MSI Journal of Multidisciplinary Research (MSIJMR)

Using Tai Chi and Qigong to Treat Chronic Fatigue Syndrome: An Application of Artificial Intelligence to Traditional Chinese Medicine

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The authors declare that no funding was received for this work.

OPEN ACCESS

Received: 05-December-2025
Accepted: 08-January-2026
Published: 10-January-2026

This article is published in the **MSI Journal of Multidisciplinary Research (MSIJMR) ISSN 3049-0669 (Online)**

The journal is managed and published by MSI Publishers.

Volume: 3, Issue: 1 (January-2026)

ABSTRACT: Objective: To systematically summarize and evaluate the clinical evidence for Tai Chi and Qigong as therapeutic interventions for chronic fatigue syndrome (CFS)/myalgic encephalomyelitis (ME).

Methods: Fourteen English-language publications (5 completed randomized controlled trials, 3 study protocols, 3 systematic reviews/meta-analyses, 2 non-randomized interventions, and 1 case series) were identified via PubMed and individually summarized with the assistance of the artificial intelligence tool Grok (xAI). Study design, participant characteristics, intervention protocols, primary outcomes, biomarkers, proposed mechanisms, safety profile, limitations, and clinical implications were extracted and synthesized.

Results: Interventions lasting 4–16 weeks (most commonly Baduanjin Qigong, 24-style Tai Chi, PLWNT, and Wu Xing Ping Heng Gong) consistently demonstrated moderate-to-large reductions in fatigue severity (pooled SMD 0.85, 95% CI 0.64–1.07 compared with passive controls), improvements in sleep quality (SMD 0.34, 95% CI 0.10–0.57), depression (SMD 0.53, 95% CI 0.34–0.72), anxiety, health-related quality of life, and functional capacity. Beneficial biomarker changes included increased telomerase activity, elevated adiponectin, and enhanced resting-state functional connectivity in the

default mode, frontoparietal, and sensorimotor networks. Effect sizes against active controls (e.g., CBT, education) were small and non-significant. Interventions were well tolerated with only minor, transient adverse events reported.

Conclusion: Current evidence, albeit predominantly from small-to-moderate-sized trials conducted in China and Hong Kong, indicates that Tai Chi and Qigong are safe, promising adjunctive therapies for CFS, producing clinically meaningful reductions in fatigue and associated symptoms together with favorable neurophysiological and biochemical changes. High-quality, multicenter RCTs with active controls, longer follow-up periods, and objective physiological outcomes are now warranted to confirm efficacy and establish optimal protocols.

Keywords: *Chronic fatigue syndrome, myalgic encephalomyelitis, Tai Chi, Qigong, mind-body exercise, fatigue reduction, sleep quality, depression, functional connectivity, telomerase, systematic review.*

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 chronic fatigue syndrome.

Chronic fatigue syndrome (CFS) is a debilitating condition characterized by persistent, unexplained fatigue that impairs daily functioning, often accompanied by symptoms such as sleep disturbances, cognitive issues, and psychological distress. Traditional mind-body practices like Tai Chi and Qigong, rooted in Chinese medicine, have emerged as promising non-pharmacological interventions. This review synthesizes evidence from 14 studies (reviews, RCTs, protocols) on their

effects in CFS patients, highlighting improvements in fatigue, sleep, mood, and biomarkers. Building on prior summaries for conditions like osteoarthritis and depression, this analysis adopts a consistent methodology to inform clinical practice and research.

Chronic fatigue syndrome (CFS), also known as myalgic encephalomyelitis (ME) or systemic exertion intolerance disease (SEID), remains a complex, multisystem illness with no approved pharmacological treatment and only modestly effective behavioral interventions. The absence of curative options and the frequent intolerance of graded exercise therapy have driven interest in gentle, self-regulated mind-body practices that simultaneously address physical deconditioning, autonomic dysfunction, immune dysregulation, and psychological distress without provoking post-exertional malaise.

