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THE IMPACT OF CULTURAL-BASED COGNITIVE INTERVENTIONS FOR OLDER ADULTS WITH NEUROCOGNITIVE CONDITIONS: A SYSTEMATIC REVIEW

O IMPACTO DAS INTERVENÇÕES COGNITIVAS DE BASE CULTURAL EM IDOSOS COM CONDIÇÕES NEUROCOGNITIVAS: UMA REVISÃO SISTEMÁTICA

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Abstract

Background: Neurocognitive disorders, including dementia and mild cognitive impairment, impose a substantial burden on ageing populations worldwide. Non-pharmacological approaches, particularly cognitive activities, may provide sustained benefits, while culturally grounded interventions may further enhance engagement and therapeutic meaning. Aim/Objectives: This review evaluated the effectiveness of culturally based cognitive interventions in improving cognition, mood, and well-being among older adults with neurocognitive conditions. Methods: Systematic searches of PubMed, Scopus, Web of Science, and ScienceDirect identified 16 studies involving 13,616 participants. Included studies used randomised, controlled, or quasi-experimental designs, and findings were narratively synthesised. Results: Most interventions improved attention, memory, and executive function. Mahjong and Tai Chi showed sustained cognitive benefits for up to nine months. Tai Chi and Tai Ji Quan also improved physical performance. Ska showed stronger

Resumo

Contexto: Os transtornos neurocognitivos, incluindo demência e comprometimento cognitivo leve, impõem um ônus substancial às populações envelhecidas em todo o mundo. Abordagens não farmacológicas, especialmente atividades cognitivas, podem produzir benefícios sustentados, enquanto intervenções culturalmente enraizadas podem ampliar o engajamento e a relevância terapêutica. Objetivo: Avaliar a eficácia de intervenções cognitivas de base cultural na melhora da cognição, do humor e do bem-estar de idosos com condições neurocognitivas. Métodos: Buscas sistemáticas nas bases PubMed, Scopus, Web of Science e ScienceDirect identificaram 16 estudos, totalizando 13.616 participantes. Os desfechos foram sintetizados narrativamente. Resultados: A maioria das intervenções melhorou atenção, memória e função executiva. Mahjong e Tai Chi apresentaram benefícios cognitivos sustentados por até nove meses. Tai Chi e Tai Ji Quan também melhoraram o desempenho físico. O jogo Ska mostrou

cognitive outcomes, whereas virtual reality produced mixed findings. Interventions also reduced depressive symptoms, improved quality of life, and increased brain-derived neurotrophic factor levels. Conclusions: Culturally tailored cognitive interventions appear feasible, engaging, and beneficial for older adults with mild cognitive impairment and dementia.

Keywords: Ageing. Cognition. Cultural Interventions. Dementia. Older Adults.

resultados cognitivos mais fortes, enquanto a realidade virtual apresentou achados mistos. As intervenções também reduziram sintomas depressivos, melhoraram a qualidade de vida e aumentaram os níveis de fator neurotrófico derivado do cérebro. Conclusões: As intervenções cognitivas culturalmente fundamentadas mostram-se viáveis, envolventes e benéficas para idosos com comprometimento cognitivo leve e demência.

Palavras-chave: *Cognição. Demência. Envelhecimento. Idosos. Intervenções Culturais.*

1 INTRODUCTION

Population ageing has intensified the need for effective approaches that can support cognitive health, emotional well-being, and daily functioning in later life. As increasing numbers of older adults live with mild cognitive impairment (MCI) and dementia, there is growing interest in interventions that can be implemented across clinical, community, and residential care settings in ways that are practical, meaningful, and responsive to lived experience, such as cognitive training programmes, social engagement activities, and personalised care plans that address individual needs.

Within this context, cognitive interventions represent an important non-pharmacological avenue for supporting older adults with neurocognitive conditions. Their value lies not only in the potential to stimulate cognitive processes, but also in their capacity to encourage participation, preserve meaningful activity, and promote a sense of continuity in everyday life. The present review takes the view that culture should not be treated as a peripheral feature of intervention design but as a central element that may shape relevance, engagement, and therapeutic value.

Accordingly, this article examines culturally based cognitive interventions developed from familiar cultural practices, activities, and traditions. By focusing on interventions that are culturally grounded in origin rather than merely adapted for cultural fit, this review seeks to clarify their potential contribution to cognition, mood, and overall well-being among older adults with neurocognitive conditions.

2 BACKGROUND

Global demographic transitions have led to rapidly ageing populations worldwide. A society is commonly classified as ageing when at least 10% of its population is aged 60 years and above or when 7% is aged 65 years and above (Xi *et al*., 2025). Over recent decades, life expectancy has increased markedly, rising from 65.42 years in 1990 to 73.52 years in 2019 (Wang *et al*., 2020). Correspondingly, the global population of adults aged 60 years and older is projected to double to 2.1 billion by 2050, while those aged 80 years and above are expected to quadruple to 426 million (World Health Organization, 2024). This unprecedented demographic shift is increasingly accompanied by a rise in age-related neurocognitive conditions, placing substantial psychological, social, and economic burdens on individuals, families, and healthcare systems worldwide.

Dementia is characterised by a progressive decline in cognitive functioning that exceeds normative age-related changes and interferes with independence in daily life (GAUTHIER *et al*., 2006). It currently affects around 55 million people worldwide, with about 10 million new cases diagnosed each year (World Health Organization, 2021). It is still one of the main causes of death and disability in older adults (Aranda *et al*., 2021). Pharmacological treatments for dementia, despite their considerable global impact, remain limited in efficacy, primarily providing symptomatic relief without curative benefits (Nagel *et al*., 2021; Szczechowiak *et al*., 2019). MCI, which lies along the continuum between healthy ageing and dementia (Morris; Cummings, 2005), Therefore Represents A Particularly Important Target For Early Intervention, especially given that only approximately 39.2% of individuals with MCI progress to dementia over time (Mitchell; Shiri-Feshki, 2009).

In response to these limitations, non-pharmacological cognitive interventions have received growing attention as viable strategies for slowing cognitive decline and supporting functional independence. The cognitive reserve hypothesis proposes that sustained cognitive engagement may delay the clinical manifestation of neuropathology by enhancing neural efficiency and compensatory mechanisms (Stern, 2012). Importantly, empirical evidence supports this premise. Large-scale studies, such as the Advanced Cognitive Training for Independent and Vital Elderly (Active) trial, have shown that 10–14 weeks of structured cognitive training can yield enduring cognitive

benefits, with improvements in instrumental activities of daily living (IADL) maintained for up to a decade following intervention.

