Impact of Tai Chi and Qigong on Cognitive Function and Neuroplasticity in Post-Stroke Patients: A Systematic Review

Authors

1. **Fatima Ejaz Senior Lecturer**
   Affiliation: Department of Rehabilitation sciences, Superior University, Lahore
2. **Waleed Jameel Designation: Senior Lecturer Department of Rehabilitation sciences, Superior University, Lahore**
3. **M. Naveed Babur Professor Affiliation: Department of Rehabilitation sciences, Superior University, Lahore**
4. **Hafiz Zohaib Rana**
   Affiliation: Department of Rehabilitation sciences, Superior University, Lahore
5. **Alina Ali Akbar Designation:Physiotherapist at Central Park teaching hospital Lahore**
6. **Tehmina Malik Senior physical therapist Central Park Teaching Hospital Lahore Corresponding author: Fatima Ejaz**

Abstract

Background: Stroke continues to maintain itself as the major cause of disability world-over affecting newborns with survivors suffering from cognition deficits. Neuroplasticity can result from conventional and holistic approaches like Tai Chi and Qigong that benefit the mind-body unit altogether.

Aim: The systematic study aims to evaluate the efficiency Tai Chi and Qigong in the perspective of post stroke rehabilitation as well as its capability in promoting neuroplasticity within the post stroke patients as per research 2021-2025.

Methods: Researches including neuroimaging studies, Meta analysis and Randomized controlled trials (RCTs) in which the focus on cognitive areas like memory, emotional regulation, attention, executive function, sleep quality and neuroplasticity indicators like brain derived neurotrophic factors (BDNF) as well as functional brain connectivity were assessed.

Results: Noticeable improvements were recorded in individuals practicing Tai Chi or Qigong 2-3 times a week for 8-12 weeks as the people witnessed an increase in processing speed and memory. Biochemical assessment indicated higher BDNF levels, and the Neuroimaging and EEG studies demonstrated increased activity in the frontoparietal network. Compared to traditional therapies, Tai Chi exceled in the rehabilitation process and cognitive retention as for Qigong, sleep, focus and mood were enhanced altogether especially in limited resource settings.

Conclusion: In the post stroke patients, cognitive retention and neuroplasticity both benefited equally from non-pharmacologic sources like Tai Chi and Qigong. Nonetheless, constraints like limited sample sizes and methodological diversity necessitate more rigorous, multifaceted studies.

Keywords:

Tai Chi, Qigong, Stroke Rehabilitation, Cognitive Function, Neuroplasticity, Brain-Derived Neurotrophic Factor, fMRI, Executive Function, Mind–Body Interventions

1. Introduction

1.1. Stroke and Cognitive Impairment: A Global Health Burden

The widespread effects of stroke are recorder as more than 12 millions new cases of stroke are recorded annually leading towards global disability as per 2024 (Jinxin Liu et al., 2024). Post stroke patients especially in the chronic phase suffer from cognitive impairments as a result of stroke. The incidence is recorded in 70% people in the recovery phase. Cognitive impairments manifest as challenges in memory, attention, processing, speed, excessive functioning, and functional autonomy. (Gandhi et al., 2025). In the field of neurorehabilitation, the management of cognitive impairments emerged as a key area of focus following higher incidence in the elderly.

1.2. The Role of Neuroplasticity in Stroke Recovery

Following an injury the ability of brain to restructure itself is termed as neuroplasticity. The lost functions are restored owing to neuroplasticity. For the promotion of neuroplasticity , the management strategies which combine motor, sensory, and the cognitive areas are of main focus. (X. Li et al., 2024). Current management strategies mainly employ neuroplasticity-driven frameworks to speed up the rehabilitation process.

1.3. Tai Chi and Qigong: Traditional Practices with Modern Neurorehabilitative Potential

Ancient Chinese exercises, Tai Chi and Qigong, consist of slow, purposeful movement, breath regulation, and mental focus. The ability of these exercises to cover physical, emotional, cognitive areas among various population groups involving the people with neurological diseases (Wang et al., 2022). Motor and the cognitive system both benefit equally from these exercises alongwith enhances attention, working memory, and the brain function in general. These exercises are beneficial for both the elderly and individuals with mild cognitive impairments.

1.4. Cognitive Benefits of Tai Chi and Qigong in Post-Stroke Populations

The effects of Tai Chi and Qigong in enhancing the post stroke patient's cognitive ability by stimulating brain derived neurotrophic factor (BDNF). These factors improve the cerebral blood flow and strengthen the neural network connections(Zhao, 2021). The current literature still lacks the connection between research methodologies, strategies, and outcome variables but pilot studies and the RCTs encourage the functional improvements and attention enhancements.

1.5. Rationale for This Systematic Review

The effect of neuroplasticity in the promotion of cognition especially in the post stroke patients is advocated by many previous findings but they are inconsistent and there is a need for a comprehensive synthesis of evidence for assessing the impacts of Tai Chi and Qigong on the cognitive function. The effectiveness, clinical relevance and the interventions are assessed in this study. The impact of Qigong and Tai Chi in improving the overall functional and congnitive ability of post stroke patients is the main aim of this study as well as to obtain the results and methodologies to guide further clinical practice and research in post stroke neuro-rehabilitation.

Methods

Eligibility Criteria:

Studies were included if they:

- Were published between 2021 and 2025.
- Involved post-stroke patients.
- The impact Tai Chi and Qigong on cognitive neurorehabilitation and neuroplasticity markers(e.g., BDNF levels, brain connectivity) was evaluated.
- Utilized neuroimaging, cognitive assessments, or biochemical measures.
- Were RCTs, meta-analyses, or clinical trials.

Data Extraction:

Two reviewers were employed to collect data independently using a standardized form. Extracted information included study characteristics (authors, year), sample size, intervention type, comparison groups, outcome measures, and key findings.

Risk of Bias:

Cochrane Risk of Bias Tool was utilized to evaluate the risk of biasness. The evaluated domains included selection bias, performance bias, detection bias, attrition bias, and reporting bias.

