Psychological Medicine

www.cambridge.org/psm

Ranking psychological interventions for post-stroke depression: A systematic review and network meta-analysis

Xuerong Cao[1], Rong Chen[2], Yingying Qu[3], Yating Ban[1] and Qi Zhang[1]

[1]School of Nursing, Sun Yat-sen University, Guangzhou, China; [2]Deyang People's Hospital, Deyang, China and [3]Department of Neurology, Sun Yat-Sen Memorial Hospital, Guangzhou, China

Original Article

Cite this article: Cao, X., Chen, R., Qu, Y., Ban, Y., & Zhang, Q. (2026). Ranking psychological interventions for post-stroke depression: A systematic review and network meta-analysis. *Psychological Medicine*, **56**, e230, 1–14
https://doi.org/10.1017/S0033291726105273

Received: 05 November 2025 UTC
Revised: 01 June 2026 UTC
Accepted: 01 June 2026 UTC

Keywords:
depression; network meta-analysis; post-stroke; psychological interventions

Corresponding author:
Qi Zhang;
Email: zhangq569@mail.sysu.edu.cn

X.C. and R.C. made equal contributions to this manuscript.

Abstract

Background. Post-stroke depression (PSD) is the most common neuropsychological complication in stroke survivors. While psychological interventions are promising non-pharmacological treatments, the most effective intervention type, as well as their mid- to long-term efficacy and effectiveness across PSD severity levels, remains unclear. This study aims to compare the efficacy of psychological interventions for PSD, focusing on overall effectiveness, mid- to long-term efficacy, and effectiveness across PSD severity levels.

Methods. We systematically searched seven databases for randomized controlled trials (RCTs) of psychological interventions targeting depression in stroke survivors. The primary outcome was depression symptom reduction. Post-intervention, mid- to long-term data were analyzed. A frequentist network meta-analysis (NMA) with random effects was conducted in Stata 17.0. Subgroup analyses by PSD severity were performed.

Results. Thirty-eight RCTs involving 3106 participants were included. Post-intervention, third-wave therapies (Hedges' $g = -1.08$, 95% CI: −1.62 to −0.55) significantly improved PSD compared to treatment as usual. At mid- to long-term follow-up, third-wave therapies (Hedges' $g = -0.82$, 95% CI: −1.25 to −0.39) maintained significant effects. Relaxation therapy significantly ameliorated mild PSD (Hedges' $g = -0.77$, 95% CI: −1.27 to −0.27); for moderate-to-severe PSD, no significant effects were observed.

Conclusions. Third-wave therapies are potentially effective for PSD, showing sustained mid- to long-term benefits. Relaxation therapy seems to be most effective for mild PSD, while no significant effects were observed for moderate-to-severe PSD. However, the NMA showed high heterogeneity and generally low to very low evidence certainty for most comparisons, the findings should be interpreted with caution.

Introduction

Post-stroke depression (PSD) is the most common psychiatric complication after stroke, characterized by persistent low mood, diminished interest, and emotional distress (Zhou, Wei, & Xie, 2024). The prevalence of PSD ranges from 11% to 41% within two years after stroke (Guo, Wang, Sun, & Liu, 2022). It is associated with poorer treatment adherence, delayed functional recovery, reduced social participation, lower quality of life, and even higher risks of suicide and mortality (Cai et al., 2019; J. Li et al., 2023; Paolucci et al., 2019). Early and effective management of PSD is therefore critical for improving recovery trajectories and overall well-being (van Nimwegen et al., 2023).

Clinical guidelines in the UK and Ireland recommend offering psychological support to stroke survivors at risk of depression (Intercollegiate Stroke Working Party, 2023). Over the past decades, numerous trials have examined various psychological interventions for PSD in stroke survivors (Allida et al., 2020), creating a valuable but heterogeneous body of evidence. Conventional systematic reviews and meta-analyses have reported that interventions such as mindfulness-based therapies (Tao et al., 2022), cognitive behavioral therapy (CBT) (M. Wan, Zhang, Wu, & Ma, 2024), and motivational interviewing may be effective for PSD in stroke survivors (Qiqi et al., 2021). However, traditional pairwise meta-analyses are limited because they cannot determine the comparative effectiveness of different psychological interventions – a critical question for clinical decision-making.

Network meta-analysis (NMA) provides a methodological advantage by integrating both direct and indirect evidence to compare and rank multiple interventions simultaneously (Bucher, Guyatt, Griffith, & Walter, 1997). Despite its potential, few NMAs have comprehensively evaluated psychological therapies for PSD, and existing findings remain inconsistent. For instance, Yi et al. (2024) conducted a NMA of 43 studies involving 3138 stroke survivors to compare the efficacy of various non-pharmacological therapies for PSD. The study reported no significant difference between psychotherapy and control groups, but their analysis included only 13 psychological intervention studies – insufficient to capture the current diversity of approaches and the overall evidence grade is

© The Author(s), 2026. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives licence (http://creativecommons.org/licenses/by-nc-nd/4.0), which permits non-commercial re-use, distribution, and reproduction in any medium, provided that no alterations are made and the original article is properly cited. The written permission of Cambridge University Press or the rights holder(s) must be obtained prior to any commercial use and/or adaptation of the article.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

very low. Conversely, another NMA explored the effects of 17 non-pharmacological interventions on PSD in stroke patients. The study reported superior effects of psychological interventions over usual care, but it also had limitations, namely the limited types of psychological interventions and a lack of evidence quality assessment (Y. Li et al., 2024). Thus, a more comprehensive and methodologically rigorous NMA is needed to clarify the relative efficacy of psychological interventions for PSD across diverse contexts.

Existing studies have primarily focused on short-term outcomes, overlooking the dynamic nature of PSD, which may persist, fluctuate, or recur over time (Dong et al., 2021). Moreover, patients with varying levels of baseline depression severity may respond differently to the same intervention (Zimmerman, 2019), highlighting the importance of tailoring treatment to individual needs (Cohen & DeRubeis, 2018). Despite these insights, previous NMAs have rarely compared the long-term and severity-specific effects of psychological interventions, leaving clinicians without clear evidence on which approaches work best for different patients and recovery stages.

Therefore, this study aims to conduct a systematic review and NMA to (1) evaluate and rank the comparative efficacy of psychological interventions for PSD, (2) examine their mid- to long-term effects, and (3) explore differential treatment responses based on initial depression severity.

Methods

This systematic review and NMA followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Network Meta-Analyses (PRISMA-NMA) guidelines (Hutton et al., 2015) and was registered in the International Prospective Register of Systematic Reviews (PROSPERO, CRD42023490577).

Eligibility criteria

Eligible full-text studies were identified based on the PICOS framework: Population, Intervention, Comparison, Outcome, and Study design.

Population

Adults (≥18 years) with clinically diagnosed PSD or mild-to-severe depressive symptoms identified by validated scales (e.g. a Patient Health Questionnaire-9 [PHQ-9] score ≥ 5) or explicitly described as having 'PSD' in the original studies.

Interventions and comparators

Intervention groups received psychological interventions as defined by the WHO's Psychological Interventions Implementation Manual and mhGAP guidelines, including psychoeducation, CBT, family therapy, relaxation, and others (see Supplementary Table S2). Comparators included waitlist control (WL), treatment as usual (TAU), or another psychological intervention. Studies involving combination therapies, such as pharmacological plus psychological interventions, were excluded to reduce heterogeneity.

Outcomes

Depressive symptoms measured pre- and post-intervention using validated scales.

Study design

Only randomized controlled trials (RCTs), including cluster RCTs, were included; quasi-randomized trials were excluded.

Data sources and search strategy

A systematic search was conducted in seven English databases (PubMed, Embase, CINAHL, PsycINFO, Web of Science, Scopus, and Cochrane Library) from inception to September 17, 2025. We also manually searched reference lists of relevant reviews and studies. The search followed the PICOS framework, using a combination of medical subject terms and free words (e.g. stroke OR ischemic stroke OR hemorrhagic stroke AND psychotherapy OR CBT AND depression AND RCT). Detailed search strategies and results are provided in Supplementary Table S3.

Study selection and data extraction

All studies were imported into NoteExpress 4.1.0, and duplicates were removed. Two reviewers (R.C. and X.R.C.) independently screened titles and abstracts, followed by full-text review. Disagreements were resolved through discussion with a third reviewer (Y.T.B.).

Data extraction was performed independently by RC and XRC using a structured electronic form, including publication details, participant characteristics, intervention specifics, and depression scores at baseline and post-intervention. The time to measure effects was categorized into post-intervention and mid- to long-term. We used a common metric provided by Wahl et al. (2014) to convert various depression scales to PHQ-9 scores in order to conduct subgroup analyses of depression severity. For missing data, calculations were made based on available information (X. Wan, Wang, Liu, & Tong, 2014), and authors were contacted for clarifications if needed.

Assessment of the risk of bias

The Cochrane risk-of-bias tool for randomized trials (RoB-2) was used to assess methodological quality across five domains: randomization, intervention deviations, missing data, outcome measurement, and result selection (Sterne et al., 2019). Each domain was rated as low risk, some concerns, or high risk. The overall risk was determined by the highest level of bias across all domains. Two reviewers (RC and XRC) independently assessed the studies, with disagreements resolved through discussion or adjudication by a third reviewer (YTB).

Data synthesis and analysis

We performed pairwise meta-analyses using a random-effects model in Review Manager 15.3 to calculate a single point estimate of the effect size for interventions compared to TAU with a 95% confidence interval (CI). A frequentist NMA (random-effects model) was conducted in Stata 17.0 to compare intervention categories. Depression scores, treated as continuous variables, were analyzed using standardized mean differences (SMD) and 95% CI. Statistical significance was defined as $P < 0.05$ or a 95% CI excluding 0. Effect sizes were interpreted as small ($0.20 \leq d < 0.50$), medium ($0.50 \leq d < 0.80$), and large ($d \geq 0.80$), with Hedges' g used for sample size variation (White & Thomas, 2005). Heterogeneity was assessed using I^2, classified as <40% unimportant, 30–60% moderate, 50%–90% substantial, and 75%–100% considerable (Higgins et al., 2024).

