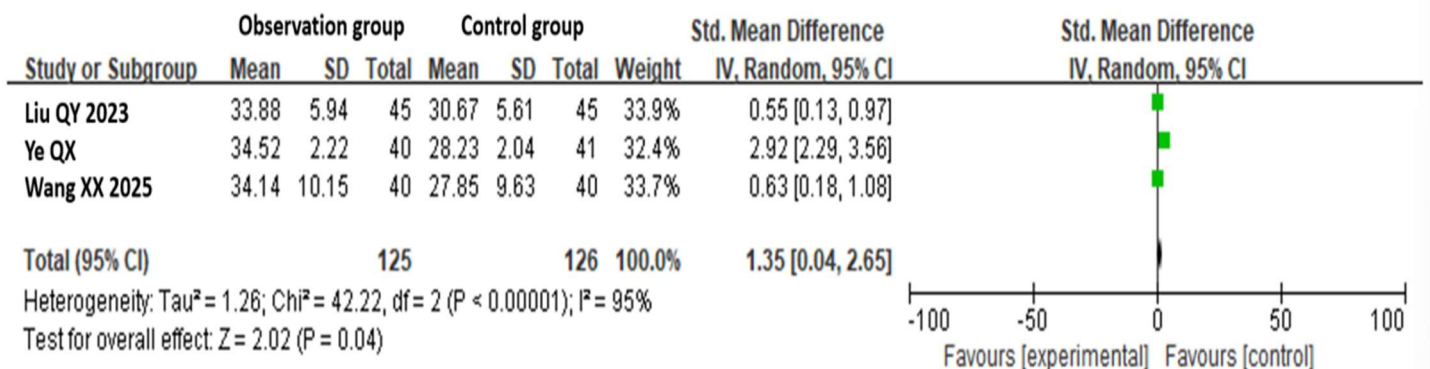


Figure 10. REM meta-analysis results of self-efficacy scores in the two groups.

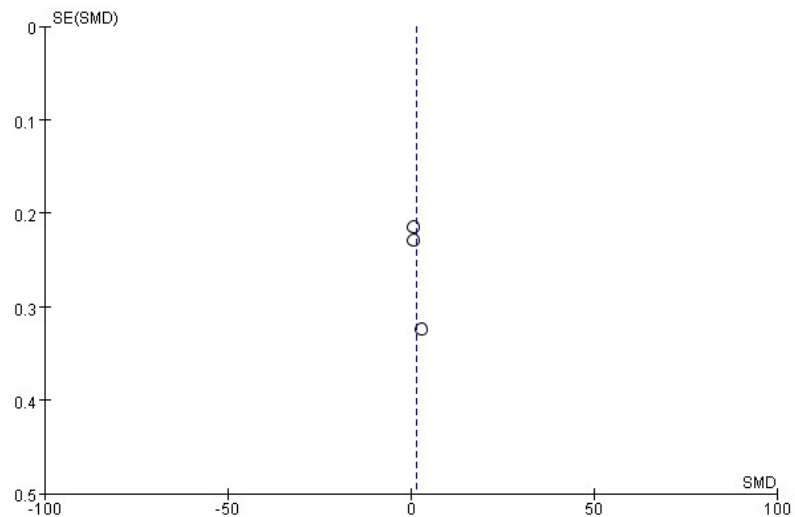


Figure 11. Funnel plot of self-efficacy scores in the two groups.

3. Discussion

Breast cancer is a commonly encountered malignancy in females. Its treatment focus has shifted from the survival rate of patients to their overall quality of life [17]. The rehabilitation of patients may be significantly impacted by surgery, as well as physiological function changes, psychological trauma, and social adaptation difficulties brought by subsequent treatment. However, empowerment-based psychological models provide a new pathway for multi-dimensional rehabilitation management by strengthening the patients' self-recognition, participation in decision-making, and resource acquisition capacity. This study systematically integrated RCTs that analyzed the impact of empowerment interventions on postoperative recovery in the field of breast cancer, aiming to offer a reference for clinical practice.

Here, although the assessment tools adopted in the included studies were inconsistent [such as Hamilton Anxiety Scale (HAMA), Self-Rating Anxiety Scale (SAS), and Hospital Anxiety and Depression Scale (HADS)], the REM showed that the effect of empowerment-based interventions on ameliorating anxiety (6 studies) and depression (6 studies) was statistically significant. However, when interpreting these results, the clinical significance and the impact of heterogeneity need to be fully considered. Firstly, although the effect sizes for anxiety ($SMD = -1.27$) and depression ($SMD = -1.33$) are relatively large, suggesting a strong intervention effect, the pooled effect sizes for psychological resilience ($SMD = 1.20$) and self-efficacy ($SMD = 1.35$), especially the very wide 95% confidence interval for self-efficacy (0.04–2.65), indicate a high degree of uncertainty in the estimation of the effect size. The exact clinical significance needs to be comprehensively judged in combination with the specific behavioral changes of patients (such as compliance with functional exercises and the improvement degree of self-management ability). Secondly, there is a high degree of heterogeneity in all outcome indicators, which limits the interpretability of the pooled effect sizes and also suggests that the effects of empowerment interventions may vary significantly depending on the duration, form, and implementers of the interventions.

