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Review Article

The Impact of Tai Chi and Qigong on Non-motor Symptoms of Parkinson's Disease: A Scoping Review of Randomized Controlled Trials

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Abstract

Background and objectives: Non-motor symptoms of Parkinson's disease, including sleep disturbance, cognitive impairment, depression, and anxiety, are common and often undertreated, yet their responsiveness to mind-body exercises remains unclear. This scoping review evaluated the currently available evidence on the effects of Tai Chi and Qigong interventions on non-motor symptoms in patients with Parkinson's disease.

Methods: We searched six databases (PubMed, Google Scholar, EMBASE, CINAHL, Web of Science, and PEDro) through February 28, 2026, for randomized controlled trials (RCTs). We included English-language RCTs that evaluated the effects of Qigong and Tai Chi interventions on non-motor outcomes in Parkinson's disease and excluded non-RCTs, review articles, and protocol articles. We were predominantly interested in the following non-motor outcome measures: cognition, depression, anxiety, fatigue, and sleep quality.

Results: This review identified 18 RCTs that met the inclusion criteria, including nine Tai Chi studies and nine Qigong studies. Most of the reviewed studies were of high quality according to the PEDro scale, but the small sample sizes limited our analysis to identifying trends in outcomes. A strong trend toward a beneficial effect was found for sleep quality and cognition, a moderate trend toward improvement was found in depression, anxiety and quality of life, and weak or unclear effects were found for other non-motor symptoms such as fatigue. Several studies also had high dropout rates.

Conclusions: Although these studies suggest that Tai Chi and Qigong may improve sleep quality and cognition, the evidence supporting their benefits in alleviating other non-motor symptoms is generally weak, primarily because of small sample sizes. The heterogeneity in methodologies across the reviewed studies and high dropout rates in some studies are significant limitations of previous RCTs.

Introduction

Parkinson's disease (PD) is a neurodegenerative disorder that affects approximately 10 million people worldwide, and its prevalence and incidence are expected to increase substantially over the next few decades.[1,2] Current clinical diagnosis of PD relies on identifying key motor symptoms, such as tremor, rigidity, bradykinesia, and postural instability.[3,4] However, most patients with PD present with a variety of non-motor symptoms, including sleep disorders, olfactory dysfunction, autonomic dysfunction, fatigue, anxiety, depression, and cognitive decline.[5,6] Moreover, non-motor symptoms in patients with PD may precede motor symptoms by many years.[7,8] Non-motor symptoms, such as cognitive decline, become more prevalent and pronounced as PD progresses and are major determinants of quality of life.[9,10] Because non-motor symptoms of PD can be difficult to diagnose specifically, they are often perceived as a lower treatment priority.[11–13] Levodopa, the conventional gold-standard treatment for PD, is usually ineffective for non-motor symptoms and often causes adverse effects.[14,15] More

Keywords: Parkinson's disease; Tai Chi; Qigong; Non-motor symptoms; Sleep quality; Cognition; Depression; Anxiety.

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Table 1. Search criteria for PubMed (adapted for other databases)

PubMed
(((((("parkinson disease"[MeSH Terms] OR ("parkinson disease"[MeSH Terms] OR ("parkinson"[All Fields] AND "disease"[All Fields]) OR "parkinson disease"[All Fields] OR ("parkinson s"[All Fields] AND "disease"[All Fields]) OR "parkinson s disease"[All Fields])) AND ("non-motor"[All Fields] AND ("diagnosis"[MeSH Subheading] OR "diagnosis"[All Fields] OR "symptoms"[All Fields] OR "diagnosis"[MeSH Terms] OR "symptom"[All Fields] OR "symptom s"[All Fields] OR "symptoms"[All Fields]))) OR "cognition"[MeSH Terms] OR ("cognition"[MeSH Terms] OR "cognition"[All Fields] OR "cognitions"[All Fields] OR "cognitive"[All Fields] OR "cognitively"[All Fields] OR "cognitive"[All Fields]) OR "depressive disorder"[MeSH Terms] OR ("depressed"[All Fields] OR "depression"[MeSH Terms] OR "depression"[All Fields] OR "depressions"[All Fields] OR "depression s"[All Fields] OR "depressive disorder"[MeSH Terms] OR ("depressive"[All Fields] AND "disorder"[All Fields]) OR "depressive disorder"[All Fields] OR "depressively"[All Fields] OR "depressive"[All Fields] OR "depressively"[All Fields] OR "depressiveness"[All Fields] OR "depressives"[All Fields]) OR ("depressive disorder"[MeSH Terms] OR "depression"[MeSH Terms]) OR "anxiety"[MeSH Terms] OR ("anxiety"[MeSH Terms] OR "anxiety"[All Fields] OR "anxieties"[All Fields] OR "anxiety s"[All Fields]) OR "mood disorders"[MeSH Terms] OR ("mood disorders"[MeSH Terms] OR ("mood"[All Fields] AND "disorders"[All Fields]) OR "mood disorders"[All Fields] OR ("mood"[All Fields] AND "disorder"[All Fields]) OR "mood disorder"[All Fields]) OR "rem sleep behavior disorder"[MeSH Terms] OR ("rem sleep behavior disorder"[All Fields] OR "rem sleep behavior disorder"[MeSH Terms] OR ("rem"[All Fields] AND "sleep"[All Fields] AND "behavior"[All Fields] AND "disorder"[All Fields]) OR "rem sleep behavior disorder"[All Fields]) OR "RBD"[All Fields]) AND "tai ji"[MeSH Terms]) OR ("tai ji"[MeSH Terms] OR ("tai"[All Fields] AND "ji"[All Fields]) OR "tai ji"[All Fields] OR ("tai"[All Fields] AND "chi"[All Fields]) OR "tai chi"[All Fields]) OR ("tai ji"[MeSH Terms] OR ("tai"[All Fields] AND "ji"[All Fields]) OR "tai ji"[All Fields] OR "taijiquan"[All Fields]) OR "qigong"[MeSH Terms] OR ("qigong"[MeSH Terms] OR "qigong"[All Fields]) OR ("qigong"[MeSH Terms] OR "qigong"[All Fields] OR ("qi"[All Fields] AND "gong"[All Fields]) OR "qi gong"[All Fields])) AND (randomizedcontrolledtrial[Filter])

MeSH, Medical Subject Headings; RBD, rapid eye movement sleep behavior disorder; REM, rapid eye movement.

effective treatments for non-motor symptoms in PD are needed.

