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Resilience-focused interventions for post- stroke depression: A systematic review

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Abstract

Background: Stroke is one of the leading causes of long-term disability and morbidity worldwide. Post-stroke depression (PSD) is a common psychological complication that negatively affects recovery, functional outcomes, and quality of life. Psychological resilience is considered a key factor in helping patients adapt to post-stroke challenges; however, evidence regarding effective interventions to strengthen resilience in patients with PSD remains limited.

Purpose: To evaluate the effectiveness of interventions that potentially enhance resilience-related components in patients with post-stroke depression and to provide evidence-based recommendations for nursing and clinical practice.

Method: A systematic review was conducted in accordance with the PRISMA 2020 guidelines. Literature searches were performed across five databases such as PubMed, Scopus, ScienceDirect, ProQuest, and Wiley using the keywords *post-stroke depression*, *resilience*, and *intervention*. Randomized controlled trials published in English that involved PSD patients and reported psychological outcomes related to resilience were included. Of 9,241 identified records, nine studies involving 779 participants met the inclusion criteria and were analyzed using narrative synthesis.

Results: Psychological interventions, including Acceptance and Commitment Therapy (ACT) and Mindfulness-Based Interventions (MBI), showed significant improvements in psychological flexibility (25–35%), mindfulness (20–32%), and coping ability (15–25%), alongside a significant reduction in depressive symptoms ($p < 0.001$). Physical-based interventions such as Tai Chi and Yijinjing Qigong were associated with improved emotional regulation and reductions in depressive symptoms of up to 45%. Technology-assisted approaches, particularly Virtual Reality interventions, reduced depressive symptoms by up to 22%. Pharmacological treatments demonstrated faster mood improvement but showed limited effects on strengthening psychological resilience.

Conclusion: ACT, MBI, and structured physical exercise appear to be the most effective interventions for enhancing resilience-related components and alleviating depressive symptoms in patients with post-stroke depression. Future studies are recommended to directly measure resilience outcomes and examine the long-term sustainability of these interventions.

Keywords: Intervention; Post-Stroke Depression; Quality of Life; Resilience.

INTRODUCTION

Stroke remains one of the leading contributors to global disease burden and long-term disability. The World Health Organization (World Health Organization, 2025) estimates that approximately 13.7 million new stroke cases occur annually worldwide, resulting in 5.5 million deaths. Notably, around 70% of stroke cases and 87% of stroke-related deaths or disabilities occur in low- and middle-income countries (Ghofir, 2021). Evidence from the Global Burden of Disease study and reports by the World Stroke Organization further demonstrate that the global impact of stroke remains alarmingly high, with estimated economic losses reaching US\$721 billion per year (World Stroke Organization, 2022; Feigin, Brainin, Norrving, Martins, Sacco, Hacke, Fisher, Pandian, & Lindsay, 2022; Thayabaranathan, Kim, Cadilhac, Thrift, Donnan, Howard, Howard, Rothwell, Feigin, Norrving, Owolabi, Pandian, Liu, & Olaiya, 2022). In Indonesia, data from the 2023 Indonesian Health Survey (*Survei Kesehatan Indonesia* [SKI]) report a stroke prevalence of 10.9 per 1.000 population (the highest in Southeast Asia) positioning stroke as a major cause of disability and a substantial national economic burden (Ministry of Health of the Republic of Indonesia, 2024). Beyond its clinical consequences, stroke also imposes profound social and economic strain on patients and their families (Kariasa, 2022).

One of the most prevalent psychological complications following stroke is post-stroke depression (PSD). Numerous empirical studies and meta-analyses indicate that the prevalence of PSD ranges from 25% to over 40% within the first year after stroke, with a considerable risk of progression to chronic depression if left untreated (Dong, Williams, Brown, Case, Morgenstern, & Lisabeth, 2021). Importantly, PSD contributes to a *vicious cycle*, in which emotional distress reduces patients' motivation and engagement in rehabilitation programs, ultimately leading to poorer functional outcomes and increased long-term disability (Ayerbe, Ayis, Wolfe, & Rudd, 2013; Wu, Wu, Liu, Chen, Wang, Anderson, Sandercock, Wang, Huang, Cui, Pu, Jia, Zhang, Liu, Zhang, Xie, Fan, Ji, Wong, & Wang, 2019). In addition to clinical implications, PSD places a substantial psychosocial and economic

burden on family members and caregivers (Kariasa, 2022).