Transitivity was checked by comparing trial and sample characteristics. Inconsistency was analyzed using loop-specific and side-splitting methods. The surface under the cumulative ranking curve (SUCRA) was used to rank interventions. Publication bias was

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

assessed with funnel plots and Egger's test. League tables and network diagrams were used for ranking and evidence distribution visualization.

Subgroup analyses were conducted to assess the efficacy of psychological interventions for different PSD severities. Using a common metric (Wahl et al., 2014), other depression scales were converted into PHQ-9 scores: 5 ≤ scores <10 (study classified as mild depression subgroup) and scores ≥10 (study classified as moderate-to-severe depression subgroup) (Williams et al., 2005). Studies using scales that cannot be converted to PHQ-9 scores were excluded from quantitative analyses but retained for qualitative synthesis. Effects were analyzed separately for each group, following the overall NMA methodology.

Sensitivity analyses excluded studies in which some participants were taking antidepressants, studies with a sample size <30, and studies in which participants had a confirmed diagnosis of cognitive impairment.

Certainty assessment

We used the Confidence in Networks Meta-Analyses (CINeMA) web tool to evaluate the quality of evidence for each comparison (Papakonstantinou et al., 2020). Six domains were assessed: within-study bias, reporting bias, indirectness, imprecision, heterogeneity, and incoherence. Each comparison was rated for concern in these domains as no concern, some concern (downgraded one level), or major concern (downgraded two levels). The overall quality of evidence for each comparison was classified as high, medium, low, or very low.

Results

Study selection

A total of 6,861 records were identified across seven databases. After removing 2,859 duplicates, 4,002 records were screened by title and abstract, and 226 full-text articles were reviewed. Of these, 188 were excluded for not meeting inclusion criteria. Ultimately, 38 articles were included in the analysis. The search and screening process is shown in Figure 1, following the PRISMA flowchart.

Characteristics of included studies and participants

Table 1 provides the general characteristics of the included studies. Our NMA involved 3,106 stroke survivors from 38 studies published between 2003 and 2025, across 12 countries in North America, Europe, Asia, and Oceania. Sample sizes ranged from 11 to 213, with the majority of studies conducted in China (34.21%), followed by the UK (21.05%) and Australia (10.52%). The mean age of participants ranged from 47.2 to 76.5 years.

Characteristics of the interventions

Eleven psychological interventions were included: psychoeducation (n = 3), cognitive training (n = 4), supportive therapy (n = 3), family therapy (n = 6), CBT (n = 10), reminiscence therapy (n = 2), third-wave therapies (n = 7), biofeedback therapy (n = 1), art therapy (n = 4), relaxation training (n = 3), and motivational interviewing (n = 1). Five studies compared two psychological interventions, and most compared an intervention with TAU or WL. Interventions were primarily hospital-based (n = 15), with others conducted at home (n = 6), in the community (n = 6), or across multiple settings (n = 10). Four studies involved multidisciplinary teams. Most interventions were face-to-face (n = 27), with others using telehealth (n = 6) or hybrid formats (n = 4). Duration varied from 3 days to 12 months, with most lasting 8 weeks. Details are provided in Table 1.

Characteristics of outcome measurements

The included studies measured depression using nine different scales (including the Hospital Anxiety and Depression Scale, Hamilton Depression Rating Scale, the Center for Epidemiologic Studies Depression Scale, Geriatric Depression Scale, PHQ-9, Beck Depression Inventory, Stroke Aphasia Depression Questionnaire, the Patient-Reported Outcomes Measurement Information System, and Depression, Anxiety, and Stress Scale-21). Common tools included the Hospital Anxiety and Depression Scale (n = 18) and the Stroke Aphasia Depression Questionnaire for aphasia survivors. Only two studies used the Patient-Reported Outcomes Measurement Information System (Terrill et al., 2018; Terrill et al., 2022).

Risk of bias and quality assessment

Of the 38 studies, 14 (36.80%) had low risk of bias, 15 (39.50%) moderate, and 9 (23.70%) high. Eight studies raised concerns about randomization, including unclear methods or baseline imbalances. Eleven had issues with intervention deviations, mainly due to lack of blinding and intention-to-treat analysis. Most studies had missing data concerns due to unspecified dropout reasons. Outcome measurement bias was frequently high due to unreported assessor information. One study showed high reporting bias (Lawrence et al., 2025). Details are in Supplementary Figures S1–S3.

Traditional pairwise meta-analysis

Supplementary Figures S4 and S5 show results of direct comparisons. Family therapy (n = 3, sample sizes 116 vs 110, Hedges' g = −0.30, 95% CI: −0.57 to −0.04), CBT (n = 8, sample sizes 273 vs 273, Hedges' g = −0.33, 95% CI: −0.58 to −0.08), reminiscence therapy (n = 2, sample sizes 162 vs 160, Hedges' g = −0.35, 95% CI: −0.57 to −0.13), third-wave therapies (n = 6, sample sizes 221 vs 212, Hedges' g = −1.18, 95% CI: −2.19 to −0.16), art therapy (n = 3, sample sizes 138 vs 150, Hedges' g = −0.66, 95% CI: −1.20 to −0.11), and relaxation therapy (n = 2, sample sizes 48 vs 48, Hedges' g = −0.70, 95% CI: −1.11 to −0.29) significantly reduced PSD compared to TAU, exhibiting a small-to-large effect size.

Network meta-analysis

Main outcomes

Thirty-seven studies comparing 11 intervention types were included in the NMA (Figure 2a). As shown in the league table (Figure 3a), third-wave therapies (Hedges' g = −1.08, 95% CI: −1.62 to −0.55) significantly reduced PSD compared to TAU. Third-wave therapies were also more effective than cognitive training (Hedges' g = −0.99, 95% CI: −1.94 to −0.04). According to the SUCRA rankings (Figure 4a), third-wave therapies had the highest probability of being the most effective intervention (SUCRA, 88.80%; mean rank, 2.30), followed by biofeedback therapy (SUCRA, 71.40%; mean rank, 4.40), art therapy (SUCRA, 68.20%; mean rank, 4.80), relaxation training (SUCRA, 65.90%; mean rank, 5.10), and CBT (SUCRA, 50.70%; mean rank, 6.90). TAU ranked the lowest (SUCRA, 19.50%; mean rank, 10.70).

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

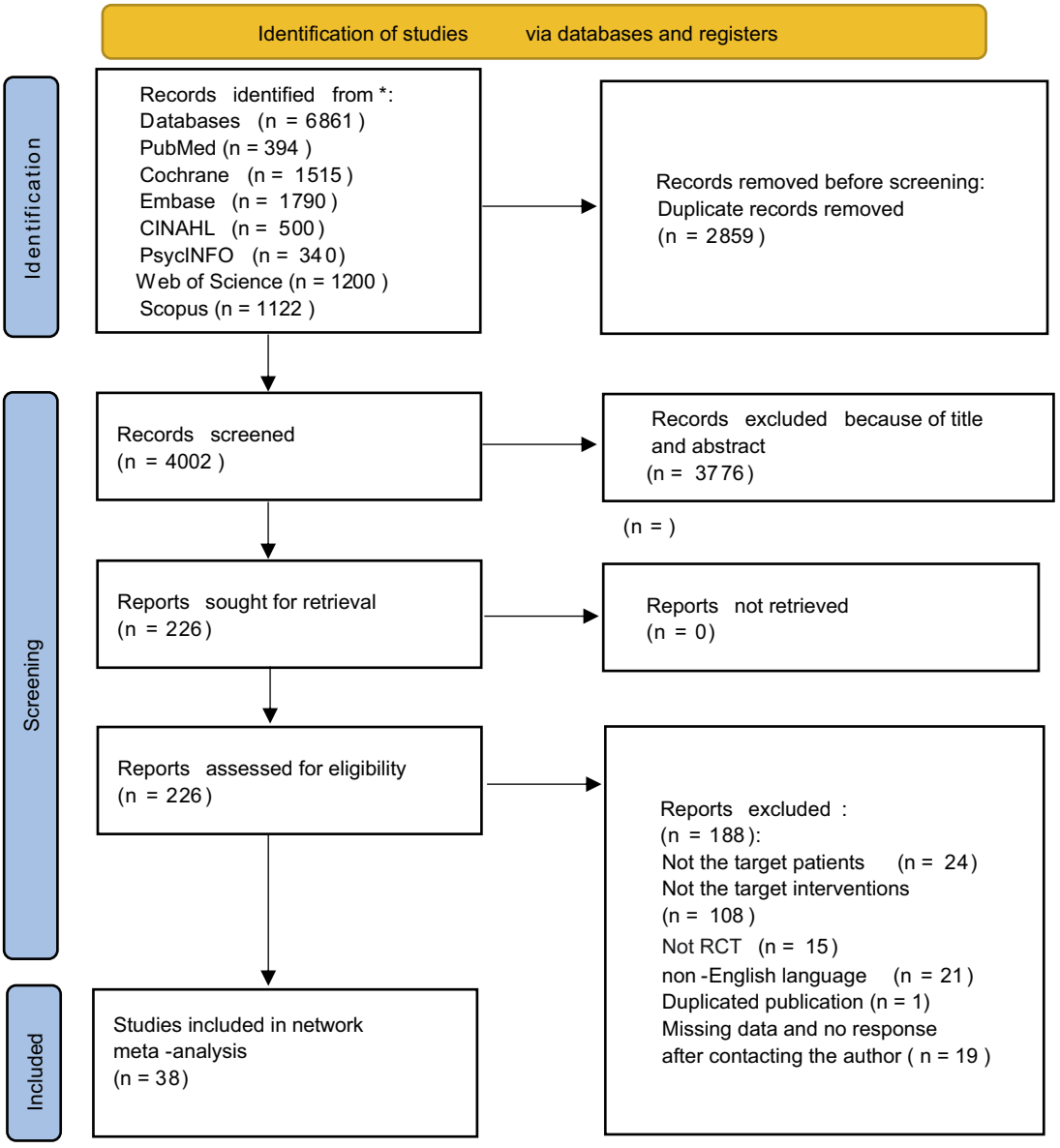


Figure 1. PRISMA flow diagram.