Tai Chi and Qigong are similar mind-body approaches that incorporate meditation, deep breathing, and rhythmic body movement and may alleviate non-motor symptoms of PD beyond the benefits derived from conventional exercise.[16,17] Previous studies of Tai Chi and Qigong interventions have reported improvements in pain and sleep disturbance,[18–23] depression and anxiety,[24,25] cognitive flexibility,[26] and quality of life.[27,28] Previous reviews of the effects of Tai Chi and Qigong on PD have focused on motor symptoms.[17,29,30] Only one systematic review examined non-motor outcomes in PD.[16] However, it included outcomes from many different mind-body interventions, including dance, Tai Chi, yoga, and Qigong, which reduced the review's specificity. In recent years, more studies have emerged to allow reviews to focus specifically on Tai Chi and Qigong interventions. Thus, this scoping review aims to clarify the potential beneficial effects of Tai Chi and Qigong on non-motor symptoms of PD.

Materials and methods

In this scoping review, we conducted electronic literature searches for English-language articles in the following databases: PubMed, Google Scholar, EMBASE, CINAHL, Web of Science, and Physiotherapy Evidence Database (PEDro) in March 2026 and included studies published through February 28, 2026. Medical Subject Heading (MeSH) terms and free-text terms related to the keywords: Parkinson's disease, Tai Chi, Qigong, non-motor symptoms were used for the searches in PubMed, and similar search criteria were adapted for the other databases (Table 1). This scoping review was reported according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) extension for Scoping Reviews (PRISMA-ScR) (Fig. 1 and Supplementary Table 1).[31]

We included randomized controlled trials (RCTs) that used Tai Chi and/or Qigong exercise as interventions in patients with PD and that measured non-motor symptom outcomes including but not limited to cognition, depression, anxiety, fatigue, and sleep. We excluded non-English articles because we could not access them, review articles, protocol articles, and non-randomized controlled trials.

Two researchers (ZL and DY) independently assessed study eligibility, extracted and analyzed data for all the citations retrieved using the search criteria listed in Table 1 and the inclusion/exclusion criteria described above. After an initial screening by assessing abstracts, the remaining articles were independently screened by full-text review. Articles that met the inclusion criteria were then summarized. A third author (WL) was available to resolve disagreements.

The studies selected for review were assessed for quality and strength of evidence. The PEDro scale is a validated tool to assess the methodological quality and validity of RCTs and was used to evaluate the quality of the reviewed RCTs using metrics such as blinding, randomization, statistical analysis of outcomes, and other metrics.[32] Sackett's level of evidence was assessed for the reviewed articles.[33] The ranking system used in Sackett's level of evidence allows for a better understanding of the relative strength of articles based on their results and how those results compare to other similar studies.[34] We also defined any trends in outcome measures as "strong", "moderate" or "weak/unclear" via the percentage of publications that demonstrated a significant improvement in the outcome measure. A strong trend in outcome is defined as ≥75% of the studies reporting a significant improvement in either the Tai Chi or Qigong intervention group compared to a control group. A moderate trend in outcome is defined as greater than 25% but less than 75% of the studies reporting a significant improvement in either the Tai Chi or Qigong intervention group compared to the control group. A weak or unclear trend in outcome is defined as either ≤25% of the studies reporting a significant improvement or that there were too few studies (≤3 studies) that measured that outcome.