From a nursing perspective, family involvement and patient education constitute essential components of post-stroke care, particularly in supporting patients' adjustment to physical and psychosocial changes. National-level studies have shown that active family participation enhances self-management abilities and improves quality of life among stroke survivors (Rumiati, Kariasa, & Waluyo, 2021). Furthermore, patients' perceptions of social support and quality of life have been shown to influence adherence to treatment regimens and participation in rehabilitation from the early stages of recovery (Kariasa, 2009). Alongside social support, psychological factors play a decisive role in shaping recovery trajectories, with resilience emerging as a critical determinant.

Resilience refers to an individual's capacity to adapt positively in the face of adversity and sustained stress. In the context of stroke recovery, resilience influences treatment adherence, engagement in rehabilitation activities, and the ability to maintain functional independence (Heltty & Zhalhalim, 2023). Empirical evidence suggests that stroke patients with higher levels of resilience demonstrate better emotional regulation, stronger functional adaptation, and more favorable clinical outcomes (Yan & Lin, 2022; Zhang, Zhou, Ye, Gao, & Zhou, 2022). These findings underscore resilience as a central psychological construct in post-stroke recovery and highlight its potential as a target for therapeutic intervention.

Despite its importance, research on interventions addressing post-stroke depression continues to exhibit notable limitations. To date, no randomized controlled trials have explicitly evaluated resilience as a primary outcome. Existing interventions tend to focus on indirect indicators of resilience, such as psychological flexibility in *Acceptance and Commitment Therapy* (ACT), mindfulness skills in *Mindfulness-Based Interventions* (MBI), and adaptive behavioral changes in *Behavioral Activation*. While these outcomes represent components of resilience, they have rarely been examined within an integrated analytical framework. Moreover, the current evidence base is fragmented across diverse intervention

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models with heterogeneous methodologies and outcome measures, limiting the ability to draw firm conclusions regarding the most effective strategies for strengthening psychological resilience in stroke patients. Therefore, this systematic review seeks to synthesize existing evidence and identify interventions with the potential to enhance resilience through relevant psychological indicators, thereby providing a robust foundation for future clinical recommendations.

RESEARCH METHOD

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, Brennan, Chou, Glanville, Grimshaw, Hróbjartsson, Lalu, Li, Loder, Mayo-Wilson, McDonald, McGuinness, Stewart, Thomas, Tricco, Welch, Whiting, dan Moher, 2021). A comprehensive literature search was performed across five major electronic databases, namely PubMed/MEDLINE, Scopus, ScienceDirect, ProQuest, and Wiley Online Library. The search covered studies published between 2019 and 2024 to capture the most recent evidence relevant to post-stroke depression and resilience-based interventions.

The search strategy combined Medical Subject Headings (MeSH), free-text keywords, and Boolean operators to maximize sensitivity and specificity. Key terms included Stroke, Post-Stroke Depression, Depressive Disorder, Psychological Resilience, Coping, Psychological Flexibility, and Intervention, which were systematically combined using AND/OR operators. An example of the search syntax applied was ("post-stroke depression" AND "resilience" AND intervention AND randomized controlled trial). To further ensure completeness, manual searching of reference lists from relevant articles was also undertaken to identify additional eligible studies that may not have been captured through database searches.

Studies were included if they met the following criteria: randomized controlled trials (RCTs) involving post-stroke patients presenting with depressive symptoms or a formal diagnosis of depression; interventions of psychological, physical, technological, or pharmacological nature that incorporated elements aimed at strengthening resilience-related constructs, such as self-efficacy, coping strategies, mindfulness, or psychological flexibility; articles published in English; and availability of full-text. Studies were excluded if they were study protocols, review articles, involved non-stroke populations, or failed to report psychological outcomes related to resilience.

The methodological quality and risk of bias of the included studies were assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for RCTs. This tool evaluates key domains including randomization procedures, allocation concealment, blinding, completeness of follow-up, validity and reliability of outcome measurements, and the potential for selective outcome reporting. Quality assessment was conducted independently by two reviewers, and any discrepancies were resolved through discussion or consultation with a third reviewer.