More recently, this line of work has been extended through increasing interest in culturally grounded cognitive interventions that integrate participants' language, traditions, belief systems, and social practices into therapeutic design. Culturally embedded approaches may improve engagement, emotional significance, and ecological validity, leading to greater adherence and therapeutic efficacy. For example, participation in traditional games such as mahjong has been associated with cognitive benefits among individuals with dementia, including improvements in memory and broader cognitive functioning (Cheng *et al*., 2006). Similarly, the strategic board game Go has been explored as a culturally meaningful activity with potential benefits for mood, quality of life, and disease severity in people with Alzheimer's disease (LIN *et al*., 2015). The Thai board game Ska has also demonstrated positive effects on memory, attention, and executive functioning in older adults (PANPHUNPHO *et al*., 2013). Beyond games, culturally rooted practices such as mental abacus training and Tai Chi further illustrate the therapeutic potential of culturally grounded cognitive interventions (Huang *et al*., 2021; Huang *et al*., 2019; Lam *et al*., 2014).

Despite these emerging findings, systematic syntheses that specifically examine culturally tailored cognitive interventions for older adults with neurocognitive conditions remain limited. Previous reviews have predominantly concentrated on cognitive training or non-pharmacological interventions, frequently neglecting the significance of cultural relevance in influencing engagement, acceptability, and intervention outcomes. To address this gap, the present systematic review aims to: (1) evaluate the effectiveness of culturally tailored cognitive interventions in enhancing cognitive functioning and overall well-being among older adults with neurocognitive conditions; (2) examine traditional games, activities, and culturally embedded practices adapted as cognitive tools and their effects on memory, attention, and executive functioning; (3) compare intervention outcomes across different cultural, ethnic, and national contexts; and (4) identify promising culturally grounded strategies that can be applied in supporting older adults with neurocognitive disorders, with implications for both intervention and prevention.

3 METHODS

3.1 Protocol and reporting standards

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. To enhance transparency, replicability, and methodological rigour, the review protocol was prospectively registered with the International Prospective Register of Systematic Reviews (Prospero; registration ID: CRD420251002865). The full registration record is publicly available through the PROSPERO database.

3.2 Eligibility criteria

Studies were selected using predefined inclusion and exclusion criteria established prior to the literature search. Eligible studies were required to:

1. Be published in peer-reviewed journals in the English language
2. Report on **culturally based cognitive interventions** involving older adults diagnosed with dementia or related geriatric neurocognitive disorders

Studies were excluded if they:

1. Were systematic reviews or meta-analyses
2. Employed **multimodal interventions** (e.g., combined cognitive, physical, or psychosocial components) rather than cognitive interventions alone
3. Described interventions at the **design or development stage** without empirical testing
4. Involved **culturally adapted**1 interventions, as opposed to interventions that were culturally based or culturally embedded in origin

This distinction was considered important to preserve conceptual clarity between adaptation and cultural grounding.

1For this review, culturally based interventions were defined as practices or activities originating within a culture, rather than standard interventions later modified for cultural fit.

3.3 Search strategy

A comprehensive literature search was conducted across four electronic databases: Scopus, PubMed, Web of Science, and ScienceDirect, covering records from database inception to February 2025. The search strategy was designed to capture empirical studies examining culturally based cognitive interventions for older adults with dementia and other neurocognitive disorders.

Search terms were applied to titles and abstracts using combinations of the following keywords: ("cognitive stimulation" OR "cognitive intervention" OR cognition OR "cognitive function" OR "cognitive impairment" OR "cognitive ability" OR "cognitive health") AND ("ageing" OR "healthy ageing" OR "healthy older adults" OR "older adults" OR dementia OR "mild cognitive impairment").

These keywords were selected due to their frequent use within the cognitive intervention and ageing literature.

3.4 Study selection and data extraction

The database search yielded a total of 596 records, including 95 from Scopus, 102 from PubMed, 173 from Web of Science, and 226 from ScienceDirect. After the removal of duplicate records, 522 unique articles remained for screening.

Titles and abstracts were screened against the eligibility criteria, resulting in the exclusion of 482 articles. Following this initial screening, 40 articles were retrieved for full-text assessment. Two articles were excluded at this stage, as they were published in conference proceedings and could not be retrieved as full journal articles.

A further 22 studies were excluded following full-text review for the following reasons:

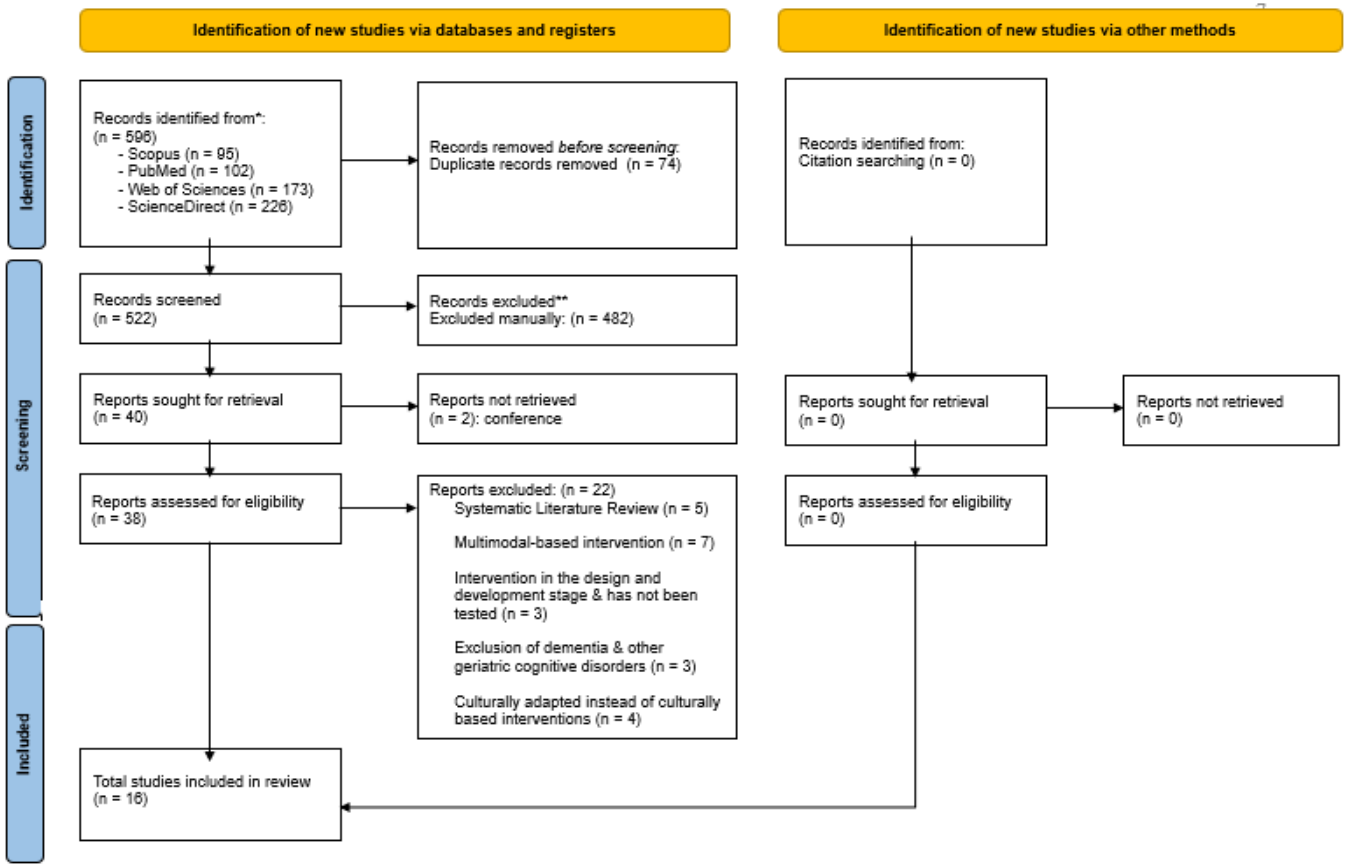
1. Five were systematic literature reviews
2. Seven employed multimodal rather than solely cognitive interventions
3. Three focused on interventions in the development phase without outcome evaluation
4. Three did not include participants with dementia or geriatric neurocognitive conditions, and