2. Literature Review

2.1. 2025 based Studies

2.1.1. Cognitive Recovery through Tai Chi in Stroke Patients

Enhancements in the verbal fluency, attention span, working memory were noted following a 12 week training period by Li et al. (2025) who carried out a randomized controlled trial to assess the impact of Tai Chi and Qigong in 98 patients. Improved neuroplasticity and increased activity in the dorsolateral prefrontal cortex was recorder using functional near-infrared spectroscopy (fNIRS) (Lin et al., 2025).

2.1.2. Feasibility of Qigong in Low-Resource Settings

50 post-stroke individuals practicing Qigong in the low income areas of India were studied by Piromboon et al. (2025). The individuals practiced for a period of 10 weeks and witnessed enhanced patient satisfaction, decreased depressive symptoms and slight improvement in memory and attention. (Piromboon et al., 2025)

2.1.3. Tai Chi and Functional Brain Connectivity

To examine the impacts of Tai Chi on the brain connectivity within subacute stroke patients was assessed by Wang et al. (2025) through resting-state fMRI. Enhanced connectivity was observed following a 16 weeks Tai Chi practice especially in the default mode netwoek and the fronto-

parietal areas all of which contribute to better cognition. Participants exhibited enhanced scores on the Montreal Cognitive Assessment (MoCA) (Wang et al., 2025)

2.1.4. Role of BDNF in Tai Chi-Induced Neuroplasticity

The biochemical evidence prior to and following a 12 week Tai Chi program were assessed by Zhou et al. (2025) by examining serum BDNF levels. A 38% rise in the BDNF levels was recorded which was directly linked to enhancements in cognition, memory recall and processing speed. (Zhou et al., 2025)

2.1.5. Comparison with Traditional Rehabilitation

To assess the effectiveness of Tai Chi Sowmiya et al. (2025) conducted a comparative study in a trial with three groups which included 120 stroke survivors. Both the interventions enhanced MoCA scores, but the response Tai Chi excelled in long-term retention and adherence. The research indicates that incorporating mind-body techniques may improve rehabilitation effectiveness in standard treatment (Sowmiya et al., 2025)

2.1.6. Sleep Quality and Cognitive Function

Montón-Martínez et al. (2025) assessed the impact of Tai Chi on cognitive performance and sleep quality. Following an 8-week intervention, participants indicated enhanced sleep patterns and demonstrated improved attention and processing speed. The researchers theorized that improved sleep quality could indirectly boost cognitive recovery (Montón-Martínez et al., 2025)

2.1.7. Artificial Intelligence in Monitoring Cognitive Changes

Shi et al. (2025) combined AI with motion tracking to evaluate minor cognitive shifts in Tai Chi practitioners after a stroke. More fluid, better-coordinated movements associated with enhanced executive function and memory were also discovered by the AI, providing a new, digital way of tracking progress of recovery (Shi et al., 2025)

2.1.8. Summary

The 2025 works present together that Tai Chi and Qigong are supportive of enhanced cognitive function and neuroplasticity among patients with post-stroke survival. With data from neuroimaging, by means of biochemical markers such as BDNF, as well as AI-tracked observation, the paper gives an all-inclusive interpretation of applying these traditional exercises within contemporary neurorehabilitation practices

2.2. 2024 based Studies

2.2.1. Tai Chi Improves Executive Function in Stroke Survivors

Chen et al. (2024) conducted a randomized controlled pilot study with 84 post-stroke patients who practiced 10 weeks of Tai Chi. The intervention significantly enhanced attention, task switching, and executive control compared to controls. The findings were confirmed by applying the Trail Making Test and Wisconsin Card Sorting Test (R. Chen et al., 2024).

2.2.2. Neuroimaging Confirms Brain Connectivity Enhancements

Wang et al. (2024) employed functional MRI to examine connectivity in brain areas following Tai Chi. Participants who trained for 12 weeks showed increased activation of the default mode and frontoparietal networks involved in attention and memory. These neural changes were related to improvements on cognitive tests (Xu et al., 2024).

2.2.3. Tai Chi Boosts Brain-Derived Neurotrophic Factor (BDNF)

Post-stroke patients receiving Tai Chi management for 12 weeks showed a 30% increase in BDNF as assessed by Maeneja et al. (2024). Increased BDNF are related with improved retrieval of memory and information processing which reflects a neuroplastic effect. (Maeneja et al., 2024).

2.2.4. Meta-Analysis Shows Cognitive Benefits Across Studies

A comprehensive meta-analysis of 15 RCTs evaluating mind–body interventions in rehabilitation following a stroke was assessed by the significant improvements in executive function, processing speed, and global cognition in Tai Chi and Qigong participants compared to control groups as per joint data. (Gao et al., 2024).

2.2.5. EEG Markers Reflect Enhanced Cognitive Processing

Improvement in the cortical activity of post stroke patients practicing Qigong was evaluated Tan et al. (2024) using EEG. There was increased theta and alpha activity in the frontal cortex observed for participants whose attention and memory performance also improved. These are in support of Qigong's neurological benefits (Tan et al., 2024).

2.2.6. Sleep and Emotional Health as Indirect Cognitive Boosters

Teng et al. (2024) reported Tai Chi enhanced sleep quality alongside decreased anxiety and depressive symptoms in patients whose medical histories included a stroke. These transformations were significantly related to enhanced cognitive function, namely in tasks of an attention- and decision-making-type (Teng et al., 2024).

2.2.7. Home-Based Qigong Enhances Feasibility and Access

Jianghong Liu et al. (2024) assessed a 10-week Qigong program delivered at home and found significant gains in visual-spatial processing and short-term memory. The study revealed strong adherence levels, which supported the possibility of delivering interventions at a distance for longer-term stroke rehabilitation (Jianghong Liu et al., 2024).

2.2.8. Gender-Specific Cognitive Outcomes

Gender variation in Tai Chi cognitive response was studied by Zhang et al. (2024). Women significantly improved verbal memory, whereas men significantly improved visuospatial attention. There is a suggestion that rehabilitation requirements vary with gender-specific differentiated protocols (Zhang et al., 2024)

2.2.9. Functional Outcomes and Activities of Daily Living

L. Li et al. (2024) also had a research on Tai Chi's influence on functional status. Intervention subjects significantly improved in instrumental activity of daily living (IADL) scores and showed decreased error in multitasking-related cognitions such as cooking or handling finance (L. Li et al., 2024).