Mid- to long-term outcomes

Twenty-four studies with follow-ups compared 9 intervention types (Figure 2b). As shown in the league table (Figure 3b), third-wave therapies (Hedges' g = −0.82, 95% CI: −1.25 to −0.39) significantly reduced PSD compared to TAU, showing large effects. Third-wave therapies were also more effective than psychoeducation (Hedges' g = −0.91, 95% CI: −1.76 to −0.05), and CBT (Hedges' g = −0.55, 95% CI: −1.08 to −0.02). No significant effects were found for other interventions. SUCRA rankings (Figure 4b) indicated third-wave therapies (SUCRA, 85.60%; mean rank, 2.40) had the highest probability of being the most effective, followed by biofeedback therapy (SUCRA, 81.40%; mean rank, 2.90), relaxation therapy (SUCRA, 65.30%; mean rank, 4.50), art therapy (SUCRA, 51.40%; mean rank, 5.90), and CBT (SUCRA, 49.30%; mean rank, 6.10). TAU ranked lowest (SUCRA, 22.50%; mean rank, 8.70).

Subgroup analysis of mild-to-severe PSD

Stroke survivors in 20 studies had mild PSD at baseline (Supplementary Figure S6A). Supplementary Figure S7A shows that relaxation therapy (Hedges' g = −0.77, 95% CI: −1.27 to −0.27), family therapy (Hedges' g = −0.37, 95% CI: −0.57 to −0.17), and CBT (Hedges' g = −0.36, 95% CI: −0.60 to −0.13) significantly improved PSD compared to TAU, with small-to-medium effect sizes. Relaxation therapies were also more effective than psychoeducation (Hedges' g = −0.72, 95% CI: −1.28 to −0.16). Detailed rankings are in Supplementary Figure S8A.

Nine studies included stroke survivors with moderate-to-severe PSD at baseline (Supplementary Figure S6B). As shown in the league table (Supplementary Figure S7B), no significant difference was observed in this subgroup analysis. Detailed rankings are in Supplementary Figure S8B.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

Table 1. Main characteristics of included studies

Author (Year)	Country	Sample size (Intervention/ comparator)	Mean age of stroke survivors mean (SD)		Mean baseline depression scores mean (SD)		Intervention group						Control group	Intention-to-treat analysis; Adverse events
			Intervention	Comparator	Intervention	Comparator	Setting	Type	Frequency; Time	Duration	Deliverers	Format		
Nikath (2025)	India	15/15	52.27 (12.19)	54.07 (9.86)	15.80 (2.21)	16.47 (1.36)	NR	Relaxation	Three times per week; each session for 60 min	4w	NR	Face-to-face	TAU	NR; NR
Lawrence (2025)	UK	30/32	56.0 (11.8)	56.8 (10.6)	24.70 (12.60)	21.30 (9.87)	Home	Third	Six days a week; 22.70 min per day	9w	MBSR trainers	Online	TAU	ITT; NR
Najibi, (2025)	Iran	18/18	/	/	10.40 (8.01)	22.81 (11.08)	Hospital	Third	Once a week; each lasting 2.5 h	8w	Certified experts	Face-to-face	TAU	No; No
Zhang et al. (2025)	China	48/47	/	/	12.36 (1.40)	12.62 (1.37)	Hospital and home	Third	Hospital: twice per week; 1 to 1.5 hours per session Home: once per week; 1 to 1.5 hours per session	6w	Physician; head nurse; rehabilitation therapist; psychological counselors; nursing assistant; master's-level nursing student	Hospital: face-to-face Home: remote	WL	NR; No
Ho et al. (2025)	China	75/82	54.3 (8.61)	55.5 (7.50)	7.12 (4.00)	7.27 (3.66)	Public hospitals and community	AT	Once a week; 90 min each session	8w	A registered expressive arts therapist	Face-to-face	TAU	ITT; No
Wan et al., 2024)	China	60/60	66.23 (9.41)	69.17 (9.58)	5.60 (4.44)	4.50 (4.07)	Community health center; rehabilitation unit	Support	Once a week; 120 min each session	6w	Nurse and peer facilitator	Face-to-face	TAU	ITT; NR
Nordin et al. (2025)	Malaysia	33/33	49 (3.1)	47.2 (2.8)	7.12 (2.16)	8.42 (1.71)	Hospital/Home	Relaxation	Three times per week; 60 min each session	3 m	Physiotherapist	Face-to-face	TAU	ITT; NR
Liu et al. (2024)	China	9/9	49.50 (35.25)	55.40 (14.56)	23.78 (4.29)	24.00 (6.00)	Hospital	AT	Five days a week; 30 min per day	3w	Speech-language pathologist	Face-to-face	TAU	ITT; No adverse events in music intervention group
Yue et al. (2024)	China	88/88	65.4 (6.0)	67.3 (5.8)	7.6 (3.2)	7.6 (3.4)	Home	CBT	Once a week; 120 min each time	3 m	Nurses; psychological counselor; AIS specialist	Face-to-face	TAU	NR; NR
Liu et al. 2023)	China	70/70	62.21 (9.94)	61.61 (10.84)	10.9 (2.64)	10.2 (2.63)	Medical center	Third	Twice a week; 45–60 min each session	4w	Two research nurses	Face-to-face	TAU	ITT; NR
Mou et al. (2023)	China	81/81	54.63 (11.8)	57.52 (10.37)	8.31 (4.34)	7.89 (5.03)	Hospital and home	FAM	1) within a week of hospital pre-discharge; 60 min each session; 2) once a week for 4 weeks; 30 min each time	5w	Registered nurse	Face-to-face and telephone	TAU	ITT; NR

(*Continued*)

Table 1. (*Continued*)

Author (Year)	Country	Sample size (Intervention/ comparator)	Mean age of stroke survivors mean (SD)		Mean baseline depression scores mean (SD)		Setting	Intervention group					Control group	Intention-to-treat analysis; Adverse events
			Intervention	Comparator	Intervention	Comparator		Type	Frequency; Time	Duration	Deliverers	Format		
Adamit et al. (2023)	Israel	33/33	64.6 (8.2)	64.4 (10.8)	6.4 (3.3)	6.4 (4.0)	Community	CBT	Once a week; 60 min each session	10w	Occupational therapist	Face-to-face	TAU	ITT; NR
Yu et al. (2023)	China	81/79	66.1 (8.0)	66.9 (8.2)	6.6 (3.0)	6.9 (3.6)	Rehabilitation center	RT	Once a month; 60 min each time	12 m	Trained nurses	Face-to-face	TAU	ITT; NR
Zhang et al. (2023)	China	81/81	65.4 (7.9)	66.9 (8.1)	7.9 (2.4)	7.7 (2.6)	Hospital	RT	Four times each month; 60 min each session	6 m	Trained nurses	Face-to-face	TAU	ITT; NR
Fleming et al. (2024)	UK	48/36	58.5 (12.7)	58.7 (14.7)	10.2 (4.4)	9.5 (5.1)	Home	CBT	Once a week; 15–20 min each session	6w	NR	Automated online sessions	TAU	ITT; No adverse events
Mou et al. (2022)	China	20/20	49.95 (11.51)	53.85 (11.28)	7.60 (4.15)	7.15 (5.93)	Hospital and home	FAM	1) three sessions; 60 min each session; 2) once a week for 4 weeks; 30 min each time	5w	Registered nurse	Face-to-face and telephone	TAU	ITT; No adverse events
Niu et al. (2022)	China	52/52	61.5 (11.5)	64.8 (12.1)	10.8 (5.8)	10.3 (4.2)	Hospital	Third	Five sessions with 45–55 min per session during the hospitalization	2w	Psychological therapist, research assistant, and a nurse	Face-to-face	TAU	NR; NR
Terrill et al. 2022)	USA	20/14	51.68 (16.73)	55.85 (15.56)	16.89 (7.18)	16.92 (6.49)	University-affiliated clinic	FAM	60 min each week	8w	NR	Face-to-face	WL	NR; NR
Minshall et al. (2020)	Australia	42/31	67 (13.7)	69 (11.9)	6.31 (4.20)	6.40 (4.52)	Hospital/Home	FAM	60 min each week	8 w, followed by a 'booster' session at 3 months.	Psychologist	Face-to-face/ telephone/ Skype	TAU	ITT; NR
Chang et al. (2020)	Taiwan	20/20	67.6 (11.4)	67.2 (7.6)	13.1 (3.2)	14.3 (2.9)	Hospital	Biofeedback	Twice a day; 20 min per day	4d	Researcher	Face-to-face	TAU	No; NR
Wang et al. (2020)	China	101/101	×	×	18.48 (6.91)	19.96 (8.17)	Hospital	Third	Eight 2-hour group sessions	8w	Professional therapists	NR	PE	NR; NR
Majumdar et al. (2019)	UK	26/27	65.3 (11.9)	60.0 (15.6)	12.46 (6.3)	10.85 (7.5)	Community	Third	120 min each week	4w	Clinical psychologists, assistant psychologists, or stroke care coordinators	Face-to-face	TAU	ITT; NR

(*Continued*)

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

Table 1. (*Continued*)