5. Four interventions were culturally adapted rather than culturally based.

Consequently, 16 studies m*et al*l inclusion criteria and were included in the final synthesis (see Figure 1).

Figure 1

PRISMA flow diagram illustrating the process of article selection. Records were sourced from four databases. These records underwent screening based on titles and abstracts, followed by eligibility assessment through full study evaluation. Ultimately, 16 studies were included.



3.5 Methodological quality appraisal

The 16 included studies' methodological quality was appraised using the items from the McMaster Critical Appraisal Tool. The McMaster items are listed as 1) Was the purpose stated clearly? 2) Was relevant background literature reviewed? 3) What was the study design? 4a) Sample number; 4b) Was the sample described in detail? 4c) Was the sample size justified? 5a) Were the outcome measures reliable? 5b) Were the outcome measures valid? 6a) Was the intervention described in detail? 6b) Was contamination avoided? 6c) Was cointervention avoided? 7a) Were results reported in terms of statistical significance? 7b) Were the analysis method/s appropriate? 7c) Was clinical importance reported? 7d) Were drop-outs reported? and 8) Were the conclusions reasonable given the study methods and results? Each item is rated on a dichotomous scale, with "Yes" receiving a score of 1 and "No" a score of 0. The total score for all 16 studies was tabulated in Table 1. Based on the McMaster Critical Appraisal Tool scoring, the methodological quality of the selected studies ranged from moderate to good, with scores ranging from 9 to 14, and only three studies scoring 9, 11, and 12, respectively (MAN *et al*., 2010; PANPHUNPHO *et al*., 2013; PARK *et al*., 2020). The mean score was calculated as 13.18 (SD = 1.42), indicating a generally high quality of the studies. The level of evidence varied across the studies, ranging from level II to level IV, with eight studies classified as level II (CHENG *et al*., 2014; HUANG *et al*., 2019; LAM *et al*., 2012; LAM *et al*., 2014; LIN *et al*., 2015; PANPHUNPHO *et al*., 2013; PARK *et al*., 2020; ZHANG *et al*., 2020), seven as level III (CHENG *et al*., 2006; HSIEH *et al*., 2019; LI *et al*., 2014; MAN *et al*., 2010; MATÍAS-GUIU *et al*., 2016; SIU *et al*., 2018; TIAN *et al*., 2022), and one as level IV (HUANG *et al*., 2021).

Table 1

Scoring of McMaster items states the evaluation done by core authors

Studies	1	2	3	4a	4b	4c	5a	5b	6a	6b	6c	7a	7b	7c	7d	8	Total/ 14
Huang *et al*. (2021)	Y	Y	Pre-post intervention study with a single group intervention – IV	80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Cheng *et al*. (2006)	Y	Y	Randomized trial without a control group – III-2	62	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Lin *et al*. (2015)	Y	Y	Randomized controlled trial with three groups – II	147	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Man *et al*. (2010)	Y	Y	Cross sectional study – III-3	135	Y	N	N	N	Y	N	N	Y	Y	Y	Y	Y	9
Panphunpho *et al*. (2013)	Y	Y	Randomised control trial – II	40	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N	Y	11
Park *et al*. (2020)	Y	Y	Randomised control trial – II	21	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	12
Cheng *et al*. (2014)	Y	Y	Cluster-randomized open-label controlled design – II	110	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Siu *et al*. (2018)	Y	Y	Quasi-experimental design with a nonequivalent control group – III-2	160	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Lam *et al*. (2014)	Y	Y	1-year single-blind cluster randomized controlled trial – II	389	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Li *et al*. (2014)	Y	Y	Nonrandomized control group pretest-posttest design – III-2	30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Hsieh *et al*. (2019)	Y	Y	Clustered quasi-experimental clinical trial design III– 2	60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Huang *et al*. (2019)	Y	Y	Randomised control trial – II	80	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	13
Lam *et al*. (2012)	Y	Y	1-year single-blind cluster randomized controlled trial – II	389	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Matías-Guiu *et al*. (2016)	Y	Y	Prospective observational study III– 2	20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14
Tian *et al*. (2022)	Y	Y	Prospective cohort study – III– 2	1182 1	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	13
Zhang *et al*. (2020)	Y	Y	Randomised control trial – II	56	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	14

Y = Yes, N = No, Na = Not applicable.

Table 2
Tabulation of study characteristics.