Results

A systematic search across six databases, including PubMed (897

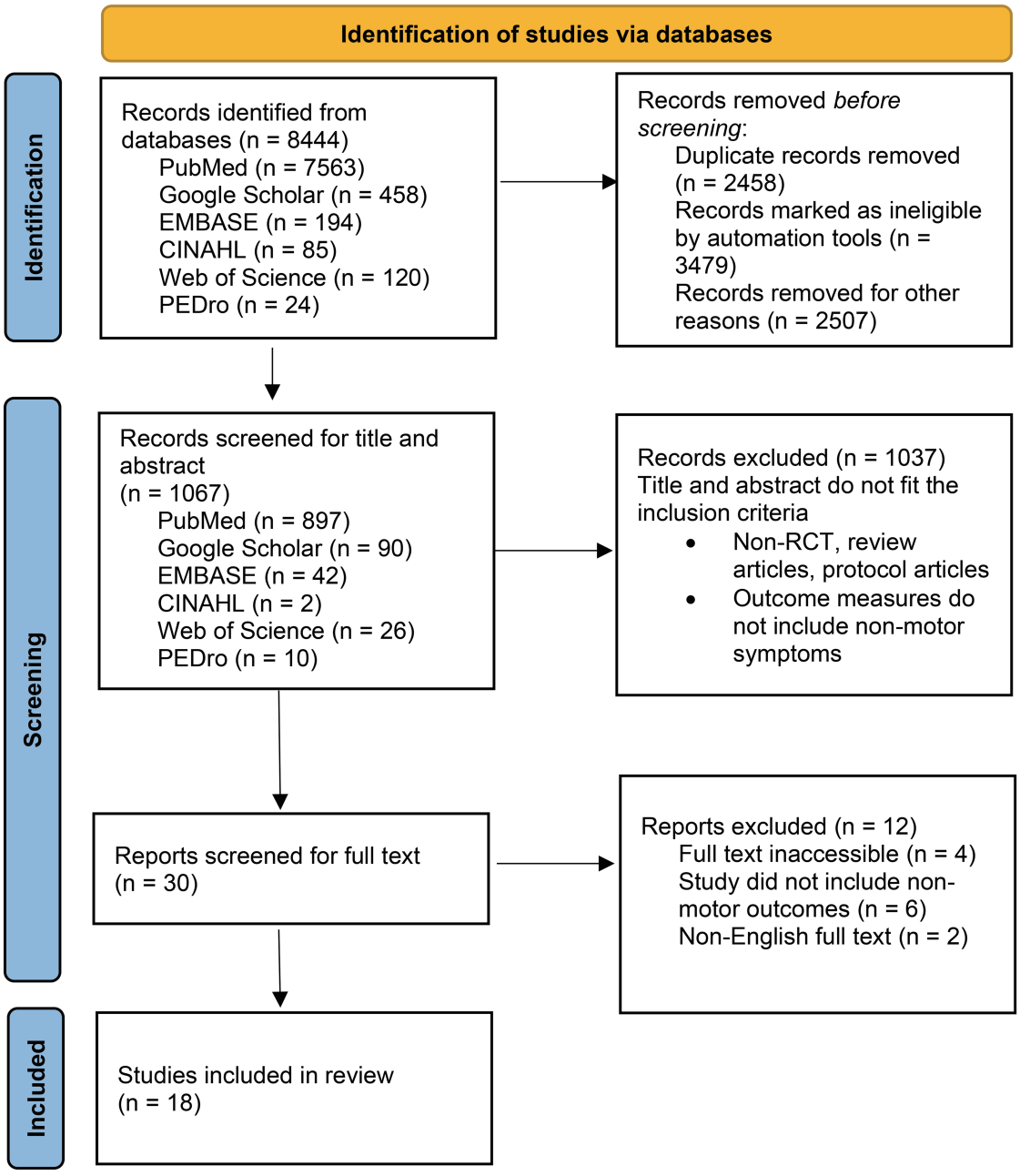

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of literature search for Tai Chi and Qigong's impact on non-motor symptoms of Parkinson's disease. CINAHL, Cumulative Index to Nursing and Allied Health Literature; EMBASE, Excerpta Medica Database; PEDro, Physiotherapy Evidence Database; RCT, randomized controlled trial.

articles), Google Scholar (90), EMBASE (42), CINAHL (2), Web of Science (26), and PEDro (10), identified 1,067 records. After removing duplicates and excluding articles based on title and abstract screening and full-text review, 18 articles ultimately met the inclusion criteria and were included in this review (Fig. 1).

The included studies (Table 2) used diverse styles of Tai Chi and Qigong interventions.[35–50] Yang-style short-form or 24-form Tai Chi was used most frequently.[35–39,51] Sun-style Tai Chi was used in one study.[40] Yi Tai Chi was used in another study.[41] Baduanjin Qigong was used in two studies.[42,52] Wuqinxi Qigong was used in two studies.[43,44] The "Six Healing Sounds" Qigong was used in three studies.[45–47] A combined Qigong program, integrating multiple practices (Baduanjin, Wuqinxi, and Yijinjing) was used in one study.[48] Some studies did not specify the Tai Chi or Qigong styles used.[49,50] Control groups in the studies utilized a variety of methods including sham Qigong, brisk walking, stretching, or routine activity, highlighting variability in intervention design and comparators across studies.

The included studies also varied in intervention duration, session length, and frequency. Short-term intervention studies (6–8