Tai Chi and Qigong, with their emphasis on slow, deliberate movement, diaphragmatic breathing, meditative focus, and cultivation of "Qi," align particularly well with the physiological limitations of CFS patients. Unlike conventional aerobic or resistance training, these practices can be adapted to very low exertion levels, performed seated or lying down when necessary, and emphasize energy conservation and restoration rather than expenditure. Emerging neuroimaging and biomarker data further suggest that these practices may normalize hypothalamic–pituitary–adrenal axis function, reduce systemic inflammation, enhance telomere maintenance, and restore aberrant brain network connectivity—mechanisms directly implicated in CFS pathophysiology. The present AI-assisted review therefore seeks to consolidate the current evidence base, identify consistent with prior summaries by the author on Tai Chi/Qigong applications in osteoarthritis, fibromyalgia, and depression, while highlighting remaining gaps that must be addressed before these ancient practices can be confidently integrated into Western clinical guidelines for CFS/ME.

Study Summaries

Alraek et al. (2011) Systematic Review [31]

Study Design: Systematic review of 26 randomized controlled trials (RCTs) evaluating complementary and alternative medicine (CAM) interventions, including

Tai Chi and Qigong, for chronic fatigue syndrome (CFS). Trials were assessed using the Cochrane risk of bias tool.

Participant Details: Total of 3,273 participants across studies; for Tai Chi/Qigong-specific trials: Liu (2010) Tai Chi study had 90 participants (age 26.4–46.2 years, 44 males, 46 females); Dybwad (2007) Qigong study had 31 participants (age 17–62 years, 4 males, 27 females); Collinge (1998) Qigong study had 70 participants (demographics not detailed). All met CFS diagnostic criteria (e.g., Fukuda or CDC).

Intervention Protocols: Qigong: 2 hours weekly for 9–12 weeks, often combined with meditation (e.g., Collinge 1998, Dybwad 2007). Tai Chi: 1 month duration (Liu 2010), combined with Tuina; specific frequency not reported.

Key Findings with Statistical Data: Qigong improved work capacity (VO2max, $p=0.01$) and fatigue severity ($p<0.05$) vs. no treatment (Dybwad 2007); no significant SF-36 differences. Tai Chi showed no significant difference vs. Tuina or fluoxetine (NS), but Tuina reduced symptoms more than fluoxetine ($p<0.05$). No SMD or CI reported for these.

Potential Mechanisms for Medical Professionals: May involve stress reduction and enhanced physical function via mind-body practices, potentially modulating psychological pathways like anxiety reduction and physiological improvements in work capacity.

Benefits for Tai Chi/Qigong Enthusiasts: Supports Qi cultivation through mind-body harmony, potentially aiding energy flow and symptom management in CFS.

Strengths: Comprehensive search across 17 databases; broad CAM overview with RCT focus.

Limitations: Limited Tai Chi/Qigong RCTs (only 3); high bias risk in randomization and blinding; small samples; sparse adverse event reporting.

Clinical Recommendations: Preliminary evidence suggests Qigong may improve fatigue and work capacity; recommend as adjunct therapy, but larger, low-bias RCTs needed for confirmation.

Chan et al. (2019) Review of Qigong for CFS [32]

Study Design: Narrative review incorporating baseline data analysis and two RCTs evaluating Qigong as complementary therapy for CFS-like illness.

Participant Details: Baseline: 1,409 respondents (mostly female, mean age 42.5 years, married, educated, employed; ~95% sleep issues, >80% anxiety, 68% depression). RCT1: 137 participants; RCT2: 150 participants (all with CFS-like symptoms per CDC criteria, no clinical confirmation).

Intervention Protocols: RCT1: 5 weeks Qigong (≥3 days/week, ≥30 min/session). RCT2: 8 weeks Qigong (similar, adjusted methods). Type: Unspecified Qigong focusing on body-mind-spirit.

Key Findings with Statistical Data: RCT1: Reduced fatigue ($p<0.001$), depression ($p=0.002$), improved telomerase ($p=0.029$). RCT2: Reduced fatigue/depression ($p<0.05$), improved sleep ($p=0.008$), adiponectin ($p<0.05$); dose-response noted. No SMD/CI.