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implication
Huang *et al.*	2021	80/ >55 years, high-risk group (MoCA score: < 26), low-risk group MoCA score ± 26)	Pre-post intervention study with a single group intervention	MoCA (Taiwanese Version), CTT1, CTT2	The MA training: 12 courses/once a week (1.5 hours)/2-hand method, involves mentally manipulating the abacus in the same manner as they would when using a real abacus	Mental Abacus (MA) Training	Pretest: MoCA (24.6 ± 3.7), CTT1 (71.3 ± 46.5 seconds) CTT2 (132.2 ± 85.4 seconds) Post-test: MoCA ($p < .01$), CTT2 time ($p < .01$) showed improvement in the overall participant group and the high-risk subgroup. However, in the low-risk subgroup, only the CTT2 time showed improvement ($p < .01$)	MA training has the potential to improve cognitive performance in older adults, particularly in individuals with cognitive impairment To validate the effects of MA training, future studies should include control groups that do not receive MA training
Cheng *et al.*	2006	62/ ≥ 60 years old, dementia (MMSE score ≤ 24), ability to play Mahjong, not having played mahjong for the past six months.	Randomized trial without a control group.	Digit forward span, digit forward sequence, verbal memory and MMSE	16 weeks, randomly assigned to play either twice ($n = 33$) or 4 times ($n = 29$) a week over/Each session: 75–90 min) (money not involved)/4 participants at each Mahjong table (stayed with the same mahjong table throughout the treatment)	Mahjong	Irrespective of the frequency of playing, mahjong consistently improved cognitive performance across all measures. It had significant positive effects on digit forward memory (effect sizes: 1.0 to 1.4 for both span and sequence), moderate-to-large effects on verbal memory (effect sizes: 0.5 and 0.9), and a moderate	Mahjong presents a promising treatment approach for dementia. One of its key advantages is that it does not require professional supervision and can be easily implemented within the available space. This makes integrating mahjong into the daily routines of institutional settings highly beneficial, as it offers significant advantages with minimal or no cost to the institution.

							effect on the MMSE score (approximately 0.6). These effects persisted even after discontinuing mahjong for a month, indicating that continuous practice is necessary to maintain the therapeutic benefits once a certain level of proficiency is reached.	
Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Lin *et al.*	2015	147/ All AD patients diagnosed with NINCDS-ADRDA (National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association)	RCT with three groups	CDR, MMSE, MADRS, HADS, KICA-Dep, RAND-36, TAS-20	AD patients were randomly assigned into control (without GO-game intervention), Short-time GO-Game Intervention (SGGI, 1 h daily) and Long-time GO-game Intervention (LGGI, 2 h daily) groups.	GO game	The intervention resulted in a decrease in the mean scores MADRS and HADS, while increasing the mean scores of GAF and RAND-36. These improvements were statistically significant compared to the control group. Additionally, the intervention improved 9	GO game has been found to be a feasible and effective intervention for enhancing the quality of life in patients with AD by reducing their depression. The intervention also shows reductions in severity of AD by increasing BDNF levels. These findings suggest that a GO game could be developed as a novel therapeutic approach for AD.

							out of 11 items on KICA-dep. Serum levels of brain-derived neurotrophic factor (BDNF) were higher in the groups that received the game intervention, and there was a negative correlation between BDNF levels and MADRS scores, as well as a positive correlation with RAND-36 scores.	
Man *et al.*	2010	135/ Inclusion: 55 or above, independent in self-care, able to communicate and follow simple verbal instructions, emotionally stable	cross-sectional design	MBI, CMMSE, GDS, CTT, RBMT-CV, HKLLT,	Tai Chi group (from tai chi clubs): *n* = 42/at least 3 times a week (for about 45 minutes per session) individually for 3 or more years, and were able to perform the 108 forms of t'ai chi by themselves. Regular Exercise group (from community centers): *n* = 49 Control group (from local elderly centers): *n* = 44	Tai chi & regular exercise	The main result of the study showed significant differences in attention and memory functions among the three groups. Specifically, the t'ai chi group exhibited superior performance compared to the other two groups in most of the subtests.	Since the present study was cross-sectional, it is not possible to establish a causal relationship. Therefore, future research is necessary to investigate the impact of t'ai chi on cognitive function through randomized control trials. Additionally, further studies should explore whether t'ai chi practice can contribute to improved health outcomes among elderly individuals.

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Panphunpho *et al.*	2013	40/ The study recruited participants who met specific criteria: they needed to be literate in Thai, have received at least primary education, and be in a mentally healthy state without cognitive impairment, depression, or impairments in hearing, vision, or speech. They should not have a medical history related to drug or alcohol abuse and should not be regular exercisers, or if they exercised, their frequency should not exceed two days per week. Participants should have had no prior experience playing	Randomized control trial (RCT)	VPA I; VPA II, VR I; VR II, TMT-A, WCST	Randomly selected and arranged into two intervention groups, an experiment and a control group (20 participants each group; 10 females and 10 males) /50 minutes per day, 3 sessions per week for the continuous duration of 16 weeks.	Ska Game	Participants in the Ska group had significantly better cognitive function scores in memory, attention, and executive function compared to those in the control group. The specific tests that showed significant improvements were VPA I, VPA II, VR I, VR II, TMT-A, and WCST ($p < 0.05$). Furthermore, there was no significant difference in cognitive function between males and females in the Ska group ($p \geq 0.05$).	Playing the Ska game can improve cognitive functioning, specifically in memory, attention, and executive function, among older adults.

		Ska or similar cognitive practice games. Throughout the study, participants were not allowed to take any psychotropic drugs, and they should not have any congenital or chronic diseases that could hinder their ability to engage in board game practice.						
Park *et al.*	2020	21/ Outpatients between the ages of 50 and 80 diagnosed with aMCI.	Randomized control trial (RCT)	K-MMSE, SGDS-K, SNSB-D, digit span test (forward and backward), Korean color-word Stroop test, word fluency tests (category and letter fluency)	Participants randomly assigned to either the VR-based training group or the control group (1:1 ratio). The VR-based training group (30 minutes training per day, twice a week, for three months (24 sessions).	Culture-Based Virtual Reality (VR) Training Program	The VR-based training group did not show any notable changes in K-MMSE scores, working memory as measured by the digit span test, Stroop test performance, or word fluency after completing the three-month VR program.	Although the VR program did not improve cognition, the program was viable and well-tolerated by individuals with aMCI. These findings provide valuable insights for therapists and rehabilitation professionals, indicating that culture-based VR training programs hold promise as a potential tool for future interventions targeting patients with aMCI within a culturally relevant context.