Author (Year)	Country	Sample size (Intervention/ comparator)	Mean age of stroke survivors mean (SD)		Mean baseline depression scores mean (SD)		Setting	Intervention group					Control group	Intention-to-treat analysis; Adverse events
			Intervention	Comparator	Intervention	Comparator		Type	Frequency; Time	Duration	Deliverers	Format		
Nguyen et al. (2019)	Australia	9/6	47.22 (15.21)	51.17 (10.65)	7.78 (3.56)	8.00 (5.51)	Clinic rooms/ Home	CBT	Once a week; 60 min each time	2 m	Psychologist	Face-to-face	TAU	ITT; NR
Ellis-Hill et al. (2019)	UK	29/27	72.0 (11.22)	67.4 (12.83)	6.1 (3.75)	5.0 (2.74)	Community	AT	Ten times; 120 min each time	14w	Arts and health practitioner	Face-to-face	Support	NR; Five SAEs and five AEs were noted. None was deemed related to the intervention.
Golding et al. (2018)	UK	11/10	67.8 (7.48)	62.4 (8.36)	8.2 (3.882)	9.4 (3.596)	Community	Relaxation	Five times, once a week	1 m	NR	CD	TAU	NR; NR
Terrill et al. 2018)	USA	9/2	51.44 (16.37)	76.50 (10.61)	16.89 (7.79)	17 (7.07)	University-affiliated clinic	FAM	Four activities each week	8w	NR	Face-to-face	TAU	NR; NR
Kerr et al. (2018)	Australia	25/23	66.4 (14.9)	69.9 (12.8)	5.8 (5.4)	6.4 (6.8)	Hospital	MI	Three times; 30 min each time	3d	Nurses and social workers	Face-to-face	TAU	ITT; NR
Kootker et al. (2017)	Netherlands	31/30	62.2 (8.3)	60 (10.5)	12 (3)	12 (3)	Hospital	CBT	Thirteen–sixteen sessions; 60 min each session	4 m	Psychologist	Face-to-face	CT	ITT; NR
Van de Ven et al. (2017)	Netherlands	38/24	57.0 (9.1)	61.2 (9.0)	6.1 (3.8)	5.2 (2.4)	Home	CT	Five times per week; 30 min each time	12w	Neuropsychologist	Computer	TAU	ITT; NR
Simblett et al. (2017)	UK	19/9	62.1 (11.4)	64.6 (8.1)	19.1 (5.8)	13.4 (4.1)	Community	CBT	One module per week; 60 min each module	8w	A researcher with a master's level degree in neuropsychology	Computer	CT	NR; 3 participants discontinuing due to potential adverse effects.
Kongkasuwan et al. (2016)	Thailand	59/59	67.1 (9.2)	65.5 (9.9)	10.7 (5.8)	9.8 (5.0)	Hospital	AT	Twice a week; 90–120 min each time	4w	Therapists	Face-to-face	TAU	NR; NR
Hoffmann et al. (2015)	Australia	11/10	63.6 (13.0)	57.0 (14.2)	6.2 (2.2)	7.3 (2.9)	Hospital and home	CBT	Eight times; 60 min each time	2 m	Psychologist	Face-to-face	TAU	ITT; NR
Prokopenko et al. (2013)	Russia	24/19	62 (3)	65.5 (2)	6 (1)	7.75 (1.25)	Hospital	CT	Everyday; 30 min per day	2w	NR	Computer	TAU	NR; NR
Thomas et al. (2013)	UK	51/54	68.5 (13.1)	65.5 (13.9)	23.4 (12.2)	20.1 (9.0)	Home	CBT	Twenty sessions; 60 min each session	3 m	Psychologist	Face-to-face	TAU	ITT; NR

(*Continued*)

Table 1. (*Continued*)

Author (Year)	Country	Sample size (Intervention/ comparator)	Mean age of stroke survivors mean (SD)		Mean baseline depression scores mean (SD)		Setting	Intervention group					Control group	Intention-to-treat analysis; Adverse events
			Intervention	Comparator	Intervention	Comparator		Type	Frequency; Time	Duration	Deliverers	Format		
Sabariego et al. (2013)	Germany	110/103	55.31 (12.56)	59.31 (12.67)	5.77 (3.87)	6.19 (4.45)	Hospital	PE	60 min each session	5d	Psychologist	Face-to-face	TAU	ITT; NR
Alexopoulos et al. (2012)	USA	12/12	72.3 (7.44)	69.4 (9.58)	20.4 (9.19)	22.3 (6.89)	Hospital and home	FAM	Once a week; 45 min each session	12w	Therapist	Face-to-face	PE	ITT; NR
Chang et al. (2011)	China	39/38	58.86 (10.4)		29.29 (13.45)	29.97 (5.84)	Hospital	CBT	Once a week; 60–120 min each time	1 m	Psychology graduate student	Face-to-face	TAU	NR; NR
Lincoln et al. (2003)	UK	39/41/43	67.1 (12.7)	65 (15.1) 66.1 (13.2)	17.3 (6.92)	18 (7.69) 15 (3.70)	Home	CBT; Support	60 min each session 60 min each one time	3 m 3 m	Community psychiatric nurse	Face-to-face	TAU	NR; NR

Abbreviations: B, baseline; NR, not report; TAU, treatment as usual; WL, waitlist control; FAM, Family therapy; CBT, Cognitive behavioral therapy; RT, Reminiscence therapy; Third, Third-wave therapies; BAT, Behavioral activation therapy; Biofeedback, Biofeedback therapy; PE, Psychoeducation; CT, Cognitive training; AT, Art therapy; Relaxation, Relaxation therapy; MI, Motivational interviewing; PST, Problem-Solving therapy; Support, Supportive therapy; min, minutes; m, months; w, weeks; CD, Compact Disk; ITT, Intention-to-treat analysis; SAEs, Serious adverse events; AEs, Adverse events.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

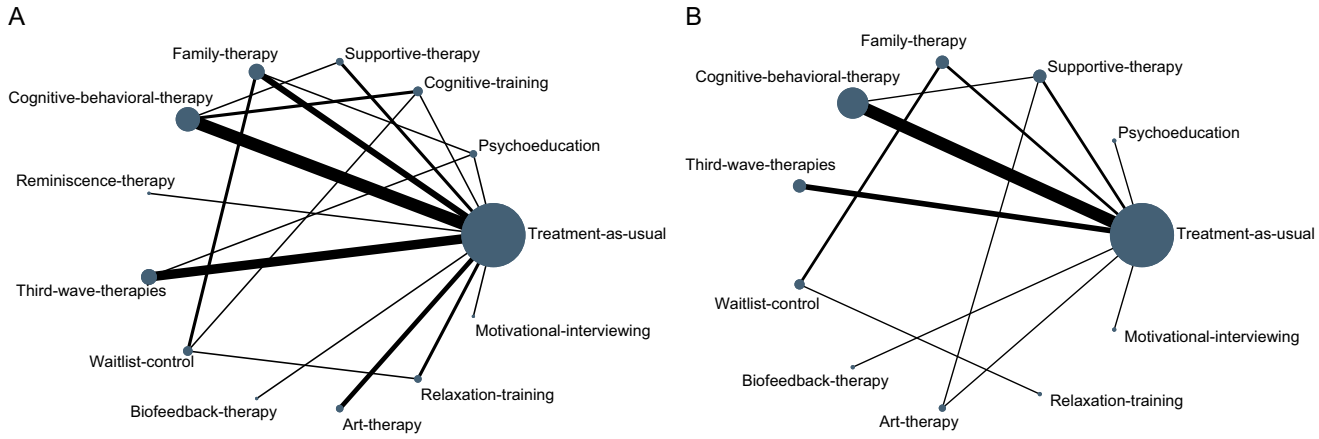


Figure 2. Network diagram. (a) Main outcomes. (b) Mid- to long-term outcomes.

Assessment of heterogeneity and inconsistency

Considerable heterogeneity was found in the main (I^2 = 83.00%) and substantial heterogeneity in mid- to long-term (I^2 = 63.50%) outcomes. No global or local inconsistency detected in the NMA for main, mid- to long-term, or mild PSD outcomes (Supplementary Text S1, Supplementary Figure S9).

Publication bias and sensitivity analyses

Funnel plots were symmetrical, indicating no small-study effects. Publication bias was not assessed for moderate-to-severe PSD due to fewer than 10 studies (Supplementary Figure S10). Sensitivity analyses excluding studies with antidepressant use, with sample size <30, or participants with cognitive impairment produced results consistent with the main analyses (Supplementary Figures S11–S12).

Certainty of evidence

The certainty of evidence for main outcomes ranged from very low to low, mainly downgraded due to within-study bias and imprecision. About three-fifths of studies had medium-to-high risk of bias, and most 95% CIs fell outside the equivalence range. Details are provided in Supplementary Table S4.

Discussion

This NMA quantified and ranked psychological interventions for PSD. The NMA revealed that third-wave therapies showed a greater probability of being the optimal psychological interventions for improving PSD in the short-term and mid-to-long-term. These findings were robust in our sensitivity analysis. In addition, the findings of our NMA suggested relaxation therapy significantly ameliorated mild PSD. However, for moderate-to-severe PSD, no significant effects were observed in this NMA.

Third-wave therapies were significantly more effective than TAU in reducing PSD, with large effects sustained at follow-up, aligning with prior depression research (Seshadri et al., 2021). Mindfulness-based interventions and acceptance and commitment therapy (ACT) are representative examples of third-wave therapies. Research suggested that mindfulness may be associated with structural changes in the brain regions responsible for sensory, cognitive, and emotional processing; this may be a possible biological mechanism underlying the beneficial effects of mindfulness-based interventions in alleviating PSD (Lazar et al., 2005; Tao et al., 2022). Acceptance commitment therapy emphasizes accepting unpleasant emotions rather than suppressing them, which may be especially helpful for stroke survivors who find it difficult to adjust distorted perceptions in the short term (Liu et al., 2023). In the studies we included, ACT was primarily delivered in group settings, with each group consisting of 4 to 8 participants; the intervention typically lasted 4 weeks. The intervention was primarily delivered by clinical psychologists, though nurses were also involved. Non-clinical psychologists were required to undergo specialized ACT training prior to delivering the intervention and received supervision from clinical psychologists throughout the intervention period.

Relaxation therapy significantly ameliorated mild PSD. This finding is consistent with prior studies in other populations, including hematopoietic stem cell transplant recipients (Xia et al., 2025) and cancer patients (Fu et al., 2025). Relaxation therapy reduces levels of arousal by acting on the autonomic nervous system. This decreases muscle tension, improves sleep, enhances mood, and alleviates depression (Mohd Nordin, Deepak, & Ezzat Ghazali, 2025). Beyond its therapeutic efficacy, relaxation therapy is safe, low risk, and easily learned, making it highly accessible. For example, autogenic training is a relaxation therapy that induces physiological changes associated with calmness and tranquility. The method requires minimal therapist involvement or external tools; practitioners can learn to elicit relaxation responses through focused attention guided by simple verbal cues. It can be delivered across diverse healthcare settings, from non-specialist facilitators in community and primary care to mental health professionals, thereby offering a scalable and flexible approach to managing PSD (Hamdani et al., 2022).