Due to substantial heterogeneity among the included studies in terms of intervention characteristics, duration, outcome measures, and assessment instruments, a quantitative meta-analysis was not considered methodologically appropriate. Therefore, data synthesis was conducted using a thematic narrative approach. As none of the included trials assessed resilience as a direct outcome, variables such as psychological flexibility, mindfulness, self-efficacy, coping ability, changes in depressive symptoms, and quality of life were treated as proxy indicators of resilience. The synthesized findings were subsequently organized based on intervention type to identify patterns of effectiveness across different therapeutic approaches.

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RESEARCH RESULTS

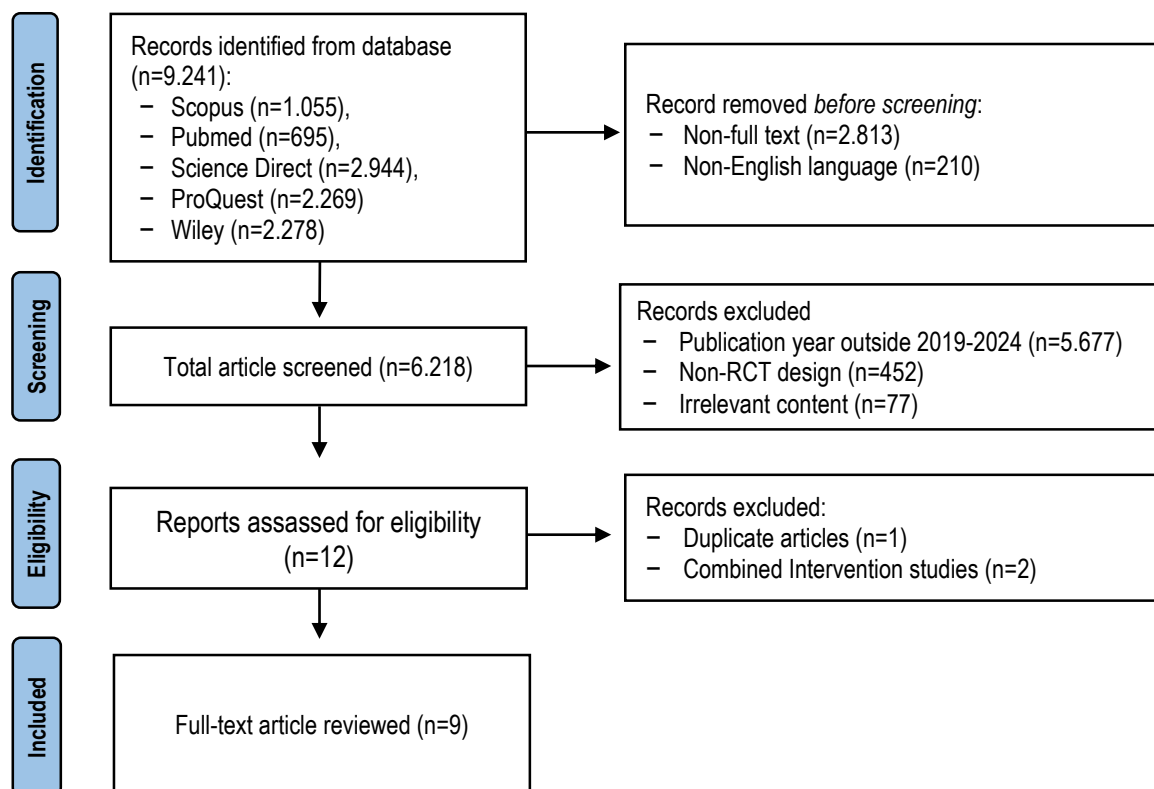


Figure Flow Diagram of the Literature Selection Process Based on PRISMA 2020

Based on this figure, from an initial total of 9.241 identified records, nine randomized controlled trials (RCTs) comprising 779 participants met the predefined inclusion criteria and were included in the narrative synthesis. None of the included studies explicitly measured resilience as a primary outcome. Nevertheless, all trials assessed psychological constructs closely related to resilience, including psychological flexibility, mindfulness, coping strategies, self-efficacy, and changes in depressive symptoms.