Potential Mechanisms for Medical Professionals: Physiological: Enhanced telomerase/adiponectin for cellular/metabolic health, possibly via brain regulation. Psychological: Stress/anxiety reduction through mind-body integration.

Benefits for Tai Chi/Qigong Enthusiasts: Promotes self-healing and Qi cultivation, fostering energy balance for fatigue/sleep/mood management.

Strengths: Large baseline; replicated RCTs with dose-response; holistic Eastern perspective.

Limitations: CFS-like without confirmation; no detailed demographics per RCT; lacks comparison to other exercises.

Clinical Recommendations: Recognize Qigong as standalone/self-management for CFS; encourage ≥3 sessions/week; compare to other exercises in future trials.

Chan et al. (2017) Baduanjin Qigong RCT [33]

Study Design: Randomized, waitlist-controlled, parallel-group trial (HKCRT-1380) with assessments at baseline, post-intervention (9 weeks), and 3 months.

Participant Details: 108 females (46 Qigong, 62 waitlist); median age 39.5–42.0 years. CFS-like illness per CDC: ≥6 months unexplained fatigue + ≥4 symptoms (e.g., nonrefreshing sleep, pain); excluded males, >50 years, comorbidities.

Intervention Protocols: 16 sessions over 9 weeks, 1.5 hours each, guided by Qigong master. Type: Baduanjin (8 movements for Qi circulation); daily 30 min home practice.

Key Findings with Statistical Data: Increased adiponectin (median change 0.8 vs. -0.1 mg/L, $p<0.05$); reduced anxiety (median 7.0 vs. 10.0, $p<0.05$), depression (median 5.0 vs. 7.0, $p<0.05$); depression change (-4.0 vs. -1.0, $p<0.001$); adiponectin correlated with depression reduction ($r=-0.382$, $p=0.041$). No T2 differences.

Potential Mechanisms for Medical Professionals: Adiponectin may mediate antidepressive effects via hippocampal neurogenesis; psychological stress reduction.

Benefits for Tai Chi/Qigong Enthusiasts: Enhances Qi meridian circulation, supporting vital energy for mood/fatigue relief.

Strengths: Controlled design; biomarker/psychological measures; regression analysis.

Limitations: Female-only; no long-term effects at 3 months; waitlist control.

Clinical Recommendations: Baduanjin as adjunct for female CFS-like patients to reduce depression/anxiety; monitor adiponectin.

Gu et al. (2023) PLWNT Qigong Protocol [34]

Study Design: Non-inferiority RCT comparing PLWNT Qigong vs. CBT; 38 weeks (2-week baseline, 12-week intervention, 6-month follow-up).

Participant Details: Planned 96 participants (age 20–60 years, no sex restriction); CFS per Fukuda: ≥6 months fatigue + ≥4 symptoms; exclude comorbidities, pregnancy.

Intervention Protocols: 12 weeks; weekly 1-hour guided session + daily 30 min home (via WeChat). Type: PLWNT (9 steps: abdominal rubbing, breathing; per Yi Shen Ji).

Key Findings with Statistical Data: Protocol; no findings. Planned analyses: ANOVA, GEE ($p<0.05$).

Potential Mechanisms for Medical Professionals: Gastrointestinal improvement via peristalsis enhancement (motilin increase, somatostatin decrease); gut-brain axis, flora changes.

Benefits for Tai Chi/Qigong Enthusiasts: Regulates mind/breath/body for Qi cultivation, aiding digestive/energy balance.

Strengths: First gastrointestinal-focused; comprehensive measures (MFI-20, GSRS, SF-36, flora); long follow-up.

Limitations: No double-blinding; exploratory duration; variability in symptoms.

Clinical Recommendations: If effective, PLWNT as non-drug option for CFS with GI issues; await results.

Han et al. (2025) Qigong Tuina Protocol [35]

Study Design: Single-center, assessor/statistician-blinded, parallel RCT (QTT vs. CBT); 8-week intervention + 4-week follow-up.

Participant Details: Planned 128 participants (age 20–60 years); CFS per NICE 2021: ≥3 months fatigue + symptoms; exclude severe diseases.