CBT, originally developed to treat depression, is recommended in clinical guidelines (American Psychological Association, 2019). It is currently widely used to treat mild depression in a variety of populations (Cuijpers et al., 2023; Du et al., 2016). The impact of CBT on stroke survivors with mild PSD may stem from its ability to transform negative thoughts and beliefs into positive ones, correct behavioral patterns, activate activities that are valued by the individual, and elicit positive reinforcement from their living environment. This process enhances self-efficacy and fosters more cognitive control over negative emotions, ultimately improving mild PSD (M. Wan, Zhang, Wu, & Ma, 2024). In addition, our research findings indicated that family therapy was more effective

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

A

Third											
-0.19 (-1.73, 1.34)	Biofeedback										
-0.38 (-1.35, 0.58)	-0.19 (-1.84, 1.46)	AT									
-0.43 (-1.45, 0.60)	-0.23 (-1.92, 1.46)	-0.04 (-1.23, 1.15)	Relaxation								
-0.69 (-1.40, 0.02)	-0.50 (-2.01, 1.02)	-0.31 (-1.24, 0.62)	-0.27 (-1.25, 0.71)	CBT							
-0.68 (-1.71, 0.35)	-0.49 (-2.18, 1.20)	-0.30 (-1.49, 0.90)	-0.25 (-1.49, 0.99)	0.01 (-0.92, 0.94)	Support						
-0.70 (-1.48, 0.07)	-0.51 (-2.07, 1.05)	-0.32 (-1.32, 0.68)	-0.28 (-1.28, 0.73)	-0.01 (-0.75, 0.73)	-0.02 (-1.08, 1.03)	FAM					
-0.79 (-1.66, 0.07)	-0.60 (-2.26, 1.06)	-0.41 (-1.56, 0.74)	-0.37 (-1.56, 0.82)	-0.10 (-1.04, 0.84)	-0.11 (-1.32, 1.09)	-0.09 (-1.00, 0.82)	PE				
-0.84 (-2.25, 0.56)	-0.65 (-2.59, 1.30)	-0.46 (-1.99, 1.07)	-0.41 (-1.98, 1.15)	-0.15 (-1.53, 1.23)	-0.16 (-1.73, 1.41)	-0.14 (-1.56, 1.29)	-0.05 (-1.59, 1.49)	RT			
-0.90 (-1.94, 0.15)	-0.70 (-2.41, 1.00)	-0.51 (-1.73, 0.70)	-0.47 (-1.52, 0.58)	-0.20 (-1.18, 0.77)	-0.22 (-1.47, 1.04)	-0.19 (-1.10, 0.71)	-0.10 (-1.29, 1.08)	-0.06 (-1.64, 1.53)	WL		
-0.95 (-2.47, 0.56)	-0.76 (-2.78, 1.26)	-0.57 (-2.20, 1.06)	-0.53 (-2.20, 1.14)	-0.26 (-1.75, 1.23)	-0.28 (-1.94, 1.39)	-0.25 (-1.79, 1.28)	-0.16 (-1.80, 1.48)	-0.11 (-2.04, 1.81)	-0.06 (-1.74, 1.63)	MI	
-0.99 (-1.94, -0.04)	-0.80 (-2.44, 0.85)	-0.61 (-1.74, 0.52)	-0.57 (-1.68, 0.55)	-0.30 (-1.08, 0.48)	-0.31 (-1.47, 0.84)	-0.29 (-1.22, 0.64)	-0.20 (-1.33, 0.93)	-0.15 (-1.67, 1.37)	-0.10 (-1.07, 0.88)	-0.04 (-1.66, 1.59)	CT
-1.08 (-1.62, -0.55)	-0.89 (-2.33, 0.55)	-0.70 (-1.51, 0.10)	-0.66 (-1.54, 0.22)	-0.39 (-0.86, 0.07)	-0.40 (-1.28, 0.47)	-0.38 (-0.97, 0.21)	-0.29 (-1.12, 0.53)	-0.24 (-1.54, 1.05)	-0.19 (-1.10, 0.72)	-0.13 (-1.55, 1.29)	-0.09 (-0.88, 0.70)

B

Third										
0.07 (-1.00, 1.14)	Biofeedback									
-0.18 (-1.91, 1.55)	-0.25 (-2.20, 1.69)	Relaxation								
-0.51 (-1.26, 0.24)	-0.58 (-1.74, 0.58)	-0.33 (-2.11, 1.46)	AT							
-0.55 (-1.08, -0.02)	-0.62 (-1.65, 0.41)	-0.37 (-2.07, 1.34)	-0.04 (-0.72, 0.63)	CBT						
-0.54 (-1.26, 0.17)	-0.61 (-1.75, 0.53)	-0.36 (-1.93, 1.21)	-0.04 (-0.88, 0.81)	0.01 (-0.65, 0.67)	FAM					
-0.56 (-1.21, 0.08)	-0.63 (-1.73, 0.46)	-0.38 (-2.12, 1.37)	-0.05 (-0.70, 0.59)	-0.01 (-0.55, 0.53)	-0.02 (-0.78, 0.74)	Support				
-0.55 (-1.76, 0.66)	-0.62 (-2.12, 0.88)	-0.37 (-1.61, 0.87)	-0.05 (-1.33, 1.24)	-0.00 (-1.17, 1.17)	-0.01 (-0.98, 0.96)	0.01 (-1.22, 1.24)	WL			
-0.87 (-1.91, 0.18)	-0.93 (-2.31, 0.44)	-0.68 (-2.61, 1.25)	-0.36 (-1.49, 0.78)	-0.31 (-1.32, 0.69)	-0.32 (-1.44, 0.80)	-0.30 (-1.38, 0.77)	-0.31 (-1.79, 1.17)	MI		
-0.91 (-1.76, -0.05)	-0.98 (-2.20, 0.25)	-0.72 (-2.55, 1.11)	-0.40 (-1.36, 0.56)	-0.35 (-1.16, 0.45)	-0.36 (-1.30, 0.58)	-0.34 (-1.23, 0.54)	-0.35 (-1.70, 1.00)	-0.04 (-1.25, 1.17)	PE	
-0.82 (-1.25, -0.39)	-0.89 (-1.87, 0.09)	-0.64 (-2.31, 1.04)	-0.31 (-0.92, 0.30)	-0.27 (-0.58, 0.05)	-0.27 (-0.85, 0.31)	-0.26 (-0.74, 0.23)	-0.27 (-1.40, 0.87)	0.05 (-0.91, 1.00)	0.09 (-0.65, 0.83)	TAU

Figure 3. Net league table. (a) Main outcomes. (b) Mid- to long-term outcomes. Effect sizes (ES) and 95% confidence intervals (CIs) are reported. Statistically significant results are highlighted in red. Abbreviations: Third, third-wave therapies; Biofeedback, biofeedback therapy; AT, art therapy; Relaxation, relaxation therapy; CBT, cognitive behavior therapy; Support, supportive therapy; FAM, family therapy; PE, psychoeducation; RT, reminiscence therapy; WL, waitlist control; MI, motivational interviewing; CT, cognitive training; TAU, treatment as usual.

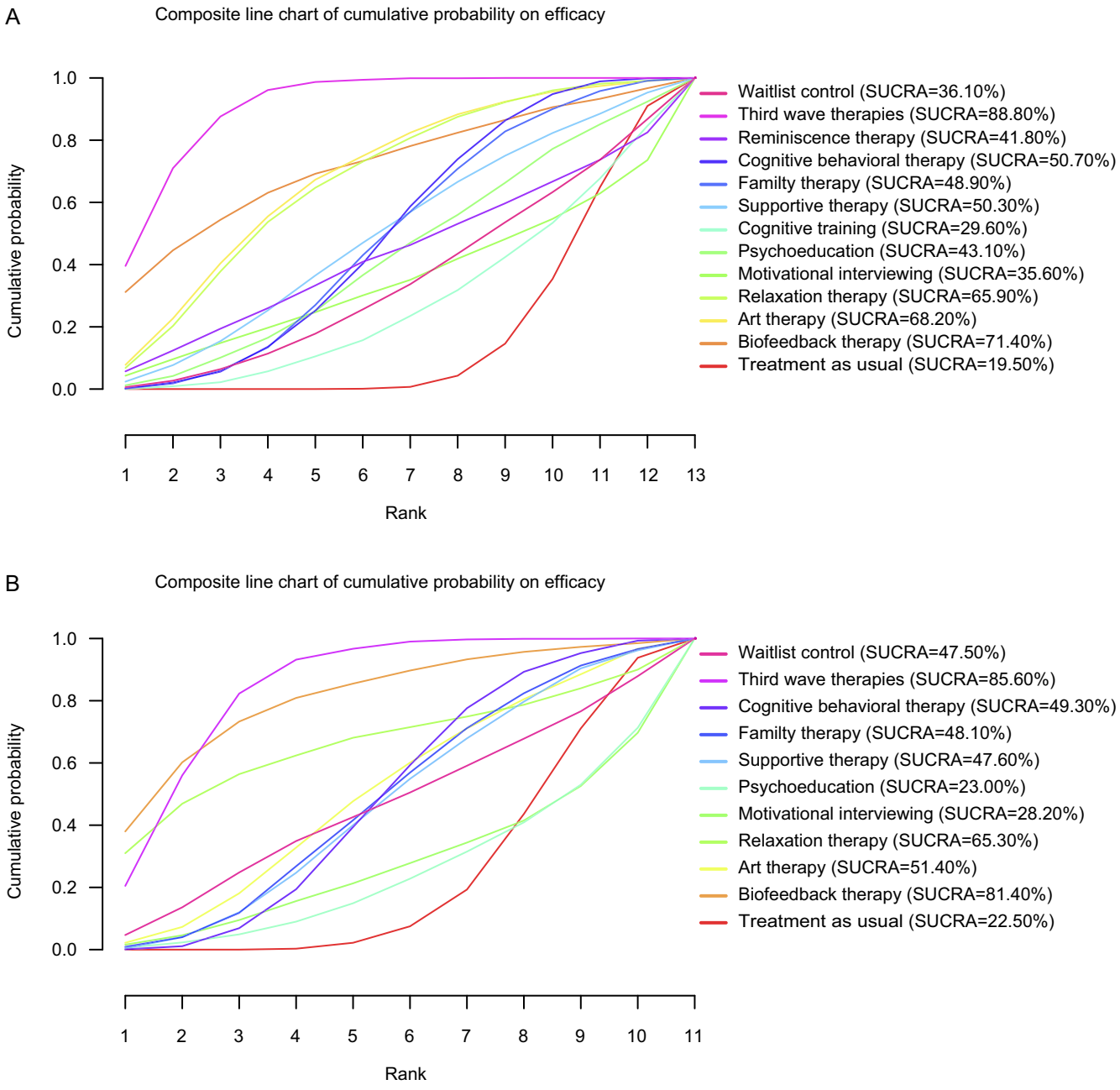


Figure 4. The probability ranking for all interventions. (a) Main outcomes. (b) Mid- to long-term outcomes.

than TAU in alleviating mild PSD. Research indicated that PSD was associated with an individual's family system (Yuliana et al., 2023). Family therapy has the advantage of considering the individual's family system. By working with participants and their relatives to establish effective communication patterns and strengthen family support networks, this approach may effectively alleviate mild depressive symptoms (Henken et al., 2007).