Table 2. Details about the studies that met the inclusion criteria

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Burini *et al*., 2006[49]	Crossover RCT	Total: 26; Sequence AB: 13; Sequence BA: 13	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage II to III; Drug status: stable medication treatment	Sequence AB: Aerobic training group (50 min, 3 times, 7 weeks) + Qigong group (50 min, 3 times, 7 weeks); Sequence BA: Qigong group (50 min, 3 times, 7 weeks) + Aerobic training group (50 min, 3 times, 7 weeks)	Qigong (type not specified)	Baseline; After first intervention; Before second intervention; After second intervention	Primary outcomes: UPDRS-II, B'DS, UPDRS-III, modified Borg scale; Secondary outcomes: BDI, PDQ-39	Depression: BDI; QoL: PDQ-39	Depression: NS interaction effect between group and time in BDI; QoL: NS interaction effect between group and time in PDQ-39	Dropout: 2 from Sequence AB and 2 from Sequence BA; Adherence: High; Adverse events: NR
Schmitz-Hübsch *et al*., 2006[52]	RCT	Total: 56; EXP: 32; CON: 24	Diagnosis standard: All diagnosed with PD; Disease severity: any stage; Drug status: no changes in medication	EXP: Qigong exercises (weekly 60-minute sessions for two 8-week periods with an 8-week pause between the periods); CON: No treatment	Baduanjin Qigong	Baseline; 3 months after baseline; 6 months after baseline; 12 months after baseline	Primary outcome: UPDRS-III; Secondary outcomes: MADRS, PDQ-39, autonomic dysfunction structured interviews	Depression: MADRS; QoL: PDQ-39; Autonomic symptoms: Structured interviews	Depression: Within-group: NS; Between-group: NS; QoL: Within-group: NS; Between-group: NS; Autonomic symptoms: Lasting improvements in constipation and pain only in the Qigong group; Urinary dysfunction, sexual dysfunction, or nausea and the prevalence of drug-induced hallucinations or motor fluctuations with dyskinesias remain unchanged in both groups	Dropout: 2 from EXP and 5 from CON; Adherence: NR; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Cheon *et al*., 2013[40]	RCT	Total: 36 (total enrolled); Participants included in data analysis: 23; Tai Chi group: 9; Combined exercise[2] group: 7; CON: 7	Diagnosis standard: All diagnosed with PD; Disease severity: mild to moderate PD; Drug status: not reported	Tai Chi group: Tai Chi exercise (60 min, 3 times, 8 weeks); Combined exercise group: (60 min, 3 times, 8 weeks); CON: No treatment	Sun style Tai Chi	Baseline; Post-intervention	Primary outcomes: UPDRS, Schwab and England scale (daily activity), chair-stand test, arm-curl test, back-scratch test, chair sit-and-reach test, 8-foot up-and-go test, 6-minute walk test; Secondary outcomes: BDI, PDQL	Depression: BDI; QoL: De Bore's PD QoL Scale (PDQL)	Depression: Within-group: BDI scores increased significantly in the control group ($P \leq 0.05$) but NS in the Tai Chi and combined exercises groups; Between-group: NS; QoL: Within-group: No significant changes in either exercise group, but significantly decreased in control group ($P \leq 0.05$)	Dropout: 9 total from study, did not specify from which groups; 4 participants' results not analyzed; Adherence: High; Adverse events: NR
Nocera *et al*., 2013[36]	RCT	Total: 23; EXP: 17; CON: 6	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to III; Drug status: stable medication usage	EXP: Tai Chi exercise (60 min, 3 times, 16 weeks); CON: No treatment	Yang-style short form Tai Chi	Baseline; Post-intervention	Primary outcomes: Digit Span Backward Subtest from Wechsler Memory Scale, Letter Verbal Frequency, Category Verbal Frequency, Stroop Color Word Test, TMT; Secondary outcomes: PDQ-39, Tinetti's Falls Efficacy Scale	Cognitive function: Digits Span Backward Subtest from Wechsler Memory Scale, Letter Verbal Fluency, Category Verbal Fluency,Stroop Color Word Test, TMT; QoL: PDQ-39, Tinetti's Falls Efficacy Scale	Cognitive function: Within-group: NS; Between-group: NS; QoL: Within-group: PDQ-39 worsened in the control group ($P \leq 0.05$); Between-group: PDQ-39 significantly improved in the Tai Chi group compared to the control group ($P \leq 0.05$)	Dropout: 2 from EXP; Adherence: High; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Kurlan *et al*., 2015[50]	RCT	Total: 44; EXP: 29; CON: 15	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: not reported; Drug status: not reported	EXP: Tai Chi exercise (60 min, 1 times, 16 weeks); CON: No treatment	Tai Chi (type not specified)	Baseline; Post-intervention	Primary outcomes: UPDRS-I, UPDRS-II, Schwab and England scale (daily activity); Secondary outcomes: GDS, PDQ-39, self-report fall diary	Depression: GDS; QoL: PDQ-39	Depression: Within-group: NS; Between-group: NS; QoL: Within-group: NS; Between-group: NS	Dropout: 2 from EXP and 5 from CON; Adherence: NR; Adverse events: NR
Xiao *et al*., 2016[42]	RCT	Total: 96; EXP: 48; CON: 48	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to III; Drug status: stable dose of antiparkinsonism medication for at least 2 weeks before beginning study	EXP: Qigong exercise (45 min, 4 times, 24 weeks) + 30 min walking per day; CON: daily walking for 30 min for 6 months	Baduanjin Qigong	Baseline; Post-intervention	Primary outcomes: UPDRS, PDSS-2, PFS; Secondary outcomes: BBS, TUG, 6-minute walk test,	Sleep quality: PDSS-2; Fatigue: PFS	Sleep quality: Within-group: PDSS-2 significantly decreased in Qigong group ($P \leq 0.05$), but NS in control group; Between-group: PDSS-2 significantly improved in Qigong group compared to control group; Fatigue: Within-group: NS; Between-group: NS	Dropout: 3 from EXP and 4 from CON; Adherence: High; Adverse events: NR
Moon *et al*., 2017[46]	RCT	Total: 10; EXP: 5; CON: 5	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to III; Drug status: no anticipated changes to PD medication, no deep brain stimulation surgery	EXP: Qigong (15–20 min twice daily home sessions for 6 weeks, plus a 60-minute group session weekly); CON: Sham Qigong (15–20 min twice daily home sessions for 6 weeks, plus a 60-minute group session weekly)	"Six healing sounds" Qigong	Baseline; Post-intervention	Primary outcomes: serum TNF-α, IL-1β, IL-6, PDSS-2	Sleep quality: PDSS-2	Sleep quality: Between-group: PDSS-2 significantly decreased in the Qigong group compared to the sham Qigong group ($P \leq 0.001$)	Dropout: 1 dropout from each group; Adherence: High; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Yang *et al*., 2017[51]	RCT	Total: 39; EXP: 20; CON: 19	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to III; Drug status: stable medication usage	EXP: Group-Based Tai Chi Training (40–50 min, 3 times, 13 weeks) + daily home Tai Chi exercise (20–25 minutes per day); CON: Individual-Based Tai Chi Training (40–50 min, 3 times, 13 weeks) + daily home Tai Chi exercise (20–25 minutes per day)	Yang-style 24 form Tai Chi	Baseline; Post-intervention	Primary outcomes: NMSS, PDSS, HDRS, MoCA; Secondary outcomes: home exercise compliance rate	Global non-motor symptoms: NMSS; Sleep quality: PDSS; Cognitive function: MoCA; Depression: HDRS	Global non-motor Symptoms: Within-group: NMSS significantly improved in both groups ($P \leq 0.001$, $P \leq 0.01$); Between-group: NS; Sleep quality: Within-group: PDSS significantly improved in both groups ($P \leq 0.001$, $P \leq 0.001$); Between-group: NS; Cognitive function; Within-group: MoCA only significantly improved in the EXP group ($P=0.002$), but NS in the CON group; Between-group: NS; Depression (HDRS): Within-group: NS; Between-group: NS	Dropout: 1 from EXP and 2 from CON; Adherence: NR; Adverse events: NR
Vergara-Diaz *et al*., 2018[37]	RCT	Total: 32; EXP: 16; CON: 16	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to 2.5; Drug status: baseline and follow-up testing while 12 hours off PD-related medication	EXP: Tai Chi exercise (in class: 60 min, 2 times; out of class: 60 min, 1 time, 24 weeks); CON: No treatment	Yang-style short form Tai Chi	Baseline; 3 months after baseline; 6 months after baseline	Primary outcomes: recruitment rate, adherence, compliance with protocol, adverse events; Secondary outcomes: dual task stride time variability, UPDRS-III, PDQ-39, TMT, ABC, TUG	Cognitive function: TMT; QoL: PDQ-39	Cognitive function: Within-group: NS; Between-group: NS; QoL: Within-group: NS; Between-group: NS	Dropout: 4 from EXP and 1 from CON; Adherence: Moderate; Adverse events: Reported adverse events (e.g., back pain, falls, illness) were unrelated to the intervention