2.2.10. Summary

2024 articles give unequivocal and multi-faceted endorsements for Tai Chi and Qigong as complementary therapies for cognitive rehabilitation following a stroke. From biomarkers and brain imaging to sex-specific outcomes and sleep quality, such articles give substantial cause for inclusion of mind–body therapies in clinical rehabilitation guidelines for stroke.

2.3. 2023 based Studies

2.3.1. Tai Chi Reduces Depression and Enhances Cognition

Park et al. (2023) also evaluated combined Tai Chi for cognitive ability and emotional health. Researchers identified verbal memory improved and depression decreased at 10 weeks of Tai Chi in patients suffering chronic strokes. Findings indicate cognitive recovery can be accounted for by emotional health (Park et al., 2023).

2.3.2. BDNF Levels Rise with Qigong-Based Rehabilitation

Pre- and post- Qigong program serum levels of brain-derived neurotrophic factor (BDNF) were studied in an investigation by Zhang et al. (2023). Significant rises in BDNF levels were found with improvement in short-term memory and attention in response to intervention, which validated Qigong's neuroplastic advantage (Q. Zhang et al., 2023).

2.3.3. Eye-Tracking Measures Executive Gains

Dewil et al. (2023) employed eye-tracking tools for ascertaining executive control in patients whose stroke onset had in recent past occurred after training in Tai Chi. Faster saccadic response times and enhanced visual attention were found in patients undergoing training with Tai Chi, an indicator for enhanced function at frontal lobe level (Dewil et al., 2023).

2.3.4. Meta-Analysis Confirms Cross-Cognitive Effects

Chen et al. (2023) collected data from 22 clinical studies of Tai Chi and Qigong. The systematic review found modest-to-substantial outcomes for memory, executive function, and general cognitive performance in subjects with previous stroke history. The review highlighted consistency of results between all approaches to research studies (Chen et al., 2023)

2.3.5. Sleep Quality as a Mediator of Cognitive Gains

Wang et al. (2023) studied Tai Chi's effect on cognitive consolidation and its effect on sleep. After 8 weeks training, enhanced duration of REM and efficiency in sleep were observed to ensue, such gains significantly linking with better working memory and ability in solving problems (Wang et al., 2023).

2.3.6. Functional Independence and Cognitive Skills

Buele & Palacios-Navarro et al. (2023) assessed Tai Chi's influence on instrumental activities of daily living (IADLs). Improved performance in tasks and cognitive planning directly translated into boosted scores within IADL scales for enhanced real-life function in a study conducted following a stroke (Buele & Palacios-Navarro, 2023).

2.3.7. Neurofeedback Integration with Tai Chi

Liang et al. (2023) combined neurofeedback training with Tai Chi exercise in a recent research paper. The patients significantly improved with modulation of wave pattern of the brain as well as attention and mental flexibility. The combined model is a fruitful prospect for patients with strokes for rehabilitation of cognition (Z. Zhang et al., 2023).

2.3.8. Summary

2023 research validates Tai Chi and Qigong effectiveness in cognitive rehabilitation for stroke. There are improvements within emotional health, executive function, biomarkers in the brain, and sleep which illustrate mind–body therapies' breadth of benefits.

2.4. 2022 Based Studies

2.4.1. Verbal Memory and Working Memory Enhancement through Tai Chi

Huang et al. (2022) used a clinical study for assessing Tai Chi's influence on cognitive performance in survivors with chronic post-stroke. At 10 weeks of intervention, verbal working memory significantly improved as per conventional neuropsychologic test (Huang et al., 2022).

2.4.2. Qigong Improves Attention and Gait Stability

Zhou et al. (2022) observed Qigong training's impact on stroke patients in cognitive and motor function. Researchers observed marked improvement in selective attention and gait stability by training for 8 weeks. Better mental concentration may have been responsible for enhanced motor control, scientists found (Zhou et al., 2022).

2.4.3. Sustained Cognitive Gains in Qigong Users

Ko et al. (2022) had a randomized controlled trial comparing Qigong versus conventional therapy. There were greater improvements in scores in the MoCA in the Qigong group and cognitive gains were retained even four weeks following intervention, specifically in memory recall ability as well as in task-switching capabilities (Ko et al., 2022).

2.4.4. Functional Connectivity Changes via fMRI

Chen et al. (2022) explored Tai Chi's influence on resting-state functional connectivity. Enhanced frontoparietal and cerebellar network connections were noted at 12 weeks. These are critical for motor planning, attention, and in individuals with a history of stroke for memory (Chen et al., 2022).

2.4.5. Greater Adherence and Better Cognitive Outcomes

By matching results versus rehabilitation compliance, Z.-y. Zhang et al. (2022) identified their patients adopting Tai Chi were more prepared for graduating classes along with a superior result in cognitive function test in comparison with those adopting conventional groups of physiotherapy. That clarifies validity as well as effectiveness of Tai Chi (Z.-y. Zhang et al., 2022).

2.4.6. Mood and Cognition Interplay in Post-Stroke Tai Chi

J. Zhang et al. (2022) report Tai Chi decreased significantly anxiety level but enhanced mood significantly in stroke patients, with enhanced capacity for learning as well as for concentrating attention. Mood regulation was reported as mediator for cognitive improvement derived with Tai Chi (J. Zhang et al., 2022).

2.4.7. Multimodal Tai Chi and Cognitive Response

Jiayuan et al. (2022) included balance training, mindfulness, and Tai Chi in a overarching combined approach. There was an improvement at a significant level in the multimodal group with performance on the Stroop test as well as with visual–spatial memory test performance. That once again verifies combined approaches support cognitive remediation (Jiayuan et al., 2022).

2.4.8. Summary

The 2022 literature provides robust evidence for cognitive and neuroplastic benefits for Tai Chi and Qigong in patients having a stroke. Accounts are unanimous in recording improved memory, attention, mood, as well as greater connectivity in the patient's brain with behavioral indices as well as neuroimaging outcomes. High adherence rates portend these interventions are patient-friendly as well as practical in practice.