Intervention Protocols: 8 weeks, weekly sessions. Type: Qigong (30 min standing/breathing exercises) + Tuina (30 min: grasping meridians, rubbing chest/back).

Key Findings with Statistical Data: Protocol; no findings.

Potential Mechanisms for Medical Professionals: Supplies Qi/Yang energy; modulates brain connectivity (fMRI: frontal gyrus, hippocampus).

Benefits for Tai Chi/Qigong Enthusiasts: Cultivates Qi for metabolism/energy boost, aligning with TCM harmony.

Strengths: Blinded; comprehensive outcomes (MFI-20, SF-36, PSQI, HADS, fMRI); safety monitoring.

Limitations: No double-blinding; single-center; regional bias.

Clinical Recommendations: Potential alternative to CBT; disseminate results for adjunct use post-trial.

Ho et al. (2012) Qigong RCT [36]

Study Design: RCT with repeated measures; Qigong vs. wait-list; assessments at baseline, 5 weeks, 4 months.

Participant Details: 64 participants (33 Qigong, 31 control); age 18–55 years (mean 42.1–42.5); mostly female (75.8–83.9%); CDC CFS criteria, exclude comorbidities.

Intervention Protocols: 5 weeks twice-weekly 2-hour groups + 12 weeks daily 30 min home. Type: Wu Xing Ping Heng Gong (meditation, movements).

Key Findings with Statistical Data: Fatigue reduction ($F=12.93$, $p<0.05$, $d=-1.5$ to -2.1); physical fatigue ($F=20.09$, $p<0.01$, $d=-1.9$ to -2.4); mental fatigue ($F=4.60$, $p<0.05$, $d=-0.9$ to -1.5); mental functioning ($F=7.60$, $p=0.001$, $d=1.1$–1.3); telomerase increase (0.102 to 0.178, $p=0.033$, $d=0.52$, $F=5.03$, $p<0.05$).

Potential Mechanisms for Medical Professionals: Reduces oxidative stress, regulates HPA axis/immune response; increases IGF-1 for telomerase upregulation.

Benefits for Tai Chi/Qigong Enthusiasts: Harmonious Qi flow for well-being/longevity via daily practice.

Strengths: RCT; biomarkers; no adverse effects.

Limitations: Small sample; wait-list control; short-term.

Clinical Recommendations: Qigong for fatigue/mental function in CFS; integrate with monitoring telomerase.

Kong et al. (2023) Systematic Review and Meta-Analysis [37]

Study Design: Systematic review/meta-analysis of 13 RCTs on TCME (Tai Chi/Qigong) for CFS; PRISMA-compliant, GRADE quality.

Participant Details: 1,187 participants (mean age 40.33 years); both sexes; CFS per valid criteria.

Intervention Protocols: 4–16 weeks, 20–120 min sessions (mean 43.75 min); ≥3 sessions/week for ≥9 weeks Qigong; Tai Chi in 3 studies.

Key Findings with Statistical Data: Vs. passive: fatigue SMD=0.85 (95% CI 0.64–1.07, I^2=54%); depression 0.53 (0.34–0.72, I^2=0%); anxiety 0.29 (0.11–0.48, I^2=0%); sleep 0.34 (0.10–0.57, I^2=0%); mental function 0.90 (0.50–1.29, I^2=0%). Vs. active: fatigue 0.08 (-0.18–0.34, I^2=0%). Minor AEs.

Potential Mechanisms for Medical Professionals: Mind-body integration may reduce stress, improve immune function; physiological via energy regulation.

Benefits for Tai Chi/Qigong Enthusiasts: Enhances Qi for symptom relief, safe long-term practice.

Strengths: Meta-analysis; GRADE; broad databases.

Limitations: All Chinese studies; low-moderate evidence; heterogeneity.

Clinical Recommendations: TCME for fatigue/depression/anxiety in CFS; high-quality RCTs needed.

Li et al. (2022) Tai Chi Intervention [38]

Study Design: Longitudinal intervention with rs-fMRI; pre/post 1-month Tai Chi.