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Cheng *et al.*	2014	110/ Not taking cholinesterase inhibitors, MMSE score between 10 and 24, at least very mild dementia according to CDR (0.5).	Cluster-randomized open-label controlled design	Primary: MMSE. Secondary: immediate/delayed recall, categorical fluency, digit span, GDS	The homes were randomly assigned to one of three conditions: mahjong, Tai Chi (TC), or simple handicrafts (control)/3 times a week for a duration of 12 weeks.	Mahjong & Tai Chi	The effects of mahjong and TC varied over time for MMSE, delayed recall, and forward digit span. TC had similar effects but not for delayed recall. Generally, control group participants exhibited cognitive decline over time, while mahjong and TC participants maintained their cognitive abilities, resulting in larger treatment effects as time progressed. At the 9-month mark, mahjong and TC participants differed significantly from the	Mahjong and TC have the potential to maintain cognitive functioning or slow down the decline in specific cognitive domains, even among individuals with significant cognitive impairment.

								control group by 4.5 points (95% confidence interval: 2.0-6.9; d = 0.48) and 3.7 points (95% confidence interval: 1.4-6.0; d = 0.40), respectively, on the MMSE. No treatment effects were observed for immediate recall and backward digit span.	
Siu *et al.*	2018	160/ Chinese (60 years or older) CMMSE score 19 to 28, adjusted based on educational level, any structured physical exercise program or Tai Chi practice within the previous year. Additionally, participants were instructed not to participate in any other structured exercise training besides the Tai Chi interventions during the study period.	Quasi-experimental design using a nonequivalent control group	CMMSE, IADL-CV, GEE	Intervention group (IG) *n* =80, received Yang-style training (simple form of Tai Chi)/twice a week for 16 weeks, with each session an hour/ trained by a certified Tai Chi master. The control group (CG), *n* = 80, did not receive any specific treatment or intervention (continue their usual activities)	Tai chi		Completed: IG (*n* = 74), CG (*n* = 71) IG: significantly higher CMMSE (P = 0.001) and IADL scores (P = 0.004) compared to the CG. However, the magnitude of these score changes did not surpass the MDCs established in the study, suggesting the possibility of measurement variation due to error cannot be ruled out.	Tai Chi shows promise as a valuable approach to improve cognitive health and preserve functional abilities in older individuals with Mild Cognitive Impairment (MCI).

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implication
Lam *et al.*	2014	389/ >65 years old, CDR 0.5 or amnestic-MCI, No previous regular practice of Tai Chi or other mind-body exercise for more than 6 months	1-year single-blind cluster randomized controlled trial	CDR, Cantonese version of the ADAS-Cog,23-digit span, delay recall, category verbal fluency tests, trail making, and MMSE Berg Balance Scale neuropsychiatric and mood symptoms measured by the Neuropsychiatric Inventory, and Cornell Scale for Depression in Dementia	Intervention (I): *n* = 171 underwent Tai Chi training, Control (C): *n* = 218 underwent stretching and toning exercise /The intervention (2 phases): induction phase: 4 to 6 weeks (received instruction for their respective exercise program), maintenance phase (provided with a video CD containing either the Tai Chi or control exercise program). The intervention required a minimum frequency of 30 minutes per day and at least 3 days per week. To maintain adherence and proper posture performance, Tai Chi masters conducted monthly	Tai chi & regular exercise	At the one-year mark, 92 (54%) participants from the Intervention (I) group and 169 (78%) participants from the Control (C) group completed the intervention. Controlling for baseline differences in education through multilevel logistic regression analysis with only the completers, it was observed that the I group showed a trend towards a lower risk of developing dementia at one year (odds ratio 0.21, 95% CI 0.05-0.92, P = 0.04). The I group also demonstrated better preservation of scores in the Clinical Dementia Rating (CDR) sum of boxes compared to the C group in both intention-to-treat (P = 0.04) and completers-only analyses (P = 0.004). In completers-only analyses, the I group showed greater	Engaging in regular exercise, particularly mind-body exercises that involve cognitive and motor coordination, may contribute to maintaining overall functioning in older individuals who are at risk of cognitive decline. However, there is a need to reassess the logistics of promoting long-term exercise practice and enhancing adherence to optimize the benefits.

					refresher lessons until the 12th month.		improvement in delayed recall (P = 0.05) and Cornell Scale for Depression in Dementia scores (P = 0.02).	
Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Li *et al.*	2014	46/At least 65 years old, ability to walk with or without assistance, MMSE scores ranging from 20 to 30, and medical clearance from a healthcare provider.	Nonrandomized control group pretest-posttest design	Primary outcome: MMSE (a measure of global cognitive function) Secondary outcomes: 50-ft speed walk, Timed Up&Go, and ABC scale Other assessments: self-survey (demographic, health status, and medical and chronic conditions information), The Physical Activity Scale for the Elderly	14-week TJQMBB program (n = 22) or a control group (n = 24).	Tai Ji Quan: Moving for Better Balance (TJQMBB)	After 14 weeks, participants who engaged in Tai Ji Quan (Tai Chi) demonstrated notable enhancements in their MMSE scores, with a mean improvement of 2.26, while the control group showed a smaller improvement of 0.63. The difference in improvement between the two groups was statistically significant. Additionally, the Tai Ji Quan participants outperformed the control group in physical performance and balance efficacy measures, with significant differences observed.	The findings of this study offer preliminary evidence regarding the potential advantages of a customized Tai Ji Quan training program for cognitive function in older adults. These results are thought-provoking and suggest the need for further research. It is recommended to conduct a large-scale randomized trial involving individuals with cognitive impairment to assess whether the program can lead to improvements in various clinical measures of cognitive function.

							The study also found a correlation between improvements in cognition, as measured by the MMSE, and improvements in physical performance and balance efficacy.	
Hsieh *et al.*	2019	60/Inclusion: age ≥65 years, MMSE scores ranging from 11 to 26, capable of following instructions.	Clustered quasi-experimental clinical trial design	Outcome measures (physical function): 6MWT, m, 30-s STS, times, 30-s AC, times, TUG, FR, cm, Sit-and-reach, cm, Drop ruler test, cm, gait speed, s Outcome measures (cognitive function): LTM, STM, ATTEN, MENMA, ORIEN, ABSTR, LANG, DRAW, ANML, CASI Outcome measures (emotional status): GDS	Participants were assigned to either the VRTC group or the control group in a cluster-based manner. The intervention, consisting of the VRTC program, was administered twice a week for a duration of 6 months.	Virtual Reality-Based Tai Chi Exercise (VRTC)	The adjusted GEE analysis revealed significant interaction effects in various measures, including the 6-minute walk test, 30-second sit-to-stand test, functional reach, 5-meter gait speed, and abstract thinking and judgment. These findings indicated that the VRTC group had medium to large effect sizes (d = 0.50-0.82) favoring their outcomes. Additionally, the average movement accuracy score in the first 3 months was found to significantly predict improvement in cognitive performance (p = 0.011).	The VRTC exercise demonstrated a beneficial effect on cognitive and physical functions in older adults with cognitive impairment. This suggests that the program's interactive and engaging nature played a crucial role in enhancing cognitive abilities in this population.