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Moon *et al.*, 2020[45]	RCT	Total: 32; EXP: 16; CON: 16	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to III; Drug status: no anticipated changes in PD medications, no deep brain stimulation surgery	EXP: Qigong (15–20 min twice daily home sessions for 6 weeks, plus a 60-minute group session weekly); CON: Sham Qigong (15–20 min twice daily home sessions for 6 weeks, plus a 60-minute group session weekly)	"Six healing sounds" Qigong	Baseline; Post-intervention	Primary outcomes: PDSS-2, actigraph measurements: sleep efficiency, total time in bed, total sleep time, wake after sleep onset, awakenings, average awakenings; Secondary outcomes: GDS, PFS, FAB, 10-point clock drawing test, TMT, NMSQ, PDQ-39, MMSE, UPDRS	Sleep quality: PDSS-2; Anxiety: GAI; Depression: GDS; Fatigue: PFS; Cognitive function: FAB, 10-point clock drawing test, TMT, MMSE; QoL: PDQ-39; Global non-motor symptoms: NMSQ	Sleep quality: Within-group: Both groups showed significant improvement in PDSS-2 (*P*≤0.05); Between-group: NS; Anxiety: Within-group: NS; Between-group: NS; Depression: Within-group: GDS showed significant improvement in Sham Qigong group (*P*≤0.05), but NS in the Qigong group; Between-group: NS; Fatigue: Within-group: NS; Between-group: NS; Cognitive function: Within-group: NS; Between-group: NS; QoL: Within-group: PDQ-39 showed significant improvement in the sham Qigong group (*P*≤0.05) but not in the Qigong group; Between-group: NS; Global non-motor symptoms: Within-group: NMSQ showed significant improvement in both groups (*P*≤0.05); Between-group: NS	Dropout: 8 from EXP and 7 from CON; Adherence: High; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Zhu *et al*., 2020[38]	RCT	Total: 41; EXP: 19; CON: 22	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to III; Drug status: stable and regular medication usage	EXP: Tai Chi exercise (40–50 min, 3 times, 12 weeks); CON: Routine exercise (40–50 min, 3 times, 12 weeks)	EXP: Yang-style short form Tai Chi; CON:	Baseline; Post-intervention	Primary outcomes: UPDRS-III, BBS; Secondary outcomes: PDQ-39, HAM-A, HDRS, PDSS, MoCA	Depression: HDRS; Anxiety: HAM-A; Sleep quality: PDSS; Cognitive function: MoCA; QoL: PDQ-39	Depression: Within-group: HDRS significantly improved in both groups ($P \leq 0.001$); Between-group: NS; Anxiety: Within-group: HAM-A only significantly improved in the control group ($P \leq 0.05$); Between-group: NS; Sleep quality: Within-group: PDSS significantly improved in both groups ($P \leq 0.01$); Between-group: PDSS improved significantly in the Tai Chi group compared to the control group; Cognitive function: Within-group: MoCA significantly improved in the Tai Chi group ($P \leq 0.001$); Between-group: MoCA improved significantly in the Tai Chi group compared to the control group ($P \leq 0.05$); QoL: Within-group: PDQ-39 significantly improved in both groups ($P \leq 0.01$); Between-group: NS	Dropout: 1 from EXP and 3 from CON; Adherence: NR; Adverse events: 2 from EXP group reported fatigue and dizziness, 1 from CON group reported muscle cramps
Shen *et al*., 2021[43]	RCT	Total: 32; EXP: 16; CON: 16	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to III; Drug status: stable drug treatment	EXP: Wuqinxi exercises (90 min, 2 times, 12 weeks); CON: Stretching exercises (90 min, 2 times, 12 weeks)	Wuqinxi Qigong	Baseline; Post-intervention	Primary outcomes: ST-I, ST-II, FAB, MoCA; Secondary outcomes: UPDRS, TUG	Cognitive function: ST-I, ST-II, FAB, MoCA	Cognitive function: Within-group: FAB, and MoCA showed significant improvement in both groups ($P \leq 0.05$); ST-I scores decreased post-intervention in both groups ($P \leq 0.05$); Between-group: The stretching group showed greater improvement than the Qigong group in ST-I score ($P \leq 0.05$)	Dropout: 1 dropout from each group; Adherence: NR; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Li *et al*., 2022[48]	RCT	Total: 42; EXP: 21; CON: 21	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to III; Drug status: no changes in medications during the study, confirmed by physicians	EXP: Qigong exercise (60 min, 5 times, 12 weeks); CON: No treatment	Combined Qigong exercise[3]	Baseline; 6 weeks after baseline; 12 weeks after baseline	Primary outcomes: HDRS, STAI	Depression: HDRS; Anxiety: STAI	Depression: Within-group: HDRS showed a significant reduction in score in Qigong group at Week 12 ($P \leq 0.001$); Between-group: The Qigong group showed significantly greater reductions in HDRS score at both Week 6 ($P \leq 0.01$) and Week 12 ($P \leq 0.001$) compared to the control group; Anxiety: Within-group: STAI showed significantly reduced scores in Qigong group at Week 12 ($P \leq 0.05$); Between-group: NS	Dropout: 3 from EXP and 3 from CON; Adherence: NR; Adverse events: NR
Chang *et al*., 2024[35]	RCT	Total: 56; AE: 18; TE: 20; CON: 18	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to II; Drug status: not reported	AE: Aerobic exercise (30 min, 3 times, 12 weeks); TE: Tai Chi Chuan exercise (30 min, 3 times, 12 weeks); CON: No treatment	Yang-style Tai Chi	Baseline; Post-intervention	Primary outcomes: UPDRS-III, Working memory task (accuracy rates (ARs) and reaction times (RTs)), Event-related potential (ERP) components (N2 and P3 latencies and amplitudes); Secondary outcome: MoCA	Cognitive function: Working memory task (accuracy rates (ARs) and reaction times (RTs)), Event-related potential (ERP) components (N2 and P3 latencies and amplitudes); MoCA	Cognitive function: Within-group: In aerobic exercise group, there was a significant improvement in RTs ($P \leq 0.001$), and a significant increase in ERP P3 amplitude ($P \leq 0.05$); in Tai Chi group, there was a significant improvement in ERP P3 amplitude ($P \leq 0.05$); in control group, there was a significant decline in ERP P3 amplitude ($P \leq 0.05$). NS in MoCA scores in any of the groups; Between-group: NS	Dropout: 4 from AE, 4 from TE, 5 from CON; Adherence: High; Adverse events: NR