For moderate-to-severe PSD, no significant effects were observed in this subgroup. This review only included nine relevant studies on moderate-to-severe PSD, so the absence of statistically significant findings should not be interpreted as evidence of ineffectiveness, but rather as reflecting insufficient power to detect potentially meaningful effects. Additionally, biofeedback therapy ranked second in both the main outcomes and mid- to long-term outcomes, but these findings were based on only one trial. SUCRA estimates derived from sparse networks are inherently unstable and may be inflated when a treatment node is informed by very few studies. Rankings for biofeedback therapy should therefore be viewed as preliminary signals rather than robust estimates of comparative efficacy.

It is also noteworthy that two of the studies included in our review focused on survivors with post-stroke aphasia. One of these studies developed an intervention manual based on guidelines for CBT for people with aphasia, tailored specific interventions to individuals' needs, and utilized communication aids such as pictures, photographs, and letter charts to overcome communication difficulties. The results showed that patients in the intervention group exhibited

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

significant improvement in depressive symptoms (Thomas et al., 2013). The other study employed art therapy, which relies less on verbal communication, and similarly achieved favorable outcomes (Li et al., 2024). This suggests that the use of augmentative and alternative communication methods, combined with appropriate psychological interventions, may also play a positive role in alleviating depressive symptoms in survivors with post-stroke aphasia.

Implications for clinical practice and future research

This NMA highlights the potential of psychological interventions in alleviating PSD, with significant implications for both clinical practice and future research. The effectiveness of relaxation therapy suggests that trained non-psychologist professionals can play a key role in PSD prevention and management, particularly in settings with limited mental health resources (Hamdani et al., 2022). Clinically, integrating psychological care into routine stroke rehabilitation is essential.

Research gaps remain. The scarcity of long-term follow-up data limits understanding of sustained intervention effects. Future studies should assess medium- and long-term outcomes to inform maintenance strategies. Stratified designs based on PSD severity are also needed to support precision mental healthcare.

Limitations

This NMA provides valuable insights but has several limitations. First, one-fifth of the included studies exhibited a high risk of bias, and two-fifths were rated as moderate risk. Furthermore, substantial heterogeneity in the primary NMA, and the inclusion of studies with small sample sizes, reduced the certainty of the evidence, necessitating cautious interpretation of the NMA results. Second, the included studies were predominantly conducted in China (34.21%), the UK (21.05%), and Australia (10.52%), while TAU may vary across healthcare contexts and care settings, the external validity of the findings is restricted. Third, scale conversion to PHQ-9 equivalents may introduce measurement error and reduce sensitivity to instrument-specific constructs. Fourth, third-wave therapies include mindfulness-based interventions, ACT, metacognitive therapy, and dialectical behavioral therapy. However, due to limited studies, only mindfulness-based interventions and ACT were included in this NMA; this limits the interpretability and generalizability of the conclusion regarding 'third-wave therapies' as a whole. Fifth, the impact of potential confounding factors, such as participant characteristics, treatment duration, and therapist expertise on PSD, was not examined in this study. These factors may have a particular impact on the results. Sixth, due to the limited number of included studies, we focused solely on PSD and were unable to synthesize evidence regarding other clinical outcomes highly correlated with PSD, such as functional recovery, quality of life, rehospitalization, and suicidality. Finally, publication bias was not assessed in the NMA of moderate-to-severe PSD, as fewer than 10 studies were included. Consequently, the results should be interpreted with caution.

Conclusions

Our NMA provides evidence suggesting that psychological interventions may improve PSD compared to TAU. Third-wave therapies show potential benefits, with third-wave therapies demonstrating better mid- to long-term outcomes. For mild PSD, relaxation therapy seems to be the most effective, while for moderate-to-severe PSD, no significant effects were observed in this subgroup. However, the primary NMA exhibited high heterogeneity, and for most comparisons, the certainty of the evidence was generally low to very low; therefore, the findings of this NMA should be interpreted with caution. Further rigorously designed, large-scale, multicenter RCTs are needed to investigate the long-term comparative efficacy of psychotherapy for PSD.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/S0033291726105273.

Acknowledgments. We thank the original authors of the selected studies for their excellent work and support of this study. In addition, we thank all members of the research team for their full cooperation. Finally, we express our sincerest gratitude to the reviewers and editors for their insightful suggestions and dedication to this work.

Author contribution. Conceptualization: X.C., R.C., Y.Q., Q.Z.; Formal analysis: X.C., R.C.; Methodology: X.C., R.C., Q.Z.; Resources: Q.Z.; Supervision: Q.Z.; Validation: Y.Q., Y.B.; Writing – original draft: X.C., R.C., Y.B., Q.Z.; Writing – review & editing: X.C., R.C., Y.Q., Q.Z.

Funding statement. This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Competing interests. The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

References

Adamit, T., Shames, J., & Rand, D. (2023). Functional and cognitive occupational therapy (FaC(o)T) improves self-efficacy and Behavioral-emotional status of individuals with mild stroke; analysis of secondary outcomes. *International Journal of Environmental Research and Public Health*, **20**(6). https://doi.org/10.3390/ijerph20065052

Allida, S., Cox, K. L., Hsieh, C. F., House, A., & Hackett, M. L. (2020). Pharmacological, psychological and non-invasive brain stimulation interventions for preventing depression after stroke. *Cochrane Database of Systematic Reviews*, **2020**(5), CD003689. https://doi.org/10.1002/14651858.CD003689.pub4

Alexopoulos, G. S., Wilkins, V. M., Marino, P., Kanellopoulos, D., Reding, M., Sirey, J. A., Raue, P. J., Ghosh, S., O'Dell, M. W., & Kiosses, D. N. (2012). Ecosystem focused therapy in poststroke depression: A preliminary study. *International Journal of Geriatric Psychiatry*, **27**(10), 1053–1060. https://doi.org/10.1002/gps.2822

American Psychological Association. (2019). Clinical practice guideline for the treatment of depression across three age cohorts. https://www.apa.org/depression-guideline

Bucher, H. C., Guyatt, G. H., Griffith, L. E., & Walter, S. D. (1997). The results of direct and indirect treatment comparisons in meta-analysis of randomized controlled trials. *Journal of Clinical Epidemiology*, **50**(6), 683–691. https://doi.org/10.1016/s0895-4356(97)00049-8

Cai, W., Mueller, C., Li, Y. J., Shen, W. D., & Stewart, R. (2019). Post stroke depression and risk of stroke recurrence and mortality: A systematic review and meta-analysis. *Ageing Research Reviews*, **50**, 102–109. https://doi.org/10.1016/j.arr.2019.01.013

Chang, K., Zhang, H., Xia, Y., & Chen, C. (2011). Testing the effectiveness of knowledge and behavior therapy in patients of hemiplegic stroke. *Topics in Stroke Rehabilitation*, **18**(5), 525–535. https://doi.org/10.1310/tsr1805-525

Chang, W. L., Lee, J. T., Li, C. R., Davis, A. H. T., Yang, C. C., & Chen, Y. J. (2020). Effects of Heart rate variability biofeedback in patients with acute ischemic stroke: A randomized controlled trial. *Biological Research for Nursing*, **22**(1), 34–44. https://doi.org/10.1177/1099800419881210

Cohen, Z. D., & DeRubeis, R. J. (2018). Treatment selection in depression. *Annual Review of Clinical Psychology*, **14**(1), 209–236. https://doi.org/10.1146/annurev-clinpsy-050817-084746

Cuijpers, P., Miguel, C., Harrer, M., Plessen, C. Y., Ciharova, M., Ebert, D., & Karyotaki, E. (2023). Cognitive behavior therapy vs. control conditions, other psychotherapies, pharmacotherapies and combined treatment for depression:

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

A comprehensive meta-analysis including 409 trials with 52,702 patients. *World Psychiatry*, **22**(1), 105–115. https://doi.org/10.1002/wps.21069

Dong, L., Williams, L. S., Brown, D. L., Case, E., Morgenstern, L. B., & Lisabeth, L. D. (2021). Prevalence and course of depression during the first year after mild to moderate stroke. *Journal of the American Heart Association*, **10**(13), e020494. https://doi.org/10.1161/jaha.120.020494

Du, X., Mao, Y., Ran, Q., Zhang, Q., Luo, Q., & Qiu, J. (2016). Short-term group cognitive behavior therapy contributes to recovery from mild depression: Evidence from functional and structural MRI. *Psychiatry Research: Neuroimaging*, **251**, 53–59. https://doi.org/10.1016/j.pscychresns.2016.04.010