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implication
Huang *et al*	2019	80/ with mild dementia were recruited	Randomized Control Trial (RCT)	MoCA, NPI, GDS	Tai Chi group: training 3 times a week for 10 months. Control group: standard treatments without any additional intervention. Cognitive function, behavior/mood, and activities of daily living were assessed for all participants at the beginning of the study, as well as at 5 months and 10 months into the program.	Tai Chi	The Tai Chi group demonstrated better performance compared to the control group. The results of the repeated measures ANOVA showed a significant interaction between group and time in the Montreal Cognitive Assessment (MoCA). In addition, both the main effect of time and the group×time interaction were statistically significant in the Neuropsychiatric Inventory (NPI) and Geriatric Depression Scale (GDS). Paired sample t-tests indicated that the Tai Chi group had lower scores at 5 and 10 months in the NPI, and at 10 months in the GDS, compared to baseline.	The findings indicate that the Tai Chi program has the potential to enhance cognitive function and promote mental well-being among older adults with mild dementia.

							Furthermore, the Tai Chi group scored lower than the control group in the NPI and GDS at 10 months.	
Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Lam *et al.*	2012	389/>65 years old, CDR (0.5)/ or aMCI,	Pretest, posttest, 1 year follow-up	CDR, ADAS, DAD, CSDD, NPI, BBS	Intervention group: training program ("24-style Tai Chi") led by a certified Tai Chi master Control group: stretching and relaxation exercises developed by physiotherapists and conducted by an	Tai Chi	The intervention group (Tai Chi), showed lower overall scores in cognitive function measures. CDR and sum of boxes scores, indicating that Tai Chi may have a positive impact in preserving cognitive abilities. However, the effect sizes of the exercise	In older adults who are at risk of cognitive decline, a combination of cognitive motor stimulation and balance training appears to have potential in preserving overall functioning. However, further research is necessary to provide more evidence and support the cognitive reserve hypothesis, as well as to explore its

		occupational therapist. The intervention was conducted in two phases; Induction phase: received instructions over a period of 4 to 6 weeks. Weekly sessions were held at the training centers until participants became familiar with the exercises. Maintenance phase: provided a video CD of the exercise program. The recommended frequency of the intervention was at least 30 minutes per day, at least 3 days per week. The adherence to the exercise regimen was monitored by the center in-charge, who recorded the extent of adherence. Tai Chi masters conducted refresher	intervention were found to be modest, suggesting the need for more sensitive outcome indicators than simple conversion rates of dementia. Additionally, both the intervention and control groups demonstrated improvements in cognitive test performance after one year.	effectiveness in modifying clinical impairments associated with dementia.

					lessons every month until the 12th month .			
Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implications
Matías-Guiu *et al.*	2016	20/>65, divided into 3 groups: 1) healthy patients (n = 6) with no cognitive complaints or cog nitive impairment affecting daily living and scoring > 24 on the MMSE; 2) patients with a diagnosis of amnestic MCI according to the diagnostic criteria by Petersen *et al.*13 (n = 6); and 3) patients diagnosed with probable early stage Alzheimer disease (AD) (Global Deterioration Scale = 4) according to the NINCDS-ADRDA diagnostic criteria14(n = 8).	Prospective observational study	Patients: MMSE, TMT, GDS (short version). Caregivers: Zarit Burden Interview (ZBI)	Individual & groups tasks. 10 sessions lasting 150 minutes each for 5 weeks (2 sessions per week). 2 groups (3 diagnosis): 10 people each; each group was led by 2 therapists. Each session: 60 minutes of abacus-based calculations, 10 minutes of mental arithmetic, 45 minutes of other cognitive tasks, and 35 minutes of relaxation and/or concentration exer cises.	Abacus arithmetic	Pre- and post-intervention scores, statistically significant differences in MMSE scores (23.1 ± 4.8 vs 24.9 ± 4.2, P = .002). No significant differences were seen in parts A and B of the TMT, the GDS, or the ZBI. pre- and post intervention, statistically significant MMSE scores when analysing patients with MCI or AD separately (21.5 ± 4.9 vs 23.35 ± 3.99, P = .01) (Table 3). Post-intervention assessments were conducted 24 ± 36 days after completing the cognitive stimulation programme.	High level of satisfaction with and usability of the method in both healthy patients and patients with MCI or AD. The levels of participation and attendance to sessions were also high. Cognitive stimulation method based on abacus arithmetic may be useful in elderly patients, both with and without cognitive impairment. Randomised comparative studies with longer follow-up periods should be conducted to evaluate the effectiveness of this method on patients' cognition and behaviour.

Tian *et al.*	2022	11,821/ ≥65, Chinese, To control potential confoundings, covariates: socio-demographic information, lifestyle factors, and health status included. MMSE: cognitive functioning	Prospective cohort study of the Chinese Longitudinal Healthy Longevity Survey (CLHLS),	socio-demographic information, lifestyle factors, and health status, MMSE	community-living Chinese individuals aged 65 years or older at 2008 baseline who were free of dementia, and were followed up every 2–3 years until 2018. Cox proportional hazards models were applied to generate the hazard ratios (HRs) and 95% confidence intervals (CIs) for analyzing the associations between the frequency of playing cards/mahjong and the incidence of dementia.	Cards/Mahjong	Compared with participants who rarely or never played cards/mahjong, participants who played cards/mahjong almost every day had a significantly lower risk of dementia (HR = 0.63; 95%CI, 0.42–0.95) after the multivariable-adjusted model. Similar results were observed in subgroup analyses based on sex (male: HR = 0.52, 0.28–0.96; female: HR = 0.62, 0.36–0.98), age (<85years: HR = 0.55, 0.32–0.89), regularly exercise (yes: HR = 0.44, 0.28–0.87) and MMSEscore [above median (25): HR = 0.66, 0.41–0.92].	More frequency of playing cards/mahjong was associated with a significant reduction in in the risk of dementia. protective association was stronger for older adults who reported playing cards/mahjong almost everyday with regular exercise. No significant difference in age, sex, and MMSE score median, and further sensitivity analysis yielded no substantial changes in findings after adjusting confounding factors. study provides evidence that frequently playing cards/mahjong may decrease the risk of dementia among Chinese elderly over 65 years old