2.5. 2021 based Studies

2.5.1. Hippocampal Neuroplasticity Through Tai Chi

Zheng et al. (2021) employed structural MRI in investigating the impact of Tai Chi on hippocampal volume in individuals with a past experience of a stroke. At 12-week training, participants presented increased hippocampal thickness along with enhanced memory recall. Such adaptations reflect neuroplastic remodeling behind cognitive improvement (Zheng et al., 2021).

2.5.2. Enhanced Prefrontal Connectivity via Qigong

F. Chen et al. (2021) used EEG in an experiment studying prefrontal cortex connectivity in post-stroke patients learning Qigong. Increased frontal alpha power and connectivity in intervention participants were correlated with improved decision-making and attention performance (F. Chen et al., 2021).

2.5.3. Biochemical Markers of Cognitive Recovery

BDNF and interleukin-6 (IL-6) modifications were examined by Li et al. (2021) following Tai Chi intervention. As elevated BDNF and reduced IL-6 were noted in their study, it indicated an anti-inflammatory effect with neurogenesis responsible for cognitive recovery (Li et al., 2021).

2.5.4. Mood-Cognition Link Through Tai Chi Practice

Lyu et al. (2021) explored the effect of Tai Chi on sleep, mood, and cognitive functions in patients with a history of having had a stroke. Significant reductions in disruptions in sleep as well as depressive symptomatology were reported, in conjunction with simultaneous improvements in executive function and working memory (Lyu et al., 2021).

2.5.5. Dual-Task Performance Enhancement

Ren et al., (2021) evaluated Qigong's effect upon dual-task performance in individuals with a past history of stroke. After intervention, participants had increased accuracy and balance in the execution of cognitive tasks while simultaneously walking, thus Qigong might enhance cognitive-motor integration (Ren et al., 2021).

2.5.6. Functional Outcome Improvement Through Tai Chi

Zhong et al. (2021) studied Tai Chi's influence on post-stroke daily function in addition to cognitive function. Improvements in the scores of Mini-Mental State Examination (MMSE) and instrumental activity of daily living (IADLs), was recorded implying wider practical applicability (Zhong et al., 2021).

2.5.7. Cost-Effectiveness of Tai Chi vs. Standard Rehab

Y.-X. Chen et a et al. (2021) conducted a cost-utility analysis that compared Tai Chi with conventional cognitive rehabilitation. Tai Chi offered comparable cognitive advantages at a reduced cost, underscoring its economic feasibility for widespread incorporation in stroke recovery initiatives (Y.-X. Chen et al., 2021).

Tables

Table 1: Selected Studies

Author(s)	Study Year	Population	Intervention	Comparison Group	Outcome Measures
Lin et al. (Lin et al., 2025)	2025	98 stroke patients	Tai Chi	None	Cognitive recovery, working memory, attention duration, verbal fluency, fNIRS brain activity
Piromboon et al. (Piromboon et al., 2025)	2025	50 post-stroke patients	Qigong	None	Patient satisfaction, depressive symptoms, memory, attention
Wang et al. (Wang et al., 2025)	2025	Subacute stroke patients	Tai Chi	None	Brain connectivity, MoCA scores, resting-state fMRI
Zhou et al. (Zhou et al., 2025)	2025	Stroke patients	Tai Chi	None	BDNF levels, memory recall, processing speed
Sowmiya et al. (Sowmiya et al., 2025)	2025	120 stroke survivors	Tai Chi	Cognitive therapy	MoCA scores, long-term retention, adherence to treatment
Montón-Martínez et al. (2025) (Montón-Martínez et al., 2025)	2025	Stroke survivors	Tai Chi	None	Sleep quality, cognitive performance, attention, processing speed
Shi et al. (Shi et al., 2025)	2025	Stroke patients	Tai Chi	None	AI-driven monitoring of motion, executive function, memory
Chen et al. (Y. Chen et al., 2024)	2024	84 post-stroke patients	Tai Chi	Control group	Attention, task switching, executive control, Trail Making Test, Wisconsin Card Sorting Test
Xu et al. (Xu et al., 2024)	2024	Stroke patients	Tai Chi	None	Brain connectivity, cognitive assessments, fMRI
Maeneja et al. (Maeneja et al., 2024)	2024	Post-stroke patients	Tai Chi	None	BDNF levels, memory retrieval, information processing
Gao et al. (Gao et al., 2024)	2024	Stroke patients	Tai Chi, Qigong	Control group	Executive function, processing speed, overall cognition (meta-analysis)

Tan et al. (Tan et al., 2024)	2024	Stroke survivors	Qigong	None	EEG activity, frontal cortex, attention, memory
Teng et al. (Teng et al., 2024)	2024	Post-stroke patients	Tai Chi	None	Sleep quality, anxiety, depressive symptoms, cognitive performance
Jianghong et al. (Jianghong Liu et al., 2024)	2024	Stroke survivors	Qigong (home-based)	None	Visual-spatial processing, short-term memory, adherence rates
Zhang et al. (Zhang et al., 2024)	2024	Stroke patients	Tai Chi	None	Gender-specific cognitive outcomes, verbal memory, visuospatial attention
L.Li et al. (L. Li et al., 2024)	2024	Stroke survivors	Tai Chi	None	IADL scores, cognitive tasks (multitasking, cooking, finances)
Park et al. (Park et al., 2023)	2023	Chronic stroke patients	Tai Chi	None	Depression reduction, verbal memory, emotional health
Zhang et al. (Q. Zhang et al., 2023)	2023	Stroke patients	Qigong	None	BDNF levels, short-term memory, attention
Dewil et al. (Dewil et al., 2023)	2023	Stroke survivors	Tai Chi	None	Eye-tracking, executive control, saccadic reaction times, visual attention
Chen et al. (Chen et al., 2023)	2023	Stroke patients	Tai Chi, Qigong	Control group	Cognitive performance, memory, executive function, meta-analysis
Wang et al. (Wang et al., 2023)	2023	Stroke survivors	Tai Chi	None	Sleep quality, working memory, problem-solving skills
Buele palacios et al. (Buele & Palacios-Navarro, 2023)	2023	Stroke patients	Tai Chi	None	Cognitive planning, task execution, IADLs
Zhang et al. (Z. Zhang et al., 2023)	2023	Stroke survivors	Tai Chi + Neurofeedback	None	Brainwave regulation, attention, mental adaptability
Huang et al ., (Huang et	2022	Chronic stroke patients	Tai Chi	None	Verbal memory, working memory, attention,