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Li *et al*., 2024[41]	RCT	Total: 95; TC: 32; BW: 31; CON: 32	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to 2.5; Drug status: stable medication at least 3 months before recruitment, not changed during follow-up unless necessary due to disease progression	TC: Tai Chi exercise (60 min, 2 times, 48 weeks); BW: Brisk Walking exercise (60 min, 2 times, 48 weeks); CON: No treatment	Yi Tai Chi	Baseline; 6 months after baseline; 12 months after baseline	Primary outcome: PDCRS changes between TC and CON groups; Secondary outcomes: PDCRS changes between TC and BW groups, PDCRS changes among all three groups, SCOPA-AUT, SS-16, ESS, FSS, HDRS, HAM-A, PDQ-39	Cognitive function: PDCRS; Global non-motor symptoms: NMS-Quest; Autonomic symptoms: SCOPA-AUT; Olfactory symptoms: SS-16; Sleep quality: ESS; Depression: HDRS; Anxiety: HAM-A; Fatigue: FSS	Cognitive function: Between-group: Tai Chi outperformed the control group in PDCRS scores ($P \leq 0.05$), especially in frontal cortical scores ($P \leq 0.05$) at 12 months; Global non-motor symptoms: Between-group: Tai Chi improved NMS-Quest scores significantly at 6 months compared to the control group ($P \leq 0.001$); Autonomic symptoms: Between-group: Tai Chi showed greater improvement in SCOPA-AUT at 6 months compared to Brisk Walking ($P \leq 0.05$); Olfactory symptoms: NS; Sleep quality: Between-group: Tai Chi improved ESS scores significantly at 6 months compared to the control group ($P \leq 0.05$); Depression: Between-group: NS; Anxiety: Between-group: NS; Fatigue: Between-group: Tai Chi outperformed Brisk Walking in FSS scores at 6 months ($P \leq 0.01$)	Dropout: 9 from BW group at 6 months, additional 5 at 12 months; 10 from CON group at 6 months, additional 5 at 12 months; Adherence: High; Adverse events: 1 from TC group, 3 from BW group and 10 from CON group reported fall; none from TC group, 2 from BW group and 6 from CON group reported dizziness; none from TC and BW groups, 3 from CON group reported back pain

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Tsai *et al*., 2025[39]	RCT	Total: 72; AE: 24; TCE: 24; CON: 24	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to II; Drug status: current use of levodopa, medically stable	AE: Aerobic exercise (30 min, 3 times, 12 weeks); TCE: Tai Chi exercise (60 min, 3 times, 12 weeks); CON: No treatment	Yang-style Tai Chi	Baseline; Post-intervention	Primary outcomes: biomarker levels: GSH, oxidized GSH, 8-OhdG, SOD, catalase, UA, MMSE; Secondary outcomes: BDI, Social Participation Questionnaire, Physical-Activity Recall Questionnaire, Seven-Day Physical-Activity Recall Questionnaire, UPDRS-III	Cognitive function: MMSE; Depression: BDI	Cognitive function: Within-group: MMSE scores significantly decreased in the CON group ($P \leq 0.05$); Between-group: Both the AE and TCE groups showed significantly better MMSE scores compared to the control group ($P \leq 0.05$). No significant difference between TCE and AE; Depression: Within-group: NS; Between-group: Significant difference in ANOVA results among AE, TCE and control groups	Dropout: 4 from AE, 3 from TCE, 4 from CON; Adherence: High; Adverse events: NR
Yin *et al*., 2025[47]	RCT	Total: 60; EXP: 30; CON: 30	Diagnosis standard: All diagnosed with PD; Disease severity: H&Y stage I to III; Drug status: dosage and type of oral anti-Parkinson's drugs stable for 3 months before study	EXP: Qigong exercise (30 min, 5 times, 12 weeks); CON: Gait training, core muscle exercises, activities focused on enhancing daily living abilities (30 min, 5 times, 12 weeks)	"Six healing sounds" Qigong	Baseline; Post-intervention	Primary outcome: respiratory function; Secondary outcomes: UPDRS-III, PDQ-39, HDRS, HAM-A	QoL: PDQ-39; Depression: HDRS; Anxiety: HAM-A	QoL: Within-group: PDQ-39 significantly improved in both groups ($P \leq 0.05$); Between-group: NS; Depression: Within-group: HDRS scores significantly improved in the Qigong group ($P \leq 0.05$); Between-group: HDRS scores significantly improved compared to the control group ($P \leq 0.05$); Anxiety: Within-group: HAM-A scores significantly improved in the Qigong group ($P \leq 0.05$); Between-group: HAM-A scores significantly improved compared to the control group ($P \leq 0.05$)	Dropout: 5 from EXP and 4 from CON; Adherence: High; Adverse events: 1 from EXP group reported temporary mild back ache, 2 from CON group reported temporary mild knee pain

(continued)

Table 2. *(continued)*

Author (year)	Study design	Sample size	Diagnosis standard, disease severity and drug status of included patients	Intervention (duration (minutes), frequency (per week, weeks))	Tai Chi/ Qigong training program	Assessment time frame	Primary and secondary outcomes	Non-motor symptoms measurements	Main results	Dropout, adherence[1], and adverse events
Wang *et al*., 2022[44]	RCT	Total: 76; WQX: 26; SE: 25; CON: 25	Diagnosis standard: All diagnosed with idiopathic PD; Disease severity: H&Y stage I to II; Drug status: some patients on Levodopa	WQX: Wu Qin Xi Qigong exercise (90 min, 3 times, 24 weeks); SE: Stretching exercise (90 min, 3 times, 24 weeks); CON: No treatment	Wuqinxi Qigong	Baseline; Post-intervention	Primary outcomes: HADS, PDSS, PDQ-39, TUG, motor inhibition tasks	Depression and anxiety: HADS; Cognitive function: MoCA; Sleep quality: PDSS; QoL: PDQ-39	Depression and anxiety: Within-group: HADS scores significantly improved in both WQX and SE groups ($P \leq 0.05$); Between-group: NS; Cognitive function: Within-group: NS; Between-group: NS; Sleep quality: Within-group: PDSS scores worsened significantly in both WQX and SE groups post-intervention; Between-group: NS; QoL: Within-group: PDQ-39 scores significantly improved post-intervention in both WQX and SE groups; Between-group: NS	Dropout: 3 from WQX and 3 from SE; Adherence: NR; Adverse events: NR