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Table Randomized Controlled Trials of Post-Stroke Depression Interventions and Their Relevance to Psychological Resilience

(Author, Year) (Country)	Purpose	Methods & Samples	Key Results	Relevance to Resilience	Clinical Application
(Pérez-De la Cruz, 2020) (Spain)	To examine the effects of aquatic therapy (Ai Chi) on pain, stress, and quality of life in chronic stroke patients.	RCT; N = 41 (26 intervention, 15 control)	Aquatic therapy significantly reduced pain and stress and improved overall quality of life.	Improved stress regulation and quality of life support emotional adaptation and coping, which are key components of resilience.	Can be applied as an adjunct rehabilitation approach for chronic stroke patients requiring physical and emotional support.
(Sun, Q. et al., 2022) (China)	To evaluate the effectiveness of Behavioral Activation Therapy (BAT) in patients with post-stroke subthreshold depression.	RCT; N = 65 (33 intervention, 32 control)	BAT significantly reduced depressive symptoms and increased engagement in meaningful activities.	Increased motivation, self-control, and activity engagement indicate enhanced psychological resilience.	Suitable as an early intervention to prevent progression to post-stroke depression.
(Wang et al., 2020) (China)	To assess the effects of mindfulness-based intervention on depression and quality of life in patients with intracerebral hemorrhage.	RCT; N = 134 (67 intervention, 67 control)	Mindfulness intervention significantly reduced depression and improved emotional and social well-being.	Enhanced emotional regulation and social functioning contribute to resilience during stroke recovery.	Can be incorporated into psychosocial rehabilitation programs for post-stroke emotional disorders.
(Zhao et al., 2022) (China)	To evaluate the effects of Sitting Tai Chi on functional and psychological outcomes in subacute stroke survivors.	RCT; N = 160 (80 intervention, 80 control)	Significant improvements in motor function, balance, and reduced depressive symptoms.	Improved physical control and self-efficacy strengthen both physical and psychological resilience.	Appropriate for patients with limited mobility and feasible for home-based rehabilitation.

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(Author, Year) (Country)	Purpose	Methods & Samples	Key Results	Relevance to Resilience	Clinical Application
(Kiper et al., 2022) (Poland)	To investigate the effectiveness of immersive virtual reality (VR) therapy on post-stroke depression.	RCT; N = 60 (30 intervention, 30 control)	VR therapy improved mood, reduced depression and anxiety, and enhanced motor outcomes.	Positive emotional experiences and motivation foster adaptive coping and self-confidence.	Useful as an innovative modality to support neuropsychological rehabilitation.
(Liu et al., 2023) (China)	To evaluate the effectiveness of group Acceptance and Commitment Therapy (ACT) in acute stroke patients with depression.	RCT; N = 139 (70 intervention, 69 control)	ACT significantly reduced depression and increased psychological flexibility and quality of life.	Psychological flexibility and value-based action are core elements of post-stroke resilience.	Can be delivered by trained nurses in inpatient stroke care settings.
(Yin et al., 2022) (China)	To assess the effects of auricular acupressure on post-stroke depression.	RCT; N = 60 (30 intervention, 30 control)	Significant reduction in depressive symptoms and improved quality of life compared with sham treatment.	Mood stabilization and emotional recovery support resilience processes.	Non-invasive, simple, and suitable as complementary therapy in clinical practice.
(Sun et al., 2022) (China)	To examine the effects of Yijinjing Qigong on depression and brain activity in post-stroke depression.	RCT; N = 60 (30 intervention, 30 control)	Qigong significantly reduced depression and improved brain connectivity efficiency.	Enhanced mental calmness, focus, and emotional balance support adaptive recovery.	Can be applied as a low-cost adjunct intervention in holistic stroke rehabilitation.
(Yan & Hu, 2024) (China)	To compare the effectiveness of escitalopram and sertraline in post-stroke depression.	RCT; N = 60 (30 escitalopram, 30 sertraline)	Both drugs were effective; escitalopram showed faster onset and fewer side effects.	Reduction of depressive symptoms enhances coping capacity and emotional resilience.	Escitalopram may be considered first-line pharmacological treatment with monitoring.

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DISCUSSION

The findings of this systematic review indicate that interventions for *post-stroke depression* (PSD) influence several psychological domains that collectively contribute to resilience, although none of the included randomized controlled trials (RCTs) explicitly measured resilience as a primary outcome. Instead, resilience was inferred through related constructs such as *psychological flexibility*, *mindfulness*, *coping strategies*, *self-efficacy*, and emotional regulation. This pattern reflects a broader trend in post-stroke mental health research, where resilience is often conceptualized implicitly rather than operationalized as a distinct clinical construct.

