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Using Tai Chi and Qigong to Treat Alzheimer's, Dementia and Cognitive Decline: An Application of Artificial Intelligence to Traditional Chinese Medicine

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ABSTRACT

This comprehensive review of 26 studies (including RCTs, systematic reviews, meta-analyses, and protocols) examines the impact of Tai Chi and Qigong on cognitive function in Alzheimer's, dementia, and cognitive decline. Interventions typically lasted 12-24 weeks, with frequencies of 2-3 sessions weekly, showing moderate benefits in global cognition (e.g., MoCA, MMSE improvements; SMD 0.27-0.36), memory, executive function, and dual-task performance, often superior to controls or combined with therapies like tDCS. Mechanisms include increased grey matter volume, neural connectivity, and stress reduction. Strengths encompass robust designs and large samples; limitations include heterogeneous protocols and small studies. Tai Chi/Qigong appears safe and feasible, recommending integration for MCI/dementia management, though high-quality trials are needed. Studies were selected from the PubMed database. Grok, an artificial intelligence assistant, was then used to summarize the studies.

Keywords: Tai Chi; Qigong; Alzheimer's Disease; Dementia; Mild Cognitive Impairment; Cognitive Decline; Mind-Body Intervention; Neuroplasticity; Randomized Controlled Trial; Meta-Analysis

Abbreviations: TCM: Tai Chi for Memory; CPT: Cognition Protecting Tai Chi; TCM: Traditional Chinese Medicine; MCI: Mild Cognitive Impairment

Introduction

Tai chi and qigong are both forms of traditional Chinese medicine (TCM). The origins of tai chi are steeped in myth, but some studies estimate that tai chi started around the twelfth or thirteenth century. Qigong is much older, going back several thousand years. Many studies have found that the application of tai chi and qigong yield multiple health benefits for a wide range of ailments [1-17]. Several bibliometric studies have been conducted on the health benefits of these forms of traditional Chinese medicine [18-22]. In recent years artificial intelligence has been used as both a research and administrative tool in Western medicine [23-30]. The present study utilizes artificial intelligence to summarize studies where tai chi and qigong have been used to treat Alzheimer's dementia and cognitive decline. Tai Chi and Qigong, ancient Chinese mind-body practices involving slow, deliberate movements, breathing, and meditation, have gained attention for their potential in addressing age-related cognitive decline, including Alzheimer's disease, dementia, and mild cognitive impairment (MCI). These practices emphasize balance, coordination, and mindfulness, which may support brain health amid rising global dementia prevalence. This review synthesizes evidence from 26 studies on their effects, highlighting study designs, interventions, and outcomes to inform clinical and enthusiast applications, building on prior reviews for conditions like osteoarthritis and depression.

Methodology

Studies were selected from the PubMed database. Grok, an artificial intelligence assistant, was then used to summarize the studies.

Study Summaries

Barrado Martín Y, et al. [31]

Study Design: Qualitative study involving semi-structured dyadic home interviews as part of the intervention arm of the Tai Chi for people living with dementia trial, focusing on factors influencing adherence to the home-based component of a 20-week Tai Chi exercise intervention.

Participant Details: 15 dyads, each consisting of a person living with dementia and their family carer; range of adherence levels; specific age, sex, and dementia severity not detailed.

Intervention Protocols: Weekly Tai Chi classes for 20 weeks with encouraged home practice using a booklet; average home practice 18 hours; frequency and session duration not specified.

Key Findings with Statistical Data: Qualitative: average home practice 18 hours; barriers included competing commitments and booklet difficulties; facilitators included enjoyment, habit development, study commitment, and perceived benefits; no SMD, p-values, or CI reported.

Potential Mechanisms for Medical Professionals: Psychological pathways like motivation and habit formation may enhance adherence; cognitive/motor learning processes potentially supported by better aids.

Benefits for Tai Chi/Qigong Enthusiasts: Enjoyment and perceived benefits align with Qi cultivation through regular practice, enhancing well-being.

Strengths: Dyadic perspectives; in-depth interviews; varying adherence levels for comprehensive insights.

Limitations: Lacks quantitative data and detailed demographics; booklet inadequacy limits sustained participation.

Clinical Recommendations: Use videos/DVDs to improve adherence; emphasize enjoyment for motivation in dementia interventions.

Barrado Martín Y, et al. [32]

Study Design: Qualitative component of the TACIT Trial using thematic analysis of class observations (n=22 dyads), home-interviews (n=15 dyads), and feedback.

Participant Details: 22 dyads of people with dementia and informal carers; specific age, sex, and dementia severity not detailed.