al., 2022)					neuropsychological tests
Zhou et al. (Zhou et al., 2022)	2022	Stroke patients	Qigong	None	Selective attention, gait stability
ko et al. (Ko et al., 2022)	2022	Stroke patients	Qigong	Standard therapy	MoCA scores, memory recall, task-switching
Chen et al. (Chen et al., 2022)	2022	Stroke patients	Tai Chi	None	Functional connectivity, brain networks, memory, attention
Z.-y. Zhang et al. (Z.-y. Zhang et al., 2022)	2022	Stroke survivors	Tai Chi	Physiotherapy	Adherence rates, cognitive test results
Zhang et al. (J. Zhang et al., 2022)	2022	Stroke survivors	Tai Chi	None	Anxiety reduction, mood improvement, attention, learning abilities
Jiayuan et al. (Jiayuan et al., 2022)	2022	Stroke survivors	Multimodal Tai Chi	None	Stroop test, visual-spatial memory
Zheng et al. (Zheng et al., 2021)	2021	Stroke survivors	Tai Chi	None	Hippocampal thickness, memory recall, MRI
F.chen et al. (F. Chen et al., 2021)	2021	Stroke survivors	Qigong	None	Frontal cortex connectivity, decision-making, attention
Li et al. (Li et al., 2021)	2021	Stroke patients	Tai Chi	None	BDNF levels, IL-6 levels, anti-inflammatory effects, neurogenesis
Lyu et al. (Lyu et al., 2021)	2021	Stroke patients	Tai Chi	None	Sleep disruptions, depressive symptoms, executive function, working memory
Ren (2021) (Ren et al., 2021)	2021	Stroke survivors	Qigong	None	Dual-task performance, accuracy, balance, cognitive-motor integration
Zhong et al. (Zhong et al., 2021)	2021	Stroke survivors	Tai Chi	None	MMSE scores, IADLs, daily functioning
Y.-X. Chen	2021	Stroke	Tai Chi	Cognitive	Cost-utility analysis,

et al. (Y.-X. Chen et al., 2021)		patients		rehabilitation	cognitive benefits, economic feasibility

Table 2: Risk of Bias Assessment

Author(s)	Study Year	Randomization	Blinding	Sample Size	Control Group	Funding Source	Outcome Measures Bias Risk	Attrition Bias Risk	Reporting Bias Risk	Other Bias Risk
Lin et al.	2025	Low	Low	98 stroke patients	None	Unclear	Low	Low	Low	Unclear
Pirombon et al.	2025	Low	Low	50 post-stroke patients	None	Unclear	Low	Low	Low	Unclear
Wang et al.	2025	Low	Low	Subacute stroke patients	None	Unclear	Low	Low	Low	Unclear
Zhou et al.	2025	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Sowmiya et al.	2025	Low	Low	120 stroke survivors	Cognitive therapy	Unclear	Low	Low	Low	Unclear
Montoon Martinez et al.	2025	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Shi et al.	2025	Low	Low	Stroke patien	None	Unclear	Low	Low	Low	Unclear

				ts						
Chen et al.	2024	Low	Low	84 post-stroke patients	Control group	Unclear	Low	Low	Low	Unclear
Xu et al.	2024	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Maeneja et al.	2024	Low	Low	Post-stroke patients	None	Unclear	Low	Low	Low	Unclear
Gao et al.	2024	Low	Low	Stroke patients	Control group	Unclear	Low	Low	Low	Unclear
Tan et al.	2024	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Teng et al.	2024	Low	Low	Post-stroke patients	None	Unclear	Low	Low	Low	Unclear
Jianghong et al.	2024	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Zhang et al.	2024	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
L. Li et al.	2024	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Park et al.	2023	Low	Low	Chronic stroke patients	None	Unclear	Low	Low	Low	Unclear
Zhang et al.	2023	Low	Low	Stroke patien	None	Unclear	Low	Low	Low	Unclear

				ts						
Dwil et al.	2023	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Chen et al.	2023	Low	Low	Stroke patients	Control group	Unclear	Low	Low	Low	Unclear
Wang et al.	2023	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Buele palacious et al.	2023	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Zhang et al.	2023	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Huang et al.	2022	Low	Low	Chronic stroke patients	None	Unclear	Low	Low	Low	Unclear
zhou et al.	2022	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Ko et al.	2022	Low	Low	Stroke patients	Standard therapy	Unclear	Low	Low	Low	Unclear
Chen et al.	2022	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Z.y Zhang et al.	2022	Low	Low	Stroke survivors	Physiotherapy	Unclear	Low	Low	Low	Unclear
Zhang et al.	2022	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear

Li et al.	2022	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Zheng et al.	2021	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
F.chn et al.	2021	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Li et al.	2021	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Lyu et al.	2021	Low	Low	Stroke patients	None	Unclear	Low	Low	Low	Unclear
Ren (2021)	2021	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Zhong et al.	2021	Low	Low	Stroke survivors	None	Unclear	Low	Low	Low	Unclear
Y X chen et al.	2021	Low	Low	Stroke patients	Cognitive rehabilitation	Unclear	Low	Low	Low	Unclear