Author	Year	*n*/condition	Design	Measures	No. of session/ duration/format	Intervention content/ programme	Outcome	Conclusion/Implication
Zhang *et al.*	2020	56/≥65 years old, MCI, MoCA-B: 17–23 [illiterate], 20-24 [elementary school], 20–25 [middle- to high school and above. CDR: 0.5–1.0 Prior experience and knowledge of how to play mahjong, but had not played mahjong in the past 6 months; Free of a handicap and/or disability that could interfere with mahjong playing.	Randomized controlled trial	Montreal Cognitive Assessment—Beijing (MoCA-B), the Shape Trail Test (STT), and the Functional Activities Questionnaire (FAQ)	randomized into mahjong and control groups (N =28,eachgroup). Subjects in the mahjong group played mahjong three times a week for 12 weeks, while people in the control group assumed normal daily activity.	Mahjong	There were nobaseline differences in MoCA-B, STT, and FAQ scoring between the two groups. The MoCA-B, STT, and FAQ scores, however, improved significantly in the mahjong group but not in the control group after the 12-week mahjong administration. Significant correlations were also found between STT and FAQ scores.	Playing Mahjong for 12 weeks improved the executive function of elderly people with MCI. Because Mahjong is a simple, low-cost entertainment activity, it could be widely applied to slow down or reverse the progression of cognitive decline in people with MCI, including those with traumatic brain injury.

4 RESULTS

Sixteen studies met the inclusion criteria and were included in the synthesis. Collectively, these studies involved 13,616 older adults with varying levels of cognitive status, including MCI and dementia.

Key study characteristics were extracted and summarised, including participant profiles, study design, outcome measures, intervention characteristics (content, delivery mode, session frequency and duration), and primary findings (Table 2).

4.1 Study designs and delivery formats

The majority of included studies employed controlled quantitative designs, most commonly randomised controlled trials, cluster-randomised controlled designs, and quasi-experimental or non-randomised pretest–posttest designs. A smaller number of studies adopted observational approaches, such as cross-sectional comparisons and prospective cohort designs.

Interventions were predominantly delivered in person, although several studies incorporated technology-assisted formats, including culture-based virtual reality programs. Across studies, intervention dosage varied considerably, with sessions typically lasting between 30 and 90 minutes and delivered once to several times per week over periods ranging from several weeks to multiple months.

4.2 Types of culturally based cognitive interventions

The culturally based cognitive interventions identified across studies could be broadly categorised into four groups: culture-embedded cognitive training approaches (such as mental abacus training and abacus arithmetic), traditional cognitive games (including mahjong, Go, and the Ska game), culturally rooted mind–body practices (most notably Tai Chi, delivered through standard or virtual reality–assisted formats), and culture-based digital or virtual cognitive training programmes.

Among these interventions, mahjong (CHENG *et al*., 2006; CHENG *et al*., 2014; ZHANG *et al*., 2020) and Tai Chi (CHENG *et al*., 2014; HSIEH *et al*., 2019; HUANG *et al*., 2019; LAM *et al*., 2012; LAM *et al*., 2014; LI *et al*., 2014; MAN *et al*., 2010; SIU *et al*., 2018) were the most frequently examined, reflecting a comparatively stronger evidence base for these approaches relative to other culturally grounded interventions.

4.3 Outcome measures

Across the included studies, cognitive outcomes were assessed primarily using established and validated instruments. The most commonly used measures were the Mini-Mental State Examination and the Montreal Cognitive Assessment, alongside task-specific measures assessing attention, executive functioning, processing speed, and memory. Several studies also incorporated assessments of emotional and behavioural functioning, such as the Neuropsychiatric Inventory and the Geriatric Depression Scale, allowing for examination of intervention effects beyond cognition alone.

Other studies reported psychosocial and biological outcomes, including improvements in depressive symptoms, quality of life, and increased serum brain-derived neurotrophic factor levels.

4.4 Synthesis of intervention effects

As presented in Table 2, most culturally based cognitive interventions were associated with measurable improvements in cognitive outcomes, reported using effect sizes, pre–post score changes, mean differences, or percentages of improvement. Studies consistently observed improvements in attention, memory, and executive functioning across the board. These findings suggest that culturally grounded cognitive programs may support cognitive performance and, in some cases, emotional well-being among older adults with MCI or dementia.

The magnitude and pattern of effects, however, varied across intervention types and study designs. Several Tai Chi interventions reported improvements not only in cognitive outcomes but also in functional and emotional domains, including reductions in neuropsychiatric and depressive symptoms, although effect sizes and clinical significance differed across studies. Mahjong-based interventions similarly demonstrated improvements in global cognition and executive functioning, with some studies reporting maintaining cognitive performance over time. Abacus-based cognitive training approaches showed promising pre–post improvements in global cognition, although interpretation was limited in some cases by the absence of control groups or relatively short follow-up periods.

In contrast, at least one culture-based virtual reality cognitive training study demonstrated good feasibility and acceptability but did not produce significant cognitive improvements, highlighting that intervention engagement alone may not be sufficient to yield measurable cognitive change. This finding emphasises the need to consider intervention

content, dosage, and outcome sensitivity when evaluating technology-assisted, culturally grounded programs.

Overall, the findings indicate that culturally based cognitive interventions are generally associated with positive cognitive outcomes, particularly in the domains of attention, memory, and executive functioning. Nevertheless, substantial heterogeneity was observed across studies with respect to participant characteristics, intervention intensity and duration, outcome measures, and study design. These factors warrant a cautious interpretation of the findings and point to the need for more standardised methodologies and long-term follow-up in future research.

5 DISCUSSION

This systematic review contributes to the expanding literature on non-pharmacological approaches to cognitive health by foregrounding the role of culture in cognitive interventions, a dimension that remains under-represented in mainstream geriatric research. Culturally grounded interventions, in contrast to traditional cognitive stimulation therapies, utilise familiar traditions, shared meanings, and socially embedded practices, potentially increasing relevancy, motivation, and adherence among older adults. By synthesising findings across diverse cultural contexts, this review highlights the therapeutic and preventive potential of culturally based cognitive interventions for individuals with MCI, dementia, and related neurocognitive conditions.

Across the 16 included studies, culturally based cognitive interventions were generally found to be both feasible and beneficial, with positive effects reported across cognitive, emotional, and functional domains. These interventions were implemented in both individual and group formats, suggesting flexibility in delivery and suitability for a range of care settings. Taken together, the findings indicate that culturally grounded approaches can serve as meaningful alternatives or complements to standard cognitive interventions, particularly in populations for whom cultural familiarity may influence engagement and persistence.