Ellis-Hill, C., Thomas, S., Gracey, F., Lamont-Robinson, C., Cant, R., Marques, E. M. R., Thomas, P. W., Grant, M., Nunn, S., Paling, T., Thomas, C., Werson, A., Galvin, K. T., Reynolds, F., & Jenkinson, D. (2019). HeART of stroke: Randomised controlled, parallel-arm, feasibility study of a community-based arts and health intervention plus usual care compared with usual care to increase psychological well-being in people following a stroke. *BMJ Open*, **9**(3), e021098. https://doi.org/10.1136/bmjopen-2017-021098

Fleming, M. K., Smejka, T., Macey, E., Luengo-Fernandez, R., Henry, A. L., Robinson, B., Kyle, S. D., Espie, C. A., & Johansen-Berg, H. (2024). Improving sleep after stroke: A randomised controlled trial of digital cognitive behavioural therapy for insomnia. *Journal of Sleep Research*, **33**(2), e13971. https://doi.org/10.1111/jsr.13971

Fu, W., Liu, Y., Jiang, Y., Chu, H., Shao, R., Chen, P., Zheng, X., Li, C., He, J., Lin, K., & Liang, W. (2025). Treatments of depressive symptoms in cancer patients: A systematic review and network meta-analysis. *Translational Psychiatry*, **15**(1), 327. https://doi.org/10.1038/s41398-025-03507-z

Golding, K., Fife-Schaw, C., & Kneebone, I. (2018). A pilot randomized controlled trial of self-help relaxation to reduce poststroke depression. *Clinical Rehabilitation*, **32**(6), 747–751. https://doi.org/10.1177/0269215517741947

Guo, J., Wang, J., Sun, W., & Liu, X. (2022). The advances of post-stroke depression: 2021 update. *Journal of Neurology*, **269**(3), 1236–1249. https://doi.org/10.1007/s00415-021-10597-4

Hamdani, S. U., Zill, E. H., Zafar, S. W., Suleman, N., Um Ul, B., Waqas, A., & Rahman, A. (2022). Effectiveness of relaxation techniques 'as an active ingredient of psychological interventions' to reduce distress, anxiety and depression in adolescents: A systematic review and meta-analysis. *International Journal of Mental Health Systems*, **16**(1), 31. https://doi.org/10.1186/s13033-022-00541-y

Henken, H. T., Huibers, M. J., Churchill, R., Restifo, K.K., & Roelofs, J.J.(2007). Family therapy for depression. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.Cd006728

Higgins, J., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., & Welch, V. A. (Eds.). (2024). *Cochrane handbook for systematic reviews of interventions version 6.5*. Cochrane. Retrieved from www.training.cochrane.org/handbook

Ho, R. T. H., Lo, T. L. T., Fong, T. C. T., Chan, C. K. P., Pang, M. Y. C., Wan, A. H. Y., Leung, P. P. Y., & Lau, G. K. K. (2025). Psychophysiological effects of an expressive arts-based intervention in young and pre-elderly stroke survivors: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, **106**(9), 1303–1311. https://doi.org/10.1016/j.apmr.2025.04.008

Hoffmann, T., Ownsworth, T., Eames, S., & Shum, D. (2015). Evaluation of brief interventions for managing depression and anxiety symptoms during early discharge period after stroke: A pilot randomized controlled trial. *Topics in Stroke Rehabilitation*, **22**(2), 116–126. https://doi.org/10.1179/1074935714z.0000000030

Hutton, B., Salanti, G., Caldwell, D. M., Chaimani, A., Schmid, C. H., Cameron, C., Ioannidis, J. P. A., Straus, S., Thorlund, K., Jansen, J. P., Mulrow, C., Catalá-López, F., Gøtzsche, P. C., Dickersin, K., Boutron, I., Altman, D. G., & Moher, D. (2015). The PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of health care interventions: Checklist and explanations. *Annals of Internal Medicine*, **162**(11), 777–784. https://doi.org/10.7326/m14-2385

Intercollegiate Stroke Working Party. (2023). National clinical guideline for stroke for the UK and Ireland. Retrieved from https://www.strokeguideline.org/

Kerr, D., McCann, T., Mackey, E., & Wijeratne, T. (2018). Effects of early motivational interviewing on post-stroke depressive symptoms: A pilot randomized study of the good mood intervention program. *International Journal of Nursing Practice*, **24**(4), e12657. https://doi.org/10.1111/ijn.12657

Kongkasuwan, R., Voraakhom, K., Pisolayabutra, P., Maneechai, P., Boonin, J., & Kuptniratsaikul, V. (2016). Creative art therapy to enhance rehabilitation for stroke patients: A randomized controlled trial. *Clinical Rehabilitation*, **30**(10), 1016–1023. https://doi.org/10.1177/0269215515607072

Kootker, J. A., Rasquin, S. M., Lem, F. C., van Heugten, C. M., Fasotti, L., & Geurts, A. C. (2017). Augmented cognitive Behavioral therapy for poststroke depressive symptoms: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, **98**(4), 687–694. https://doi.org/10.1016/j.apmr.2016.10.013

Lawrence, M., Davis, B., Clark, N. E., Booth, J., Donald, G., Dougall, N., Fenocchi, L., Grealy, M., Jamieson, M., Jani, B., Kontou, E., MacDonald, J., Mason, H., Maxwell, M., Parkinson, B., Pieri, M., Wang, X., & Mercer, S. W. (2025). A pilot randomized controlled trial testing the feasibility and acceptability of helping ease anxiety and depression after stroke (HEADS: UP): An online mindfulness-based intervention for stroke survivors. *Mindfulness*, **16**(7), 1862–1875. https://doi.org/10.1007/s12671-025-02595-8

Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport*, **16**(17), 1893–1897. https://doi.org/10.1097/01.wnr.0000186598.66243.19

Li, J., Yang, L., Lv, R., Kuang, J., Zhou, K., & Xu, M. (2023). Mediating effect of post-stroke depression between activities of daily living and health-related quality of life: Meta-analytic structural equation modeling. *Quality of Life Research*, **32**(2), 331–338. https://doi.org/10.1007/s11136-022-03225-9

Li, Y., Wang, Y., Gao, L., Meng, X., & Deng, Q. (2024). Effect of nonpharmacological interventions on poststroke depression: A network meta-analysis. *Frontiers in Neurology*, **15**, 1376336. https://doi.org/10.3389/fneur.2024.1376336

Lincoln, N. B., & Flannaghan, T. (2003). Cognitive behavioral psychotherapy for depression following stroke: A randomized controlled trial. *Stroke*, **34**(1), 111–115. https://doi.org/10.1161/01.str.0000044167.44670.55

Liu, Y. E., Lv, J., Sun, F. Z., Liang, J. J., Zhang, Y. Y., Chen, J., & Jiang, W. J. (2023). Effectiveness of group acceptance and commitment therapy in treating depression for acute stroke patients. *Brain and Behavior*, **13**(12), e3260. https://doi.org/10.1002/brb3.3260

Liu, Q., Li, W., Chen, Y., Zhang, S., Sun, Z., Yang, Y., Lv, P., & Yin, Y. (2024). Effects of repetitive transcranial magnetic stimulation combined with music therapy in non-fluent aphasia after stroke: A randomised controlled study. *International Journal of Language & Communication Disorders*, **59**(3), 1211–1222. https://doi.org/10.1111/1460-6984.12991

Majumdar, S., & Morris, R. (2019). Brief group-based acceptance and commitment therapy for stroke survivors. *The British Journal of Clinical Psychology*, **58**(1), 70–90. https://doi.org/10.1111/bjc.12198

Minshall, C., Castle, D. J., Thompson, D. R., Pascoe, M., Cameron, J., McCabe, M., Apputhurai, P., Knowles, S. R., Jenkins, Z., Chantal, F., & Ski, C. F. (2020). A psychosocial intervention for stroke survivors and carers: 12-month outcomes of a randomized controlled trial. *Topics in Stroke Rehabilitation*, **27**(8), 563–576. https://doi.org/10.1080/10749357.2020.1738677

Mohd Nordin, N. A., Deepak, T. V., & Ezzat Ghazali, S. (2025). Effectiveness of autogenic relaxation training as an adjunct to usual physiotherapy in enhancing emotional well-being and functional Independence in stroke survivors: A randomized controlled study. *Topics in Stroke Rehabilitation*, **32**(6), 573–585. https://doi.org/10.1080/10749357.2024.2444117

Mou, H., Lam, S. K. K., & Chien, W. T. (2022). Effects of a familyfocused dyadic psychoeducational intervention for stroke survivors and their family caregivers: A pilot study. *BMC Nursing*, **21**(1), 364. https://doi.org/10.1186/s12912-022-01145-0

Mou, H., Lam, S. K. K., & Chien, W. T. (2023). The effects of a family-focused dyadic psychoeducational intervention for stroke survivors and their family caregivers: A randomised controlled trial. *International Journal of Nursing Studies*, **143**, 104504. https://doi.org/10.1016/j.ijnurstu.2023.104504

Najibi, A. M., Rahnemayan, S., Poursoleimani, A., Heshmati, R., Nazari, M. A., Shali, E. G., Nasiri, E., & Farhoudi, M. (2025). Transcranial direct current stimulation and mindfulness for cognitive and mood recovery in stroke survivors: A pilot randomized controlled study. *Stroke Research and Treatment*, **2025**, 3893469. https://doi.org/10.1155/srat/3893469

Nguyen, S., Wong, D., McKay, A., Rajaratnam, S. M. W., Spitz, G., Williams, G., Mansfield, D., & Ponsford, J. L. (2019). Cognitive behavioural therapy for post-stroke fatigue and sleep disturbance: A pilot randomised controlled trial with blind assessment. *Neuropsychological Rehabilitation*, **29**(5), 723–738. https://doi.org/10.1080/09602011.2017.1326945

Nikath, M. N., & F. S., A. K. Vijay Krishna Kumar. (2025). The effect of Benson's relaxation technique on depression, anxiety, and stress in post stroke patients.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273

International Journal of Science and Healthcare Research, **10**(3). https://doi.org/10.52403/ijshr.20250313