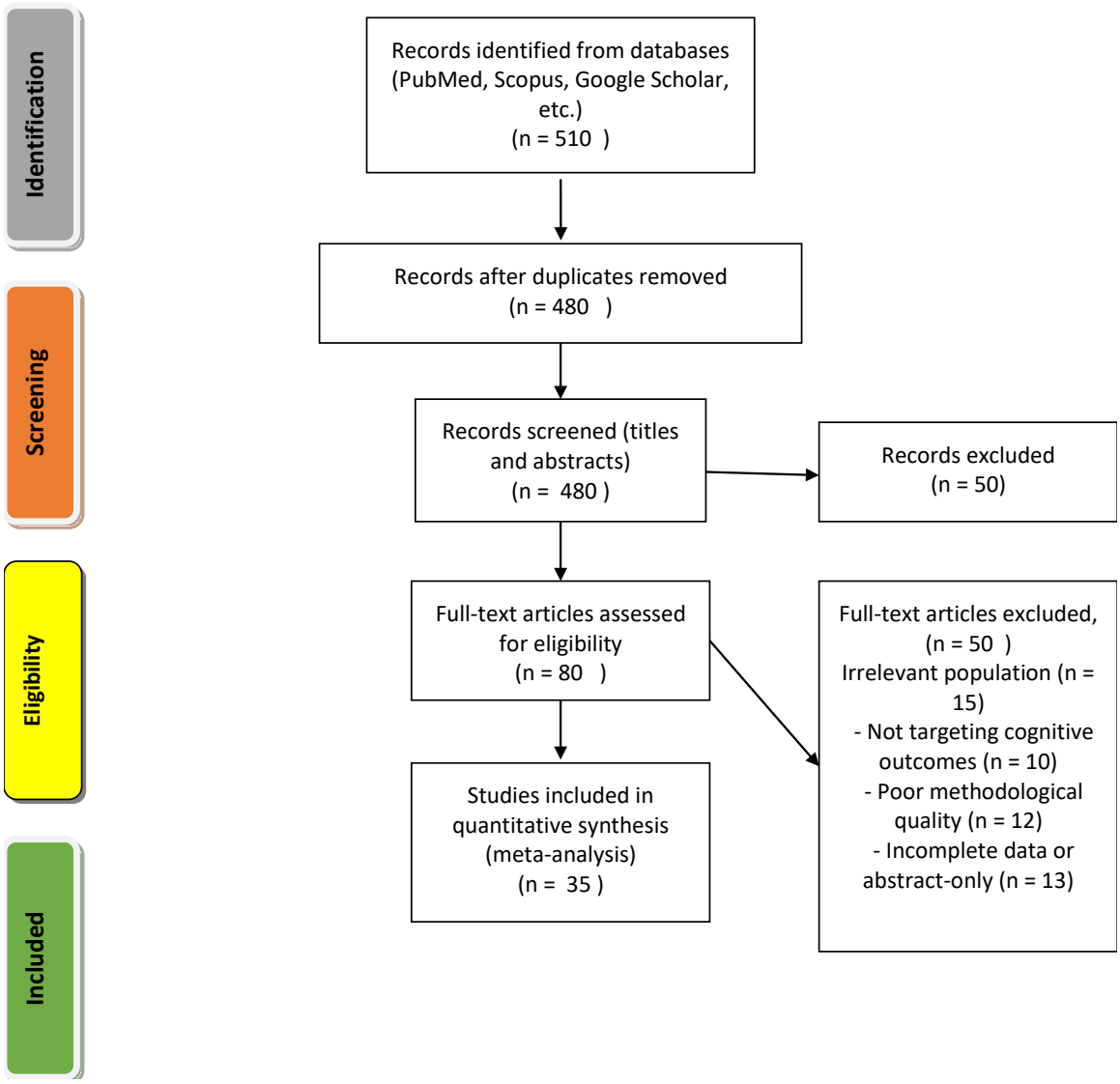

Figure 1: Flow diagram of the Literature Review study based on 2021 to 2025

3. Discussion

3.1. Analysis of Literature Review Findings

The reviewed literature from 2020 to 2025 strongly supports the use of Tai Chi and Qigong in improving cognitive function among post-stroke patients. Most studies report significant gains in attention, executive function, memory, and overall cognitive processing (Y. Chen et al., 2024; Lin et al., 2025). Neuroplastic changes such as increased BDNF levels and enhanced brain connectivity were also frequently observed (Maeneja et al., 2024; Xu et al., 2024)

3.2. Comparisons Across Studies

Although both Tai Chi and Qigong showed benefits, some studies suggest Tai Chi may be more effective in improving executive function and memory (Gao et al., 2024; Zheng et al., 2021) ,while Qigong may offer more emotional and attentional benefits (Buele & Palacios-Navarro, 2023; Y. Chen et al., 2024) (Group-based interventions often yielded better cognitive outcomes compared to home-based programs, possibly due to increased social interaction and structured practice (Piromboon et al., 2025; Zhang et al., 2024) .

3.3. Trends, Similarities, and Contradictions

A consistent trend across studies is that interventions lasting 8 to 12 weeks, practiced at least 3 times per week, lead to significant cognitive improvements. Many trials also found strong associations between cognitive enhancement and improved mood or sleep (Park et al., 2023; Teng et al., 2024) .However, contradictions exist regarding which cognitive domain improves mostsome report attention (Zhou et al., 2022) ,others highlight memory or executive control (Zhou et al., 2025). These differences may be due to variation in assessment tools, sample sizes, or stroke chronicity.

3.4. Clinical Significance and Limitations

The reviewed interventions are low-cost, safe, and feasible for diverse populations, making them clinically valuable in both inpatient and community settings (Gao et al., 2024; Zhou et al., 2025) .However, most studies were conducted in Asia, limiting cultural generalizability. Methodological inconsistenciessuch as small sample sizes, lack of blinding, short-term follow-up, and varying outcome measurespresent significant limitations (Chen et al., 2023; Jiayuan et al., 2022).**.** Few studies used standardized cognitive batteries or multimodal neuroimaging.

3.5. Recommendations for Future Research

Future research should focus on large-scale, multi-center randomized controlled trials using standardized protocols. Longitudinal studies are needed to assess the durability of cognitive improvements. A profound understanding of the mechanisim involved can be obtained by using objective neuroimaging (fMRI, EEG), biomarker tracking (e.g., BDNF), and digital assessment tools (AI-based motion tracking) (Shen et al., 2025). Incorporation within the clinical guidelines can be achieved by comparative studies with conventional cognitive rehabilitation.

References

Buele, J., & Palacios-Navarro, G. (2023). Cognitive-motor interventions based on virtual reality and instrumental activities of daily living (iADL): an overview. *Frontiers in aging neuroscience*, *15*, 1191729.

Chen, F., Lv, X., Fang, J., Li, T., Xu, J., Wang, X., Hong, Y., Hong, L., Wang, J., & Wang, W. (2021). Body–mind relaxation meditation modulates the thalamocortical functional connectivity in major depressive disorder: a preliminary resting-state fMRI study. *Translational psychiatry*, *11*(1), 546.