Despite the aforementioned heterogeneity and uncertainty, this study observed relatively stable and significant intervention effects on the two core psychological outcomes of anxiety and depression. This finding suggests that the core mechanism of the empowerment model, which is to enhance patients' sense of disease control and self-decision-making ability, can effectively break the vicious cycle of "trauma experience-negative emotions" [18,19]. In addition, the empowerment intervention helps patients break the catastrophic associations with postoperative complications through structured disease cognitive education. Then, it decomposes abstract rehabilitation tasks into actionable steps via the goal-negotiation strategy, and finally activates the social support system through the resource-linking module [20–22]. This progressive intervention path (cognitive restructuring-behavioral activation-environmental interaction) effectively promotes the transformation of patients from passive acceptance to active management [23,24]. The subgroup analysis of the intervention forms in this study provides empirical evidence for the effectiveness and variability of the above - mentioned theoretical path. For example, in terms of improving anxiety and depressive emotions, the heterogeneity in the group/spouse intervention subgroup ($I^2 = 81\%$; $I^2 = 44\%$) was significantly lower than that in the individual intervention subgroup ($I^2 = 93\%$; $I^2 = 81\%$). This result confirms that the peer - modeling effect and experience sharing in group interventions, as the core elements of the environmental interaction module, can relatively stably enhance patients' perception of the feasibility of functional exercises in different studies, which constitutes an effective common mechanism for alleviating negative emotions [25,26]. The large variation in the effect of individual interventions reflects that the effectiveness of the cognitive restructuring - behavioral activation path is more dependent on the skills of the interveners and the depth of the doctor-patient relationship, showing significant individual differences. The improvement of self-efficacy is another key benefit of the empowerment intervention [27,28]. Long-term self-management is required for post-operative breast cancer rehabilitation. The empowerment strategy, through skill training, behavioral contracts, etc., specifically enhances patients' confidence in pain management, functional exercises, and treatment compliance. This enhancement of self-efficacy not only promotes the implementation of short-term rehabilitation behaviors but may also form long-lasting health management habits [29,30]. Notably, the subgroup analysis also revealed a similar pattern in the improvement of self-efficacy and psychological resilience. Group interventions showed a moderate and precise effect, which is consistent with its mechanism of enhancing self - confidence through standardized components such as social comparison and behavioral contracts. In contrast, individual interventions, although having great potential, had extremely imprecise estimates and high heterogeneity ($I^2 > 90\%$), which directly confirms the previous inference that the different emphases of different studies on the two focuses of cognitive restructuring training and behavioral skill practice are important reasons for the increased variability of psychological resilience-related indicators.

This study contains limitations: First, most of the incorporated studies were rooted in the same cultural background, so caution should be taken when extrapolating the conclusions; second, inadequate standardization of the intervention strategies led to evident diversification of the strategies involved. For example: (1)

All the literature included in this study is from China, indicating a relatively homogeneous cultural background. In terms of the medical system, China's is government-led with a hierarchical diagnosis and treatment model, while in the West, it is mostly dominated by commercial insurance. Regarding social support, China emphasizes family and collectivism, while the West tends to be more professional and individualized. Psychologically, Chinese patients value collective harmony and respect medical authority, while Westerners emphasize personal feelings. These differences may limit the generalization of the research results to non-Chinese populations. In the future, cross-cultural research is needed to analyze the influence of culture, verify the universality of the conclusions, and contribute to the development of global healthcare and research. (2) This study used the standardized mean difference (SMD) to combine the effect sizes of different scales. However, the SMD lacks intuitiveness in clinical interpretation, and its value is affected by the scale variation. It is recommended to interpret the results in combination with the specific scale background. Moreover, due to the limitations of the RevMan 5.3 software, statistical tests for funnel plot asymmetry such as the Egger's test could not be performed on the included studies. The assessment of publication bias in this study mainly relied on the visual inspection of the funnel plot. Therefore, the conclusions should be treated with caution. (3) There is a lack of long-term follow-up data, making it difficult to evaluate the persistence of the effects. In the future, multi-center, large-sample studies should be carried out to standardize the core outcome indicators and strengthen cost-effectiveness analysis.

4. Conclusion

In conclusion, the empowerment-based psychological model can efficaciously ameliorate breast cancer patients' mental states, resilience, and self-management efficacy, providing evidence-based support for optimizing rehabilitation nursing care. In clinical settings, the individual characteristics of patients need to be combined in the design of a structural intervention strategy, while attention should be paid to cultural adaptability and sustained follow-up of outcomes. In future research, the core active components of empowerment interventions (such as cognitive restructuring, behavioral activation, and social support linkage) and their minimum effective doses (such as intervention frequency and total duration) should be clearly defined to optimize the intervention programs and improve their reproducibility. Moreover, it is recommended that future studies standardize the core outcome indicators (such as standard scales for anxiety, depression, and self-efficacy) to enhance the comparability of results and their clinical applicability.

Author contributions: Design the research study, QF and LZ; perform the research, LZ, XW, XT and LQ; collect and analyze the data, QF, XW, XT and LQ; draft the manuscript, LZ, XW, XT and LQ. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest: The authors declare no conflict of interest.

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