Psychological interventions, particularly *Acceptance and Commitment Therapy* (ACT) and *Mindfulness-Based Interventions* (MBI), demonstrated the most consistent effects across resilience-related components. ACT was shown to enhance *psychological flexibility*, defined as the ability to accept internal experiences while maintaining engagement in value-oriented actions. This mechanism is particularly relevant for stroke survivors, who must adapt to persistent physical and cognitive limitations. The reviewed studies suggest that ACT is most effective among patients with relatively preserved cognitive function and sufficient intrinsic motivation, allowing them to engage actively in reflective and value-based therapeutic processes. In contrast, MBI appears to be more suitable for patients experiencing emotional dysregulation, as it emphasizes present-moment awareness, emotional acceptance, and stress regulation through structured mindfulness practices. These findings support the view that resilience does not develop through a single pathway, but rather emerges from the dynamic interaction between cognitive capacity, emotional regulation, and adaptive coping.

Physical interventions, including *Tai Chi* and *Yijinjing Qigong*, also contributed meaningfully to resilience-related outcomes. These interventions combine slow, rhythmic movements with controlled breathing and focused attention, thereby addressing both physical and psychological domains simultaneously. The reviewed trials reported substantial reductions in depressive symptoms—approximately 40–45%—alongside improvements in emotional balance and self-efficacy. Enhanced self-

efficacy, in particular, reflects patients' growing confidence in managing their bodies and daily activities, which is a critical component of adaptive resilience after stroke. However, the effectiveness of these physical approaches is closely linked to patients' functional mobility. For individuals with severe motor impairment, participation may be limited, necessitating alternative strategies.

In this context, technology-based interventions such as *Virtual Reality* (VR) offer a promising alternative. VR-based rehabilitation was consistently associated with increased motivation, engagement, and positive emotional experiences during therapy. Although the magnitude of depressive symptom reduction associated with VR (approximately 22%) was lower compared with ACT or structured physical exercise, VR provides unique advantages for patients with restricted mobility or low motivation. By offering immersive and interactive environments, VR supports behavioral activation and engagement, which are essential for behavioral resilience. Nevertheless, practical barriers remain, including equipment costs, the need for trained personnel, and potential adverse effects such as cybersickness, which may limit widespread implementation.

Pharmacological interventions demonstrated faster symptom relief compared with psychological or physical approaches; however, their contribution to resilience-related components was limited. Antidepressant therapy primarily targets the neurobiological mechanisms of depression and does not directly address adaptive processes such as coping, self-efficacy, or psychological flexibility. As a result, pharmacological treatment alone appears insufficient for fostering long-term resilience, despite its clinical value in acute symptom management. These findings reinforce the importance of combining medication with psychosocial or rehabilitative interventions to achieve more sustainable psychological recovery.

From a clinical perspective, improvements in resilience-related domains identified in this review—such as psychological flexibility, mindfulness, and self-efficacy—were consistently associated with reduced depressive symptoms, improved adherence to rehabilitation, and better quality of life. Psychological flexibility supports acceptance of post-

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stroke limitations while facilitating meaningful engagement; mindfulness enhances emotional regulation and reduces the risk of depressive relapse; and self-efficacy developed through physical activity strengthens confidence in recovery. Together, these interrelated domains form a foundational structure for resilience in stroke survivors.

Despite these insights, several research gaps remain. None of the included studies directly measured resilience using validated resilience scales, highlighting a critical methodological limitation. Additionally, the predominance of studies conducted in Asian populations restricts the generalizability of findings to other cultural and healthcare contexts. Long-term follow-up data are scarce, even though resilience is a dynamic process that ideally evolves and stabilizes over time. Furthermore, combination interventions—such as ACT integrated with Qigong or MBI combined with VR, remain underexplored, despite indications that multimodal approaches may produce synergistic benefits.

CONCLUSION

This systematic review indicates that interventions for *post-stroke depression* (PSD) influence key components of resilience, including psychological flexibility, mindfulness, coping, and self-efficacy, although resilience was not measured directly. Psychological interventions such as *Acceptance and Commitment Therapy* (ACT) and *Mindfulness-Based Interventions* (MBI) show the most consistent effects on psychological adaptation, while physical exercise and *Virtual Reality* (VR) support emotional balance and rehabilitation engagement. Pharmacological therapy effectively reduces depressive symptoms but does not adequately strengthen adaptive capacity. These findings support the need for integrated rehabilitation approaches that combine psychological and physical interventions. Future studies should directly assess resilience and examine the long-term effectiveness of combined intervention models.

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