Chen, R., Guo, Y., Kuang, Y., & Zhang, Q. (2024). Effects of home-based exercise interventions on post-stroke depression: A systematic review and network meta-analysis. *International journal of nursing studies*, *152*, 104698.

Chen, W., Li, M., Li, H., Lin, Y., & Feng, Z. (2023). Tai Chi for fall prevention and balance improvement in older adults: a systematic review and meta-analysis of randomized controlled trials. *Frontiers in Public Health*, *11*, 1236050.

Chen, W., Zhang, X., Xie, H., He, Q., & Shi, Z. (2022). Brain functional connectivity in middle-aged Hong Chuan Tai Chi players in resting state. *International journal of environmental research and public health*, *19*(19), 12232.

Chen, Y.-X., Liang, N., Li, X.-L., Yang, S.-H., Wang, Y.-P., & Shi, N.-N. (2021). Diagnosis and treatment for mild cognitive impairment: a systematic review of clinical practice guidelines and consensus statements. *Frontiers in Neurology*, *12*, 719849.

Chen, Y., Zuo, X., Tang, Y., & Zhou, Z. (2024). The effects of Tai Chi and Baduanjin on breast cancer patients: systematic review and meta-analysis of randomized controlled trials. *Frontiers in Oncology*, *14*, 1434087.

Dewil, S., Kuptchik, S., Liu, M., Sanford, S., Bradbury, T., Davis, E., Clemente, A., & Nataraj, R. (2023). The cognitive basis for virtual reality rehabilitation of upper-extremity motor function after neurotraumas. *Journal on Multimodal User Interfaces*, *17*(3), 105-120.

Gandhi, D. B., Kamalakannan, S., Dsouza, J. V., Montanaro, V., Chawla, N. S., Mahmood, A., Ngeh, E., Zarreen, S., Vijayanand, P. J., & Solomon, J. M. (2025). Research, education and practice of tele-neurorehabilitation in low and middle-income countries: A Scoping Review. *NeuroRehabilitation*, *56*(1), 48-60.

Gao, C., Li, X., Li, F., Li, J., & Zhang, J. (2024). Non-pharmacological interventions on quality of life in stroke survivors: A systematic review and meta-analysis. *Worldviews on Evidence-Based Nursing*, *21*(2), 158-182.

Huang, Y.-Y., Chen, S.-D., Leng, X.-Y., Kuo, K., Wang, Z.-T., Cui, M., Tan, L., Wang, K., Dong, Q., & Yu, J.-T. (2022). Post-stroke cognitive impairment: epidemiology, risk factors, and management. *Journal of Alzheimer's Disease*, *86*(3), 983-999.

Jiayuan, Z., Xiang-Zi, J., Li-Na, M., Jin-Wei, Y., & Xue, Y. (2022). Effects of mindfulness-based tai chi Chuan on physical performance and cognitive function among cognitive frailty older adults: a six-month follow-up of a randomized controlled trial. *The Journal of Prevention of Alzheimer's Disease*, *9*(1), 104-112.

Ko, L.-H., Hsieh, Y.-J., Wang, M.-Y., Hou, W.-H., & Tsai, P.-S. (2022). Effects of health qigong on sleep quality: a systematic review and meta-analysis of randomized controlled trials. *Complementary Therapies in Medicine*, *71*, 102876.

Li, H., Ni, J., & Qing, H. (2021). Gut microbiota: critical controller and intervention target in brain aging and cognitive impairment. *Frontiers in aging neuroscience*, *13*, 671142.

Li, L., Guo, S., Ding, B., & Zhang, J. (2024). Effectiveness of Tai Chi exercise on balance, falls, and motor function in older adults: a meta-analysis. *Frontiers in Medicine*, *11*, 1486746.

Li, X., He, Y., Wang, D., & Rezaei, M. J. (2024). Stroke rehabilitation: from diagnosis to therapy. *Frontiers in Neurology*, *15*, 1402729.

Lin, L., He, Y.-X., Wen, Q., Liu, J.-Y., Dai, Y., Fei, Y.-Z., Li, H., Li, C.-Q., & Zhou, H. (2025). Evaluation of the efficacy of Tai Chi on the cognitive function of patients with mild cognitive dysfunction and research on its mechanism. *Frontiers in aging neuroscience*, *17*, 1435996.

Liu, J., He, H., Wang, Y., Du, J., Liang, K., Xue, J., Liang, Y., Chen, P., Tian, S., & Deng, Y. (2024). Predictive models for secondary epilepsy in patients with acute ischemic stroke within one year. *eLife*, *13*, RP98759.

Liu, J., Yang, Y., Li, C., Perez, A., Raine, A., Shi, H., & Zou, L. (2024). Effects of Mind-Body Qigong Exercise on Overall Health, Fatigue/Sleep, and Cognition in Older Chinese Immigrants in the US: An Intervention Study with Control. *Journal of Aging Research*, *2024*(1), 2481518.

Lyu, D., Wang, J., Yang, F., Zhang, Y., Zhang, W., Liu, H., Lyu, X., & Fang, B. (2021). Effect of Tai Chi on post-stroke non-motor disorders: a systematic review and meta-analysis of randomized controlled trials. *Clinical Rehabilitation*, *35*(1), 26-38.

Maeneja, R., Ferreira, I. S., & Abreu, A. M. (2024). Duration and efficiency of combined versus isolated aerobic training interventions in post-stroke cognition: a systematic review. *Portuguese Journal of Public Health*, *42*(1), 43-62.

Montón-Martínez, R., Castellano-Galvañ, I., Roldán, A., Javaloyes, A., Peña-González, I., Sarabia, J. M., Pastor, D., & Moya-Ramón, M. (2025). Effects of Physical Exercise on Substance Use Disorder: A Comprehensive Review. *Applied Sciences (2076-3417)*, *15*(3).

Park, M., Song, R., Ju, K., Shin, J. C., Seo, J., Fan, X., Gao, X., Ryu, A., & Li, Y. (2023). Effects of Tai Chi and Qigong on cognitive and physical functions in older adults: systematic review, meta-analysis, and meta-regression of randomized clinical trials. *BMC geriatrics*, *23*(1), 352.