[1]Adherence was categorized as high (≥80% attendance), moderate (60–79% attendance), or low (<60% attendance), excluding participants who dropped out. [2]Combined exercise: commenced with rhythmic movements with modified folk dancing and stepping exercises, followed by elastic-band exercises. [3]Combined Qigong exercise: ten movements from six different Qigong practices (Baduanjin, Wuqinxi, Yijinjing, Liuzijue, Twelve-Movement Daoyin, and Mawangdui Daoyinshu). 8-OhdG, 8-hydroxydeoxyguanosine; ABC, Activity-Specific Balance Confidence Scale; AE, aerobic exercise group; ARs, accuracy rates; BBS, Berg Balance Scale; BDI, Beck Depression Inventory; B'DS, Brown's Disability Scale; BW, brisk walking group; CON, control group; ERP, event-related potential; ESS, Epworth Sleepiness Scale; EXP, experimental group; FAB, Frontal Assessment Battery; FSS, Fatigue Severity Scale; GAI, Geriatric Anxiety Inventory; GDS, Geriatric Depression Scale; GSH, glutathione; HADS, Hospital Anxiety and Depression Scale; HAM-A, Hamilton Anxiety Rating Scale; HDRS, Hamilton Depression Rating Scale; H&Y scale, Hoehn & Yahr scale; IL-1β, interleukin-1-beta; IL-6, interleukin-6; MADRS, Montgomery-Asberg Depression Rating Scale; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; NMS-Quest, Non-Motor Symptoms Questionnaire; NMSQ, Parkinson's Disease Non-Motor Symptom Questionnaire; NMSS, Non-Motor Symptoms Scale; NR, not reported; NS, not significant; PD, Parkinson's disease; PDCRS, Parkinson's Disease Cognitive Rating Scale; PDQ-39, Parkinson's Disease Questionnaire-39; PDQL, Parkinson's Disease Quality of Life questionnaire; PDSS, Parkinson's Disease Sleep Scale; PDSS-2, Parkinson's Disease Sleep Scale 2; PFS, Parkinson Fatigue Scale; QoL, quality of life; RCT, randomized controlled trial; RTs, reaction times; SCOPA-AUT, Scales for Outcomes in Parkinson's Disease – Autonomic Dysfunction; SE, stretching exercise group; SOD, superoxide dismutase; SS-16, Sniffin' Sticks 16; STAI, State-Trait Anxiety Inventory; ST-I, Stroop Test I; ST-II, Stroop Test II; TC, Tai Chi group; TCE, Tai Chi exercise group; TE, Tai Chi exercise group; TMT, Trail Making Test; TNF-α, tumor necrosis factor alpha; TUG, Timed Up and Go Test; UA, uric acid; UPDRS-I, Unified Parkinson's Disease Rating Scale Part I; UPDRS-II, Unified Parkinson's Disease Rating Scale Part II; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III.

weeks) typically involved 45–60-minute sessions conducted three times per week,[40,49] or once per week.[45,46] Medium-term intervention studies (12–16 weeks) included 30–90-minute sessions conducted 2–5 times per week.[35,43,47,51] Long-term intervention studies (24–48 weeks) ranged from weekly 60-minute sessions delivered in two 8-week periods with an 8-week break,[52] four sessions per week over 24 weeks,[42] and twice-weekly 60-minute sessions over 48 weeks.[41] Some studies incorporated additional elements, such as daily or twice-daily home practice.[45,46,51]

The included studies comprehensively assessed non-motor symptoms including mood (depression and anxiety), sleep quality, cognitive function, fatigue, autonomic function, olfactory symptoms, and quality of life. Global non-motor symptoms were measured using the Non-Motor Symptoms Scale (NMSS) or Non-Motor Symptoms Questionnaire (NMS-Quest). Depression and anxiety were evaluated using tools such as the Beck Depression Inventory (BDI), Hamilton Depression Rating Scale (HDRS), Hamilton Anxiety Rating Scale (HAM-A), Geriatric Depression and Anxiety Scales (GDS, GAI), Hospital Anxiety and Depression Scale (HADS), and State-Trait Anxiety Inventory (STAI). Sleep quality was assessed using the Parkinson's Disease Sleep Scale (PDSS/PDSS-2) and Epworth Sleepiness Scale (ESS). Cognitive function was examined using tests such as the Montreal Cognitive Assessment (MoCA), Parkinson's Disease Cognitive Rating Scale (PDCRS), Mini-Mental State Examination (MMSE), Trail Making Tests (TMT), Frontal Assessment Battery (FAB), Stroop Tests I and II (ST-I and ST-II), working memory tasks, and event-related potential (ERP) components. Fatigue was assessed using the Parkinson Fatigue Scale (PFS) and Fatigue Severity Scale (FSS). Autonomic symptoms were measured using the Scales for Outcomes in Parkinson's Disease – Autonomic Dysfunction (SCOPA-AUT). Olfactory symptoms were assessed with Sniffin' Sticks 16 (SS-16). Quality of life (QoL) was measured using the Parkinson's Disease Questionnaire (PDQ-39) and Parkinson's Disease Quality of Life questionnaire (PDQL). Together, these measures offer a multifactorial understanding of how Tai Chi and Qigong interventions may affect non-motor symptoms in PD.

Most reviewed studies had high quality (PEDro ≥ 6) based on their designs (Table 3),[35–52] although a few had lower PEDro scores partly because of the lack of assessor blinding.[35,39,40] However, all but one of the reviewed studies were pilot/early efficacy trials with relatively small sample sizes, ranging from 5 to 32 per group and therefore classified as Sackett's level II evidence. Smaller sample sizes are associated with a higher risk of bias, as they are more susceptible to chance imbalances in baseline characteristics and publication bias, where statistically significant results are more likely to be published and small studies tend to have greater effects that are not replicated in larger samples.[53,54] In this scoping review we chose to define a large-scale trial as being any study with ≥ 50 participants per group.[55] None of the reviewed studies fit this criterion. Due to the lack of Level I evidence, the current evidence only cautiously supports hypothesis-generating conclusions rather than firm clinical recommendations.