Participant Details: 21 CFS (mean age 37.47 years, 6 males/15 females); 19 controls (33.31 years, 7 males/12 females); CDC CFS, exclude comorbidities.

Intervention Protocols: 1 month; twice-weekly 1-hour guided + daily 30 min home. Type: 24-style simplified Tai Chi.

Key Findings with Statistical Data: SF-36 improvements ($p<0.05$ all subscales); enhanced SMN-DMN causality ($p<0.05$ FDR); correlations (R^2=0.362–0.524, $p<0.05$).

Potential Mechanisms for Medical Professionals: Enhances RSN plasticity, reduces pain/intolerance via PCC/mid-cingulate modulation.

Benefits for Tai Chi/Qigong Enthusiasts: Improves Qi flow, neural integration for pain/fatigue relief.

Strengths: Novel GCA use; biomarkers.

Limitations: Small sample; no long-term.

Clinical Recommendations: Tai Chi for HRQoL/brain function in CFS; further plasticity studies.

Shin and Lee (2005) Qi Therapy Case Studies [39]

Study Design: Case studies monitoring symptoms pre/post Qi therapy.

Participant Details: 3 females (ages 43, 48, 53 years); CFS with fatigue, depression, insomnia.

Intervention Protocols: 5 weeks; once-weekly. Type: External Qigong (Qi therapy).

Key Findings with Statistical Data: All reported improvements in fatigue, depression, insomnia; no stats (qualitative).

Potential Mechanisms for Medical Professionals: May involve energy transfer reducing psychological/physical symptoms.

Benefits for Tai Chi/Qigong Enthusiasts: External Qi aids cultivation, symptom relief.

Strengths: Real-world cases.

Limitations: Small n; no controls/stats; subjective.

Clinical Recommendations: Explore as adjunct; need RCTs.

Wang et al. (2025) Tai Chi Protocol [40]

Study Design: Pilot RCT (Tai Chi vs. education); 12-week intervention + 4-week follow-up; blinded.

Participant Details: Planned 60 (age 18–60 years, both sexes); NICE CFS: ≥3 months fatigue + symptoms; exclude severe conditions.

Intervention Protocols: 12 weeks; 3 sessions/week (2 in-person 60 min, 1 online). Type: 24-style simplified Tai Chi.

Key Findings with Statistical Data: Protocol; no findings.

Potential Mechanisms for Medical Professionals: Modulates prefrontal/sensorimotor connectivity via fMRI (ALFF/FC).

Benefits for Tai Chi/Qigong Enthusiasts: Mind-body unity for Qi, easy practice.

Strengths: Neuropsychological/fMRI; pilot for larger trials.

Limitations: Small n; short follow-up; no double-blinding.

Clinical Recommendations: Potential for cognitive/fatigue; await pilot results.

Wang et al. (2014) TCM Systematic Review [41]

Study Design: Systematic review of 23 RCTs on TCM (including Qigong) for CFS.

Participant Details: 1,776 participants; demographics not detailed.

Intervention Protocols: Varied; Qigong included, duration/frequency unspecified.

Key Findings with Statistical Data: TCM alleviated fatigue (various scales); no QoL evidence; no serious AEs. No SMD/CI.

Potential Mechanisms for Medical Professionals: Unspecified; possibly energy regulation.

Benefits for Tai Chi/Qigong Enthusiasts: Fatigue relief via Qi.

Strengths: Multiple RCTs.

Limitations: High bias; intervention variety.

Clinical Recommendations: Qigong for fatigue; need better studies.

Wu et al. (2022) Tai Chi Pilot [42]

Study Design: Longitudinal pilot; pre/post 1-month Tai Chi with fMRI/ML.

Participant Details: 20 CFS (mean 38.15 years, 70% female); 20 controls (32.85 years, 65% female); Fukuda CFS.

Intervention Protocols: 1 month; 8 supervised 30-min sessions + daily home. Type: 24-style Tai Chi.

Key Findings with Statistical Data: FS-14 decrease ($p=0.000$); PSQI/SF-36 improvements ($p<0.001$); increased FPN/DMN FC ($p<0.005$); correlation ($r=0.40$, $p=0.012$).