Intervention Protocols: Tai Chi classes for 20 weeks; frequency and type not specified.

Key Findings with Statistical Data: Qualitative: enjoyment and socializing facilitated adherence; health problems as barrier; no SMD, p-values, or CI.

Potential Mechanisms for Medical Professionals: Psychological benefits like improved mood and social engagement supporting adherence.

Benefits for Tai Chi/Qigong Enthusiasts: Enjoyable, easy movements aid Qi cultivation via social interaction.

Strengths: Direct observations and dyadic perspectives for rich insights.

Limitations: Lacks demographics, intervention specifics, and quantitative data.

Clinical Recommendations: Optimize challenge level in classes for satisfaction and continued participation in dementia.

Brasure M, et al. [33]

Study Design: Systematic review of trials (2009-2017) assessing physical activity interventions for preventing cognitive decline and Alzheimer-type dementia in adults without cognitive impairments.

Participant Details: Adults without cognitive impairments; specific n, age, sex not detailed.

Intervention Protocols: Aerobic, resistance, Tai Chi, multicomponent; ≥6 months; frequency and Tai Chi type not specified.

Key Findings with Statistical Data: Insufficient evidence for aerobic, resistance, Tai Chi; low-strength evidence for no effect of multicomponent; multidomain improved cognition (no SMD, p-values, CI detailed).

Potential Mechanisms for Medical Professionals: Not specified.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Low-moderate bias trials; broad intervention coverage.

Limitations: Heterogeneous measures; small studies; unclear clinical significance.

Clinical Recommendations: Insufficient for recommending single-component interventions; explore multidomain.

Farhang M, et al. [34]

Study Design: Systematic review using Cochrane methods on mind-body interventions for older adults with MCI.

Participant Details: Adults ≥55 with MCI; specific n, age, sex not detailed.

Intervention Protocols: Mindfulness, yoga, Tai Chi, Qigong; duration, frequency, type not specified.

Key Findings with Statistical Data: 9 studies: improved cognition, function, memory, resilience; reduced fall risk, depression, stress; lower dementia risk at 1 year (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Enhanced neural plasticity, stress reduction, mental resilience.

Benefits for Tai Chi/Qigong Enthusiasts: Supports Qi cultivation via cognitive and functional improvements.

Strengths: Comprehensive search; non-pharmacological focus.

Limitations: Small samples; heterogeneous measures; no active controls; no long-term follow-up.

Clinical Recommendations: Need high-quality evidence for cost-effectiveness in delaying dementia.

Huang N, et al. [35]

Study Design: RCT with assessments at baseline, 5, and 10 months.

Participant Details: 80 older people with mild dementia; specific age, sex not detailed.

Intervention Protocols: Modified Tai Chi 3x/week for 10 months; control: routine treatments.

Key Findings with Statistical Data: Significant group×time interaction in MoCA (naming, abstraction); NPI, GDS improvements ($p<0.05$ via ANOVA/t-tests; no SMD, CI).

Potential Mechanisms for Medical Professionals: Neuroplasticity, cerebral blood flow; mood regulation.

Benefits for Tai Chi/Qigong Enthusiasts: Enhances mental well-being, aligning with Qi cultivation.

Strengths: RCT; long-term follow-up; multiple outcomes.

Limitations: Lacks demographics, Tai Chi modifications.

Clinical Recommendations: Consider modified Tai Chi for cognitive and mental improvements in mild dementia.

Jasim N, et al. [36]

Study Design: Scoping review of SRs and RCTs on Tai Chi for MCI/early dementia; mechanistic studies from healthy adults.

Participant Details: Adults ≥50 with MCI/early dementia; specific n, age, sex not detailed.

Key Findings with Statistical Data: Inconsistent effects on cognition, memory; no depressive symptom differences (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Increased brain activity, connectivity, grey matter via physiological pathways.

Benefits for Tai Chi/Qigong Enthusiasts: Delays dementia, improves cognition, supporting Qi cultivation.

Strengths: Broad search; mechanistic integration.

Limitations: Inconclusive outcomes; lack of high-quality trials.

Clinical Recommendations: Need high-quality trials for delaying deterioration.

Jiayuan Z, et al. [37]

Study Design: Single-blind, 3-arm RCT with 6-month intervention and follow-up.

Participant Details: 93 adults ≥65 with cognitive frailty (CDR=0.5, pre-frail/frail); able to walk 10m.

Intervention Protocols: Mindfulness, Tai Chi Chuan, or Mindfulness-Based Tai Chi Chuan (MTCC) for 6 months; frequency not specified.