Niu, Y., Sheng, S., Chen, Y., Ding, J., Li, H., Shi, S., & Ye, D. (2022). The efficacy of group acceptance and commitment therapy for preventing post-stroke depression: A randomized controlled trial. *Journal of Stroke and Cerebrovascular Diseases*, **31**(2), 106225. https://doi.org/10.1016/j.jstrokecerebrovasdis.2021.106225

Paolucci, S., Iosa, M., Coiro, P., Venturiero, V., Savo, A., De Angelis, D., & Morone, G. (2019). Post-stroke depression increases disability more than 15% in ischemic stroke survivors: A Case-control study. *Frontiers in Neurology*, **10**, 926. https://doi.org/10.3389/fneur.2019.00926

Papakonstantinou, T., Nikolakopoulou, A., Higgins, J. P. T., Egger, M., & Salanti, G. (2020). CINeMA: Software for semiautomated assessment of the confidence in the results of network meta-analysis. *Campbell Systematic Reviews*, **16**(1), e1080. https://doi.org/10.1002/cl2.1080

Prokopenko, S. V., Mozheyko, E. Y., Petrova, M. M., Koryagina, T. D., Kaskaeva, D. S., Chernykh, T. V., Shvetzova, I. N., & Bezdenezhnih, A. F. (2013). Correction of post-stroke cognitive impairments using computer programs. *Journal of the Neurological Sciences*, **325**(1-2), 148–153. https://doi.org/10.1016/j.jns.2012.12.024

Qiqi, N., Hangting, L., Jia, W., Jiaoni, S., Xinrui, W., & Guijuan, H. (2021). A meta-analysis of the effect of motivational interviewing on depression, anxiety, and quality of life in stroke patients. *Journal of Neuroscience Nursing*, **53**(6), 244–250. https://doi.org/10.1097/jnn.0000000000000617

Sabariego, C., Barrera, A. E., Neubert, S., Stier-Jarmer, M., Bostan, C., & Cieza, A. (2013). Evaluation of an ICF-based patient education programme for stroke patients: A randomized, singleblinded, controlled, multicentre trial of the effects on self-efficacy, life satisfaction and functioning. *British Journal of Health Psychology*, **18**(4), 707–728. https://doi.org/10.1111/bjhp.12013

Seshadri, A., Orth, S. S., Adaji, A., Singh, B., Clark, M. M., Frye, M. A., McGillivray, J., & Fuller-Tyszkiewicz, M. (2021). Mindfulness-based cognitive therapy, acceptance and commitment therapy, and positive psychotherapy for major depression. *American Journal of Psychotherapy*, **74**(1), 4–12. https://doi.org/10.1176/appi.psychotherapy.20200006

Simblett, S. K., Yates, M., Wagner, A. P., Watson, P., Gracey, F., Ring, H., & Bateman, A. (2017). Computerized cognitive Behavioral therapy to treat emotional distress after stroke: A feasibility randomized controlled trial. *JMIR Mental Health*, **4**(2), e16. https://doi.org/10.2196/mental.6022

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H. Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., Higgins, J. P. T. (2019). RoB 2: A revised tool for assessing risk of bias in randomised trials. *BMJ*, **366**, l4898. https://doi.org/10.1136/bmj.l4898

Tao, S., Geng, Y., Li, M., Ye, J., & Liu, Z. (2022). Effectiveness of mindfulness-based stress reduction and mindfulness-based cognitive therapy on depression in poststroke patients-a systematic review and meta-analysis of randomized controlled trials. *Journal of Psychosomatic Research*, **163**, 111071. https://doi.org/10.1016/j.jpsychores.2022.111071

Terrill, A. L., Reblin, M., MacKenzie, J. J., Baucom, B. R. W., Einerson, J., Cardell, B., Richards, L. G., & Majersik, J. J. (2022). Intimate relationships and stroke: Piloting a dyadic intervention to improve depression. *International Journal of Environmental Research and Public Health*, **19**(3). https://doi.org/10.3390/ijerph19031804

Terrill, A. L., Reblin, M., MacKenzie, J. J., Cardell, B., Einerson, J., Berg, C. A., Majersik, J. J., & Richards, L. (2018). Development of a novel positive psychology-based intervention for couples post-stroke. *Rehabilitation Psychology*, **63**(1), 43–54. https://doi.org/10.1037/rep0000181

Thomas, S. A., Walker, M. F., Macniven, J. A., Haworth, H., & Lincoln, N. B. (2013). Communication and low mood (CALM): A randomized controlled trial of behavioural therapy for stroke patients with aphasia. *Clinical Rehabilitation*, **27**(5), 398–408. https://doi.org/10.1177/0269215512462227

van de Ven, R. M., Murre, J. M. J., Buitenweg, J. I. V., Veltman, D. J., Aaronson, J. A., Nijboer, T. C. W., Kruiper-Doesborgh, S. J. C., van Bennekom, C. A. M., Ridderinkhof, K. R., & Schmand, B. (2017). The influence of computer-based cognitive flexibility training on subjective cognitive well-being after stroke: A multi-center randomized controlled trial. *PLoS One*, **12**(11), e0187582. https://doi.org/10.1371/journal.pone.0187582

van Nimwegen, D., Hjelle, E. G., Bragstad, L. K., Kirkevold, M., Sveen, U., Hafsteinsdóttir, T., Schoonhoven, L., Visser-Meily, J., & de Man-van Ginkel, J. M. (2023). Interventions for improving psychosocial well-being after stroke: A systematic review. *International Journal of Nursing Studies*, **142**, 104492. https://doi.org/10.1016/j.ijnurstu.2023.104492

Wahl, I., Löwe, B., Bjorner, J. B., Fischer, F., Langs, G., Voderholzer, U., Aita, S. A., Bergemann, N., Brähler, E., & Rose, M. (2014). Standardization of depression measurement: A common metric was developed for 11 self-report depression measures. *Journal of Clinical Epidemiology*, **67**(1), 73–86. https://doi.org/10.1016/j.jclinepi.2013.04.019

Wan, M., Zhang, Y., Wu, Y., & Ma, X. (2024). Cognitive behavioural therapy for depression, quality of life, and cognitive function in the post-stroke period: Systematic review and meta-analysis. *Psychogeriatrics*, **24**(4), 983–992. https://doi.org/10.1111/psyg.13125

Wan, X., Wang, W., Liu, J., & Tong, T. (2014). Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. *BMC Medical Research Methodology*, **14**(1), 135. https://doi.org/10.1186/1471-2288-14-135

Wang, X., Li, J., Wang, C., & Lv, J. (2020). The effects of mindfulness-based intervention on quality of life and poststroke depression in patients with spontaneous intracerebral hemorrhage in China. *International Journal of Geriatric Psychiatry*, **35**(5), 572–580. https://doi.org/10.1002/gps.5273

White, I. R., & Thomas, J. (2005). Standardized mean differences in individually-randomized and cluster-randomized trials, with applications to meta-analysis. *Clinical Trials*, **2**(2), 141–151. https://doi.org/10.1191/1740774505cn081oa

Williams, L. S., Brizendine, E. J., Plue, L., Bakas, T., Tu, W., Hendrie, H., & Kroenke, K. (2005). Performance of the PHQ-9 as a screening tool for depression after stroke. *Stroke*, **36**(3), 635–638. https://doi.org/10.1161/01.Str.0000155688.18207.33

Xia, H., Yuan, J., Hou, J., Han, X., Feng, Y., & Qian, W. (2025). Effects of relaxation training combined with music-based intervention on anxiety and depression in patients undergoing hematopoietic stem cell transplantation: A quasi-experimental study. *Supportive Care in Cancer*, **33**(11), 935. https://doi.org/10.1007/s00520-025-09992-8

Yi, Y., Zhao, W., Lv, S., Zhang, G., Rong, Y., Wang, X., Yang, J., & Li, M. (2024). Effectiveness of non-pharmacological therapies for treating post-stroke depression: A systematic review and network meta-analysis. *General Hospital Psychiatry*, **90**, 99–107. https://doi.org/10.1016/j.genhosppsych.2024.07.011

Yu, J., Tang, Y., Han, J., Chen, J., Lin, W., & Cui, W. (2023). Reminiscence therapy is a feasible care program for improving cognitive function, anxiety, and depression in recurrent acute ischemic stroke patients: A randomized, controlled study. *Irish Journal of Medical Science*, **192**(3), 1463–1471. https://doi.org/10.1007/s11845-022-03114-7

Yue, S., Yin, Y., Liu, J., & Liu, Z. (2024). Cognitive behavioral stress management effectively facilitates neurologic recovery, alleviates mental distress, and elevates health status in acute ischemic stroke patients. *Brazilian Journal of Medical and Biological Research*, **57**, e13689. https://doi.org/10.1590/1414-431X2024e13689

Yuliana, S., Yu, E., Rias, Y. A., Atikah, N., Chang, H. J., & Tsai, H. T. (2023). Associations among disability, depression, anxiety, stress, and quality of life between stroke survivors and their family caregivers: An actor-partner interdependence model. *Journal of Advanced Nursing*, **79**(1), 135–148. https://doi.org/10.1111/jan.15465

Zhang, L., Li, X., Wang, J., & Liu, Y. (2023). Reminiscence therapy relieves anxiety, depression and boosts spiritual well-being in both stroke patients and their spouse caregivers: A randomized, controlled study: Reminiscence therapy in stroke patients/caregivers. *Irish Journal of Medical Science*, **193**(1), 407–415. https://doi.org/10.1007/s11845-023-03451-1

Zhang, Z., Dong, Y., & Sun, Y. (2025). Effect of mindfulness-based cognitive therapy on rumination and post-traumatic growth in patients with acute cerebral infarction: A randomized controlled trial. *Medicine*, **104**(22), e42570. https://doi.org/10.1097/md.0000000000042570

Zhou, H., Wei, Y. J., & Xie, G. Y. (2024). Research progress on post-stroke depression. *Experimental Neurology*, **373**, 114660. https://doi.org/10.1016/j.expneurol.2023.114660

Zimmerman, M. (2019). Severity and the treatment of depression: A Review of Two Controversies. *The Journal of Nervous and Mental Disease*, **207**(4), 219–223. https://doi.org/10.1097/nmd.0000000000000960

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 17 Nov 2026 at 23:50:00, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0033291726105273