Consistent cognitive benefits were reported across multiple intervention types. Mahjong-based interventions were associated with improvements in forward digit memory, verbal memory, and global cognition as measured by the Mini-Mental State Examination, with some studies demonstrating the maintenance of gains following intervention cessation. Similarly, Tai Chi interventions were frequently associated with improvements in attention and memory and, in several cases, showed superiority over comparison activities. The Ska board

game also yielded significant improvements in memory, attention, and executive functioning relative to control conditions. In contrast, culture-based virtual reality interventions produced mixed results, with limited cognitive gains despite good feasibility and acceptability. This pattern suggests that cultural relevance alone may be insufficient and that cognitive demand, intensity, and task structure remain critical determinants of intervention efficacy.

The observed cognitive and emotional benefits can be interpreted through established theoretical frameworks. The cognitive reserve hypothesis proposes that sustained engagement in cognitively demanding and socially meaningful activities can delay the clinical expression of neurocognitive decline by strengthening compensatory neural mechanisms. Culturally embedded interventions such as Mahjong and Tai Chi may be particularly effective in this regard, as they combine cognitive challenge with affective engagement and social interaction. Socioemotional selectivity theory offers additional explanatory value, suggesting that older adults increasingly prioritise emotionally meaningful experiences, making culturally familiar activities inherently more motivating and rewarding.

Several studies also reported evidence of cognitive preservation over time. Both Mahjong and Tai Chi interventions were associated with maintaining cognitive functioning over follow-up periods of up to nine months, while Tai Chi and Tai Ji Quan programs demonstrated concurrent improvements in cognitive scores and physical performance. These findings are notable given the progressive nature of neurocognitive disorders and suggest that culturally grounded interventions may play a role not only in short-term cognitive enhancement but also in slowing functional decline.

Beyond cognition, culturally based interventions were associated with broader psychosocial benefits. Improvements were observed in depressive symptoms, anxiety, global functioning, and quality of life measures, alongside biological markers such as increased brain-derived neurotrophic factor levels. The consistent decline observed in control groups across several studies further emphasises the value of active engagement in cognitively and socially meaningful activities for maintaining emotional and cognitive well-being in later life.

Although virtual reality–based interventions demonstrated limited cognitive effects, their high acceptability highlights potential avenues for future development. As immersive technologies continue to evolve, culturally tailored virtual environments that incorporate familiar settings, languages, and narratives may enhance ecological validity and engagement, particularly for individuals with mobility limitations or restricted access to in-person programs.

Cultural competence among facilitators emerged as an implicit but important factor influencing intervention success. Sensitivity to cultural norms, beliefs, and practices may

enhance trust, acceptability, and authenticity, thereby strengthening therapeutic engagement, which is crucial for the overall effectiveness of the intervention. At the same time, substantial variability in intervention duration, intensity, and frequency across studies highlights the need for clear guidance and standardisation. Balancing cultural flexibility with methodological consistency will be essential for advancing this field, as it will help ensure that interventions are both effective and respectful of diverse cultural contexts.

A wide range of culturally specific practices, including mental abacus training, abacus arithmetic, Mahjong, Go, Tai Chi, and the Ska game, demonstrated promising outcomes. Mental abacus training showed particular benefits for attention and working memory, while Mahjong and Go offered low-cost, socially engaging options suitable for both institutional and community settings. Even in cases where cognitive gains were modest, high participant satisfaction and adherence highlight the importance of feasibility, enjoyment, and social connection as integral components of effective intervention design.

From a clinical perspective, these findings support the integration of culturally meaningful cognitive activities into care plans across community, residential, and home-based settings. Embedding familiar practices within cognitive rehabilitation may enhance adherence, reduce stigma, and foster emotional connection, thereby improving both engagement and outcomes. Training practitioners in cultural competence and encouraging flexibility in program delivery may further enhance intervention effectiveness.

Several limitations should be acknowledged. Publication bias may have favoured studies reporting positive outcomes, while the restriction on English-language publications may have excluded relevant research conducted in other languages. Heterogeneity in study design, intervention characteristics, and outcome measures limited direct comparison across studies. Additionally, although the McMaster Critical Appraisal Tool provided a structured assessment of methodological quality, some degree of subjectivity is inherent in quality appraisal, which can lead to variability in how different reviewers interpret the quality of the studies being assessed.

Despite these limitations, this review provides useful information about the feasibility, effectiveness, and broader relevance of culturally based cognitive interventions for older adults with neurocognitive conditions. Future research should prioritise well-designed longitudinal randomised controlled trials using standardised cognitive and functional outcomes along with culturally sensitive intervention frameworks. Cross-cultural comparative studies may help distinguish universally effective components from those that are context-specific, thereby enhancing the applicability of interventions across diverse populations. Further exploration of

hybrid models that integrate traditional practices with emerging technologies represents a promising direction for developing interventions that are culturally sensitive and effective in promoting cognitive health and emotional well-being in ageing populations. Addressing these gaps will be critical for clarifying the mechanisms through which culture supports cognitive health and emotional well-being in ageing populations, such as through community engagement, social support networks, and culturally relevant interventions.

6 CONCLUSION

This systematic review demonstrates that culturally based cognitive interventions constitute a promising, feasible, and engaging approach for supporting older adults with mild cognitive impairment and dementia. Across diverse cultural contexts, these interventions were associated with improvements in cognitive functioning, emotional well-being, and quality of life, alongside evidence of preserved functional abilities over time. Their distinctive strength lies in cultural grounding—integrating familiar traditions, languages, and socially meaningful practices—which appears to enhance relevance, emotional resonance, and sustained engagement among older adults.

Taken together, culturally based cognitive interventions represent a person-centred, evidence-informed approach that respects cultural identity while promoting cognitive vitality, dignity, and social connectedness in later life. With continued methodological refinement, stronger longitudinal evidence, and broader implementation across care settings, these interventions hold considerable potential to complement existing dementia care and prevention strategies in an increasingly ageing global population.

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ETHICS OF THE STUDY

The authors declare that the systematic review adheres to and respects all ethical considerations. The study clearly explained all the processes followed.

DECLARATION OF CONFLICT OF INTEREST

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

ABBREVIATIONS

The following abbreviations are used in this manuscript:

MCI	Mild Cognitive Impairment
IADL	instrumental activities of daily living
ACTIVE	Advanced Cognitive Training for Independent and Vital Elderly
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
PROSPERO	Prospective Register of Systematic Reviews

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