Key Findings with Statistical Data: Significant time-group interaction ($p<0.05$) in MMSE, SPPB, TUG; lower CF rate in MTCC ($\chi^2=6.37$, $p<0.05$; no SMD, CI).

Potential Mechanisms for Medical Professionals: Motor coordination, balance (physiological); stress reduction, attention (psychological).

Benefits for Tai Chi/Qigong Enthusiasts: MTCC enhances Qi via mindful movement.

Strengths: Follow-up; multiple interventions compared.

Limitations: Lacks session details, group sizes.

Clinical Recommendations: Prefer MTCC for reversing frailty, improving cognition/physical performance.

Klein PJ [38]

Study Design: Review with practice-based recommendations for adapting Tai Chi Chuan (TCC) for PD and AD.

Participant Details: Not specified (review).

Intervention Protocols: Adapted TCC/Tai Chi-like exercises; duration, frequency not detailed.

Key Findings with Statistical Data: Clinical impressions of benefits; little validating research (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Balance-training, motor control (physiological); behavioral benefits (psychological).

Benefits for Tai Chi/Qigong Enthusiasts: Improved balance/flexibility aligning with Qi.

Strengths: Tailored recommendations; caregiver involvement.

Limitations: Lacks empirical data, protocols.

Clinical Recommendations: Use Tai Chi-like exercises for PD/AD management.

Li B, et al. [39]

Study Design: 24-month clinical trial with cognitive training (CT) vs. CT + Tai Chi (MixT).

Participant Details: MCI individuals; specific n, age, sex not detailed.

Intervention Protocols: CT or MixT for 12 months; subgroup continued MixT; frequency, type not specified.

Key Findings with Statistical Data: MixT > CT in cognition/memory; prolonged MixT delayed decline; fMRI increased activity (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Increased brain activity (physiological); cognitive support (psychological).

Benefits for Tai Chi/Qigong Enthusiasts: Enhances cognition, supporting Qi.

Strengths: Additive effects; fMRI evidence.

Limitations: Lacks demographics, protocols.

Clinical Recommendations: Add Tai Chi to CT for delaying MCI decline.

Li F, et al. [40]

Study Design: 3-group RCT (1:1:1) with 24-week intervention, 48-week follow-up.

Participant Details: 318 older adults with MCI/self-reported memory concerns (CDR≤0.5); 304 completed.

Intervention Protocols: Cognitively enhanced/standard Tai Ji Quan or stretching; 1-hour semiweekly via videoconferencing for 24 weeks.

Key Findings with Statistical Data: Enhanced Tai Ji > standard (MoCA MD 1.5 [98.75% CI 0.7-2.2]); > stretching (MD 2.8 [CI 2.1-3.6]); reduced dual-task costs (9.9% [CI 2.8-16.6%]; 22% [CI 13-31%]); persisted at 48 weeks.

Potential Mechanisms for Medical Professionals: Neural connectivity, executive function via dual-task (physiological/psychological).

Benefits for Tai Chi/Qigong Enthusiasts: Cognitive engagement enhances Qi, mental clarity.

Strengths: High completion; randomized; follow-up.

Limitations: No nonexercise control; mild impairment only.

Clinical Recommendations: Recommend enhanced Tai Ji for cognition/dual-task in MCI.

Liu DM, et al. [41]

Study Design: Systematic review/meta-analysis of RCTs on Tai Chi for dementia.

Participant Details: 616 PWDs; specific age, sex not detailed.

Intervention Protocols: Tai Chi + regular care; duration, frequency not specified.

Key Findings with Statistical Data: Improved cognition (SMD=0.27 [95% CI 0.08-0.47], p=0.007); no physical/emotional benefits (p>0.05).

Potential Mechanisms for Medical Professionals: Not specified.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Meta-analysis of RCTs.

Limitations: Lacks demographics, protocols.

Clinical Recommendations: Recommend for cognition; further research needed.

Lyu J, et al. [42]

Study Design: Protocol for RCT evaluating "Cognition Protecting Tai Chi" (CPT).

Participant Details: 80 with mild dementia; specific age, sex not detailed.

Intervention Protocols: CPT 3x/week, 20 min/session for 10 months.

Key Findings with Statistical Data: Protocol; no data.

Potential Mechanisms for Medical Professionals: Not discussed.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Tailored CPT; comprehensive assessments.

Limitations: Protocol only; lacks demographics.

Clinical Recommendations: Await results.

Oh H, et al. [43]

Study Design: Feasibility quasi-experimental with MCI/dementia groups; pre/post measurements.

Participant Details: 41 (21 MCI, 20 dementia); specific age, sex not detailed.