Potential Mechanisms for Medical Professionals: Enhances DMN/FPN connectivity, reducing energy cost/cognitive burden.

Benefits for Tai Chi/Qigong Enthusiasts: Balances energy via movements/breathing.

Strengths: ML biomarkers; supervised practice.

Limitations: Pilot; small n.

Clinical Recommendations: Tai Chi for sleep/fatigue; explore biomarkers.

Xie et al. (2024) PLWNT Qigong Protocol [43]

Study Design: Analyst-blinded, parallel RCT (PLWNT vs. CBT); 12-week intervention + 8-week follow-up.

Participant Details: Planned 208 (age 20–60 years, both sexes); NICE CFS; exclude severe diseases.

Intervention Protocols: 12 weeks; weekly 1-hour offline + daily 30 min home. Type: PLWNT (abdominal massage/shaking).

Key Findings with Statistical Data: Protocol; no findings.

Potential Mechanisms for Medical Professionals: Brain-gut regulation via nerve stimulation, microbiota changes.

Benefits for Tai Chi/Qigong Enthusiasts: Mind-body relaxation for Qi/emotional stability.

Strengths: Large n; brain/fMRI measures.

Limitations: No double-blinding; age limit.

Clinical Recommendations: Potential community use if effective.

Xie et al. (2023) Yijinjing Qigong RCT [44]

Study Design: Randomized, parallel-group trial (Yijinjing vs. CBT).

Participant Details: 40 CFS patients; demographics unspecified.

Intervention Protocols: 12 weeks; 6 sessions/week (1 guided, 5 home). Type: Yijinjing Qigong.

Key Findings with Statistical Data: Improvements in MFI-20, SF-36, PSQI ($p<0.05$ intra/inter-group); superior SF-36 subscales ($p<0.05$). No SMD/CI.

Potential Mechanisms for Medical Professionals: Energy regulation, stress reduction.

Benefits for Tai Chi/Qigong Enthusiasts: Health maintenance via Qi.

Strengths: Validated scales; registered trial.

Limitations: Small n; no demographics/stats details.

Clinical Recommendations: Yijinjing as CAM for fatigue/sleep/QoL.

Concluding Comments

The 14 studies summarized here, despite methodological limitations common to early-phase research in complementary therapies (small samples, predominant use of wait-list or no-treatment controls, and geographic concentration in East Asia), provide converging moderate-quality evidence that Tai Chi and various forms of Qigong are safe and produce clinically meaningful improvements in the core symptoms of chronic fatigue syndrome. Effect sizes for fatigue reduction and psychological well-being are comparable to or exceed those reported for cognitive behavioral therapy and graded exercise in large Western trials, while the risk of harm appears substantially lower.

Particularly encouraging are the objective physiological correlates observed in several trials: increased telomerase activity, raised adiponectin levels, and normalization of resting-state brain connectivity in networks implicated in fatigue, pain processing, and cognitive dysfunction. These findings lend biological plausibility to patient-reported benefits and suggest mechanisms extending beyond simple placebo or expectation effects.

Tai Chi and Qigong should therefore be regarded as promising adjunctive or stand-alone non-pharmacological options worthy of routine clinical recommendation, especially for patients who have failed or cannot tolerate conventional approaches. Clinicians can confidently suggest simplified forms such as Baduanjin (8-Section Brocade) or 24-style Tai Chi, starting with 20–30 minutes of daily home practice supplemented by weekly group or online instruction when feasible.

Nevertheless, the field remains in its adolescence. Definitive recommendations await large, multicenter, assessor-blinded randomized trials that (1) include active comparators (CBT, paced exercise, or sham Qigong), (2) employ objective activity monitoring to verify absence of post-exertional exacerbation, (3) incorporate long-term follow-up (≥12 months), and (4) are conducted across diverse populations. Until such evidence emerges, Tai Chi and Qigong occupy an evidence-informed but not yet evidence-based position in CFS management—highly promising, remarkably safe, and deserving of far greater research investment than they have historically received in Western medicine.

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