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Impact of physical activity on depression and anxiety symptoms in breast cancer patients: A systematic review and meta-analysis

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Liu, R; Zhang, S.

Corresponding author:
Shuai Zhang

869812369@qq.com

Author Affiliation:
Hebei Normal University.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202580098

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 August 2025 and was last updated on 31 August 2025.

INTRODUCTION

Review question / Objective Using the PICOS framework: Population—women with breast cancer; Intervention—exercise/physical activity (aerobic, resistance, Qigong, traditional and breathing exercises); Comparator—usual care, education, minimal/no intervention; Outcomes—depression and anxiety symptoms; Study design—RCTs and factorial RCTs. Objective: to determine the effects of exercise on depression and anxiety in breast cancer patients and explore moderators (frequency, session duration, intervention length, type).

Rationale Breast cancer patients frequently experience depression and anxiety that impair quality of life and prognosis. Exercise is a non-pharmacological strategy with potential mental health benefits, but prior evidence shows heterogeneity by intervention characteristics. A rigorous meta-analysis of RCTs following PRISMA 2020 will quantify overall effects and examine moderators (type, frequency, duration, length) to inform optimized, personalized exercise prescriptions in rehabilitation.

Condition being studied Psychological symptoms—depression and anxiety—in women with breast cancer during/after treatment and rehabilitation.

METHODS

Search strategy Databases: PubMed, Web of Science, CINAHL, PsycINFO, Cochrane Library, Embase, and Medline. Timeframe: inception to 21 December 2024. English language. Search themes combined with Boolean operators for (1) exercise/physical activity (aerobic, resistance, Qigong, traditional, breathing), (2) breast neoplasms/breast cancer, and (3) depression/anxiety terms (MeSH and keywords). Reference lists and relevant conference abstracts were hand-searched.

Participant or population Women diagnosed with breast cancer (any stage) enrolled in randomized trials evaluating exercise interventions and reporting depression and/or anxiety outcomes.

Intervention Exercise/physical activity interventions including aerobic training, resistance training, Qigong and other traditional mind-body exercises, breathing exercises, and combined/rehabilitation programs, delivered at specified frequencies, session durations, and intervention lengths.

Comparator Usual/standard care, education/wait-list, minimal physical activity placebo, or no intervention.

Study designs to be included Randomized controlled trials and factorial RCTs.

Eligibility criteria Include: RCTs/factorial RCTs; breast cancer patients; exercise-related interventions; report means, SDs, and sample sizes for depression/anxiety (and QoL). Exclude: non-RCTs, non-exercise interventions, non-breast cancer/animal studies, insufficient data, non-English publications.

Information sources Electronic databases (PubMed, Web of Science, CINAHL, PsycINFO, Cochrane Library, Embase, Medline), manual screening of reference lists and relevant conference abstracts. No author contact or trial registries planned beyond database coverage.

Main outcome(s) Primary: changes in depression and anxiety symptoms post-intervention, synthesized as standardized mean differences (SMD) with 95% CIs using post-treatment scores (or change scores when appropriate).

Additional outcome(s) Quality of life and stress, where available.

Data management Two reviewers (RL, SZ) independently screened, extracted data into standardized forms/spreadsheets, and cross-checked entries. Discrepancies resolved by discussion. Data stored in version-controlled files; analysis scripts and datasets managed in Stata 16.0 project folders.

Quality assessment / Risk of bias analysis Methodological quality assessed with the modified Jadad scale (randomization, blinding, withdrawals, and clarity of methods). Assessments performed independently by two reviewers with consensus resolution.

Strategy of data synthesis Random-effects meta-analysis (Stata 16.0) to pool SMDs with 95% CIs. Heterogeneity assessed with χ^2 and I^2 statistics. Publication bias examined via Begg's and Egger's tests and funnel plots. Subgroup analyses by intervention type, frequency, session duration, and intervention length. Significance at $p<0.05$, two-tailed.

Subgroup analysis Planned subgroups: (1) intervention type (aerobic, resistance, Qigong/traditional, breathing, combined); (2) frequency (<3 vs ≥3 sessions/week); (3) session duration (45 min); (4) intervention length (12 weeks).

Sensitivity analysis Leave-one-out analyses; exclusion of low-quality studies (modified Jadad <2); alternative effect calculations where necessary to test robustness.

Language restriction English only.

Country(ies) involved China.

Other relevant information This protocol follows PRISMA 2020. The review focuses on mental health outcomes (depression, anxiety) in breast cancer and intends to inform exercise prescription parameters (frequency, session duration, length).

Keywords Breast cancer; physical activity; exercise; depression; anxiety; randomized controlled trial; meta-analysis; systematic review.

Dissemination plans Findings will be submitted to a peer-reviewed journal and presented at relevant oncology/rehabilitation conferences. Data and analysis code can be shared upon reasonable request.

Contributions of each author

Author 1 - Liu Rui - supervision; resources; review and editing.
Email: 441863874@qq.com
Author 2 - Shuai Zhang - Corresponding author; supervision; resources; review and editing.
Email: 869812369@qq.com