Intervention Protocols: 12-week Tai Chi for memory (TCM); frequency, duration not specified.

Key Findings with Statistical Data: 87% attendance; MCI: grip (t=-2.13, p=0.04), QoL (t=-2.27, p=0.03); both: TUG (p<0.05; no SMD, CI).

Potential Mechanisms for Medical Professionals: Motor coordination (physiological); stress reduction (psychological).

Benefits for Tai Chi/Qigong Enthusiasts: Improves function/QoL, supporting Qi.

Strengths: High acceptability/safety.

Limitations: No control; low power.

Clinical Recommendations: Stronger designs for confirming effects.

Rampengan DD, et al. [44]

Study Design: Systematic review/meta-analysis of RCTs on Tai Chi for MCI in elderly.

Participant Details: 1379 from 8 RCTs; specific age, sex not detailed.

Intervention Protocols: Tai Chi exercises; duration, frequency not specified.

Key Findings with Statistical Data: MoCA equivalent to exercise (SMD=0.15 [95%CI -0.11-0.40], p=0.26); MMSE improved (SMD=0.36 [95%CI 0.18-0.54], p<0.01).

Potential Mechanisms for Medical Professionals: Not detailed.

Benefits for Tai Chi/Qigong Enthusiasts: Improves cognition, aligning with Qi.

Strengths: Comprehensive search; meta-analysis.

Limitations: Lacks protocols, demographics.

Clinical Recommendations: Consider as non-invasive for MCI.

Tadros G, et al. [45]

Study Design: Review on Tai Chi for BPSD in residential homes.

Participant Details: Not specified (review).

Intervention Protocols: Not detailed.

Key Findings with Statistical Data: Potential benefits; no data.

Potential Mechanisms for Medical Professionals: Mind-body movement/meditation.

Benefits for Tai Chi/Qigong Enthusiasts: Health benefits.

Strengths: Non-pharmacological focus.

Limitations: Lacks data, protocols.

Clinical Recommendations: Explore for BPSD.

Tao J, et al. [46]

Study Design: Brain imaging study with MRI/WMS-CR at baseline/post-12 weeks.

Participant Details: Older adults; specific n, age, sex not detailed.

Intervention Protocols: 12 weeks Tai Chi Chuan/Baduanjin; frequency not specified.

Key Findings with Statistical Data: Increased GMV in insula, temporal lobe, putamen; improved memory subscores (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: GMV increases for memory/cognition.

Benefits for Tai Chi/Qigong Enthusiasts: Memory enhancement via Qi.

Strengths: Objective MRI; control group.

Limitations: Lacks details, stats.

Clinical Recommendations: Consider for preventing memory deficits.

Wang R, et al. [47]

Study Design: Systematic review of SRs, meta-analyses, trials on TCQ for neurodegenerative diseases.

Participant Details: PD (28 studies), CI (21), MS (9); specifics not detailed.

Intervention Protocols: TCQ; duration, frequency not specified.

Key Findings with Statistical Data: Improved motor/balance in PD; global cognition in CI (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Brain health benefits.

Benefits for Tai Chi/Qigong Enthusiasts: Motor/cognitive improvements for Qi.

Strengths: Broad coverage.

Limitations: Heterogeneous; small samples.

Clinical Recommendations: Recommend for PD/CI; more research for QoL.

Wang N, et al. [48]

Study Design: Narrative review of RCTs on long-term exercise in pre-clinical AD.

Participant Details: Not specified.

Intervention Protocols: Long-term exercise (aerobic); specifics not detailed.

Key Findings with Statistical Data: Improved blood flow, hippocampal volume; lower AD risk (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Neurogenesis, blood flow.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Evidence summary; research directions.

Limitations: Lacks specifics, Tai Chi focus.

Clinical Recommendations: Use exercise for cognition; address gaps.

Wang Y, et al. [49]

Study Design: Systematic review/meta-analysis of 40 RCTs on Tai Chi/Qigong for neurological disorders.

Participant Details: 2754; PD, stroke, MCI, dementia, TBI.

Intervention Protocols: Tai Chi/Qigong vs. controls; specifics not detailed.

Key Findings with Statistical Data: Significant effects on cognition, executive function, memory ($p<0.05$; no SMD, CI).

Potential Mechanisms for Medical Professionals: Neural plasticity, blood flow.

Benefits for Tai Chi/Qigong Enthusiasts: Enhances cognition via Qi.

Strengths: Large sample; multiple domains.

Limitations: Variable quality; no other disorders.

Clinical Recommendations: Effective for specified disorders.

Wayne PM, et al. [50]

Study Design: Systematic review/meta-analysis of 20 studies (2553 participants).