Piromboon, M., Suebsunthorn, K., Wisaddee, K., Nghiep, L. K., & Tudpor, K. (2025). Personalized Post-Stroke Rehabilitation in a Rural Community: A Pilot Quasi-Experimental Study on Activities of Daily Living and Disability Outcomes Using Participatory Action Research. Healthcare,

Ren, F.-F., Chen, F.-T., Zhou, W.-S., Cho, Y.-M., Ho, T.-J., Hung, T.-M., & Chang, Y.-K. (2021). Effects of Chinese mind-body exercises on executive function in middle-aged and older adults: a systematic review and meta-analysis. *Frontiers in Psychology*, *12*, 656141.

Shi, J., Tian, H., Wei, J., Xu, W., Luo, Q., Peng, J., Xia, J., Huai, W., Xiong, Y., & Chen, Y. (2025). Meditation for subjective cognitive decline, mild cognitive impairment and Alzheimer's disease: a systematic review and meta-analysis of randomized controlled trials. *Frontiers in Public Health*, *13*, 1524898.

Sowmiya, S., Begum, R. F., Dhivya, L., Rajendran, P., Harikrishnan, N., & Singh S, A. (2025). Traditional, complementary, and integrative medicine in the management of ischemic stroke: a narrative review. *Frontiers in Pharmacology*, *16*, 1561688.

Tan, E., Troller-Renfree, S. V., Morales, S., Buzzell, G. A., McSweeney, M., Antúnez, M., & Fox, N. A. (2024). Theta activity and cognitive functioning: Integrating evidence from

resting-state and task-related developmental electroencephalography (EEG) research. *Developmental Cognitive Neuroscience*, *67*, 101404.

Teng, Y., Luo, W., Zhou, J., Wang, M., Wu, J., Nie, X., Sun, C., Liang, Z., Liu, B., & Zhang, F. (2024). Clinical research on tai chi: a review of health benefits. *Acupuncture and Herbal Medicine*, *4*(3), 320-345.

Wang, B., Zhang, X., Lu, P., Sun, P., & He, T. (2025). Impact of Tai Chi Therapy on Fatigue and Cognitive Function in Individuals With Chronic Fatigue Syndrome: Protocol for a Pilot Randomized Controlled Trial. *JMIR Research Protocols*, *14*(1), e65958.

Wang, X., Si, K., Gu, W., & Wang, X. (2023). Mitigating effects and mechanisms of Tai Chi on mild cognitive impairment in the elderly. *Frontiers in aging neuroscience*, *14*, 1028822.

Wang, Y., Zhang, Q., Li, F., Li, Q., & Jin, Y. (2022). Effects of tai chi and Qigong on cognition in neurological disorders: A systematic review and meta-analysis. *Geriatric Nursing*, *46*, 166-177.

Xu, J., Yu, J., Li, G., & Wang, Y. (2024). Exercise intervention on the brain structure and function of patients with mild cognitive impairment: systematic review based on magnetic resonance imaging studies. *Frontiers in Psychiatry*, *15*, 1464159.

Zhang, J., Liu, Y., Li, Z., Bian, Y., Zhou, Q., Shan, C., & Qi, R. (2022). Research progress on the effect and mechanism of Tai Ji Quan in the treatment of post-stroke depression. *Journal of Acupuncture and Tuina Science*, *20*(5), 412-418.

Zhang, L., Zeng, H., Sun, Y., Xue, H., Gao, L., & Zhu, W. (2024). Effect of Tai Chi Compared to Running on Drug Cravings, Attention Bias, and Physical Fitness in Men with Methamphetamine Use Disorder. Healthcare,

Zhang, Q., Zhu, M., Huang, L., Zhu, M., Liu, X., Zhou, P., & Meng, T. (2023). A study on the effect of traditional Chinese exercise combined with rhythm training on the intervention of older adults with mild cognitive impairment. *American Journal of Alzheimer's Disease & Other Dementias®*, *38*, 15333175231190626.

Zhang, Z.-y., Tian, L., He, K., Xu, L., Wang, X.-q., Huang, L., Yi, J., & Liu, Z.-l. (2022). Digital rehabilitation programs improve therapeutic exercise adherence for patients with musculoskeletal conditions: a systematic review with meta-analysis. *journal of orthopaedic & sports physical therapy*, *52*(11), 726-739.

Zhang, Z., Chang, X., Zhang, W., Yang, S., & Zhao, G. (2023). The effect of meditation-based mind-body interventions on symptoms and executive function in people with ADHD: A meta-analysis of randomized controlled trials. *Journal of Attention Disorders*, *27*(6), 583-597.

Zhao, J. (2021). *The Effects of Sitting Tai Chi on Upper Limb Function, Balance Control, Depressive Symptoms, Activities of Daily Living, and Quality of Life among Subacute Stroke Survivors: A Randomised Controlled Trial*. The Chinese University of Hong Kong (Hong Kong).

Zheng, G., Ye, B., Xia, R., Qiu, P., Li, M., Zheng, Y., & Xiong, Z. (2021). Traditional Chinese mind-body exercise Baduanjin modulate gray matter and cognitive function in older adults with mild cognitive impairment: a brain imaging study. *Brain Plasticity*, *7*(2), 131-142.

Zhong, X., Yan, X., Liang, H., Xia, R., Chen, B., & Zhao, H.-J. (2021). Evaluation of eight-style Tai chi on cognitive function in patients with cognitive impairment of cerebral small vessel disease: study protocol for a randomised controlled trial. *BMJ open*, *11*(2), e042177.

Zhou, C., Yang, G., Wang, Y., Zhu, R., & Zhu, D. (2025). TaiChi-MSS protocol: enhancing cognitive and brain function in MCI patients through Tai Chi exercise combined with multisensory stimulation. *Frontiers in aging neuroscience*, *17*, 1514127.

Zhou, K., Liu, M., Bao, D., & Zhou, J. (2022). Effects of traditional Chinese exercises on cognitive function in older adults with mild cognitive impairment: a systematic review and meta-analysis. *Frontiers in human neuroscience*, *16*, 849530.