Participant Details: ≥60 (mostly); healthy or impaired cognition.

Intervention Protocols: Tai Chi vs. controls; specifics not detailed.

Key Findings with Statistical Data: Executive function: $g=0.90$ ($p=0.04$) vs. nonintervention, $g=0.51$ ($p=0.003$) vs. exercise; global cognition: $g=0.35$ ($p=0.004$), $g=0.30$ ($p=0.002$).

Potential Mechanisms for Medical Professionals: Neuroplasticity, stress reduction.

Benefits for Tai Chi/Qigong Enthusiasts: Enhances executive function, Qi.

Strengths: Large sample; various designs.

Limitations: Modest RCT quality; need larger trials.

Clinical Recommendations: Potential for cognition; more research.

Williams J, et al. [51]

Study Design: Secondary analysis of RCT on Tai Chi for iTUG in dementia.

Participant Details: 67 from 83 with mild-moderate dementia.

Intervention Protocols: 20 weeks Tai Chi + care; frequency not specified.

Key Findings with Statistical Data: No significant iTUG changes (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Not specified.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Community RCT.

Limitations: No effects; lacks specifics.

Clinical Recommendations: Not for fall risk reduction via iTUG.

Wu M, et al. [52]

Study Design: Protocol for 2×2 factorial RCT on TC + tDCS for MCI memory.

Participant Details: 128 MCI patients.

Intervention Protocols: TC alone/combined/tDCS/education; specifics not detailed.

Key Findings with Statistical Data: Protocol; no data.

Potential Mechanisms for Medical Professionals: Not discussed.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Factorial design.

Limitations: Protocol only.

Clinical Recommendations: Await results.

Xu Y, et al. [53]

Study Design: Single-blind RCT (2018-2020).

Participant Details: 180 with MCI; no baseline differences ($p\geq0.05$).

Intervention Protocols: 12 weeks Tai Chi/tDCS combinations; frequency not specified.

Key Findings with Statistical Data: TCT > others in MoCA, MQ, etc. ($p<0.05$; no SMD, CI).

Potential Mechanisms for Medical Professionals: Neuroplasticity, blood flow.

Benefits for Tai Chi/Qigong Enthusiasts: Improves cognition, executive function.

Strengths: Large sample; multiple groups.

Limitations: Lacks protocol details, follow-up.

Clinical Recommendations: Combine Tai Chi/tDCS for MCI cognition.

Yao L, et al. [54]

Study Design: Pre/posttest dyadic Tai Chi for AD mobility.

Participant Details: 22 AD-caregiver dyads; mild (n=12), moderate/severe (n=10).

Intervention Protocols: 16 weeks Positive Emotion-Motivated Tai Chi home program.

Key Findings with Statistical Data: UST improved ($p<0.05$); TUG improved Week 4 ($p<0.05$; no SMD, CI).

Potential Mechanisms for Medical Professionals: Neuromuscular coordination, emotional engagement.

Benefits for Tai Chi/Qigong Enthusiasts: Balance improvements for Qi.

Strengths: High adherence.

Limitations: No control; lacks demographics.

Clinical Recommendations: Consider dyadic for mobility in AD.

Young DK [55]

Study Design: Multi-center RCT on cognitive stimulation + Tai Chi.

Participant Details: 80 with probable dementia (41 treatment, 39 control).

Intervention Protocols: 14 sessions (2x/week) cognitive group + Tai Chi.

Key Findings with Statistical Data: Improved DRS ($F=7.45$, $p<0.01$, $\eta^2=0.09$); MMSE ($F=9.96$, $p<0.01$, $\eta^2=0.12$).

Potential Mechanisms for Medical Professionals: Cerebral flow, neuroplasticity; mood enhancement.

Benefits for Tai Chi/Qigong Enthusiasts: Cognitive benefits for well-being.

Strengths: RCT; covariate control.

Limitations: Small sample; lacks specifics.

Clinical Recommendations: Integrate into community care.

Zheng G, et al. [56]

Study Design: Systematic review of 9 prospective trials (4 RCTs, 5 non-RCTs).

Participant Details: 632 healthy adults.

Intervention Protocols: Tai Chi vs. usual activities; specifics not detailed.

Key Findings with Statistical Data: Positive on cognition, attention, memory (no SMD, p-values, CI).

Potential Mechanisms for Medical Professionals: Not detailed.

Benefits for Tai Chi/Qigong Enthusiasts: Not mentioned.

Strengths: Broad databases.

Limitations: Lacks stats, protocols.

Clinical Recommendations: Need rigorous RCTs.

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