Six Tai Chi and six Qigong studies reported mixed results for depression and anxiety (Table 2). One Tai Chi study observed a significant within-group difference in both Tai Chi and routine exercise groups in HDRS score, and also a significant within-group difference only in the routine exercise group in HAM-A score,[38] while another study observed a significant worsening in BDI scores in the control group but not in the Tai Chi or combined exercise groups,[40] and another study found a significant difference among Tai Chi, aerobic exercise and control groups.[39] Three studies reported no significant changes in BDI, HDRS, or GDS scores either within- or between groups.[41,50,51] Similarly, three Qigong studies reported significant within-group differences in HADS, HDRS, HAM-A, and STAI scores,[44,47,48] and two of those studies also reported significant between-group differences in HDRS and HAM-A scores,[47,48] but the study that reported significant within-group differences in the Qigong group also reported significant within-group differences in the stretching exercise group.[44] The other three Qigong studies reported no significant changes in GAI, GDS, MADRS, or BDI scores.[45,49,52]

The effects of Tai Chi and Qigong on sleep quality were predominantly positive across seven studies. Three Tai Chi studies reported significant within-group differences in PDSS scores,[38,51] and/or significant between-group difference between Tai Chi and routine control in PDSS and ESS scores.[38,41] The one study that only reported a significant within-group difference reported significant within-group difference in both Tai Chi and control groups.[51] Three Qigong studies reported significant within-group and/or between-group differences in PDSS or PDSS-2 scores,[42,45,46] with the one study that reported only significant within-group differences having found significant within-group difference in both Qigong and control groups.[45] Only one Qigong study did not report an improvement in PDSS scores.[44]

The trends for the effects of Tai Chi and Qigong on cognitive function appear positive. Four Tai Chi studies reported significant within-group improvements in ERP P3 amplitude,[35] MoCA scores,[38,51] or between-group improvement in MoCA or PDCRS scores.[38,41] The ERP P3 amplitude was improved in both aerobic exercise and Tai Chi groups, but decreased in the control group,[35] while MoCA score was significantly improved only in the Tai Chi group and not in the control group.[51] An additional study reported decreasing MMSE scores in the control group but not in the Tai Chi or aerobic exercise groups.[39] Two studies observed no significant differences in TMT and other cognitive tests.[36,37] One Qigong study reported significant within-group improvements in multiple cognitive domains (FAB, MoCA) in both Qigong and control groups.[43] Another study that utilized Wuqinxi Qigong observed no significant changes in MoCA score.[44] However, the mean MoCA scores of PD participants were ≥ 26 at baseline, suggesting no baseline cognitive impairment. Therefore, this result makes it difficult to determine the trend of any changes in cognitive function. Another Qigong study found no significant changes in FAB and TMT results.[45]

For other non-motor symptoms, only a limited number of trials have assessed these outcomes. One Tai Chi study reported lower FSS scores compared with the brisk walking group at 6 months post-intervention,[41] while two Qigong studies observed no significant improvements in PFS scores within or between groups.[42,45] A Tai Chi study observed better improvements in autonomic function measured by SCOPA-AUT scores at 6 months post-intervention compared to brisk walking,[41] and a Qigong study showed potential benefits for autonomic symptoms including constipation and pain but not urinary and sexual dysfunction.[52] One Tai Chi study assessed olfactory symptoms and reported no significant between-group differences.[41] Two Tai Chi studies and one Qigong study reported within-group or between group improvement in non-motor symptom scores.[41,45,51]

Ten reviewed studies reported mixed results for QoL. Two Tai Chi studies reported significant worsening of PDQL or PDQ-39 scores in the control group but not in the Tai Chi group,[36,40] and one study observed significant within-group improvement in PDQ-39 score in both Tai Chi and routine exercise groups.[38] Two other Tai

Table 3. Level and quality of studies examining the impact of Tai Chi or Qigong on non-motor symptoms in patients with Parkinson's disease

Included RCTs	Sackett's levels of evidence	PEDro items scoring[1]											PEDro total score
		1. Eligibility criteria specified?	2. Random allocation?	3. Concealed allocation?	4. Baseline comparability?	5. Blinding of subjects?	6. Blinding of therapists?	7. Blinding of assessors?	8. Adequate follow-up?	9. Intention-to-treat analysis?	10. Between-group statistical comparisons?	11. Point estimates and variability?	
Burini *et al.*, 2006[49]	II	1	1	1	1	0	0	1	0	1	1	1	7
Schmitz-Hübsch *et al.*, 2006[52]	II	1	1	1	1	0	0	0	1	1	1	1	7
Cheon *et al.*, 2013[40]	II	1	1	0	1	0	0	0	0	1	1	1	5
Nocera *et al.*, 2013[36]	II	1	1	0	1	0	0	1	1	1	0	1	6
Kurlan *et al.*, 2015[50]	II	1	1	0	1	0	0	1	0	1	1	1	6
Xiao *et al.*, 2016[42]	II	1	1	0	1	0	0	1	1	1	1	1	7
Moon *et al.*, 2017[46]	II	1	1	0	1	1	0	1	0	1	1	1	7
Yang *et al.*, 2017[51]	II	1	1	1	1	0	0	1	1	1	1	1	8
Vergara-Diaz *et al.*, 2018[37]	II	1	1	0	1	0	0	1	0	1	1	1	6
Moon *et al.*, 2020[45]	II	1	1	1	1	1	0	1	0	1	1	1	8
Zhu *et al.*, 2020[38]	II	1	1	0	1	0	0	1	1	1	1	1	7
Shen *et al.*, 2021[43]	II	1	1	1	1	0	0	1	1	1	1	1	8
Li *et al.*, 2022[48]	II	1	1	0	1	0	0	1	1	1	1	1	7
Chang *et al.*, 2024[35]	II	1	1	0	1	0	0	0	0	1	1	1	5
Li *et al.*, 2024[41]	II	1	1	1	1	0	0	1	0	1	1	1	7
Tsai *et al.*, 2025[39]	II	1	1	0	1	0	0	0	0	1	1	1	5
Yin *et al*, 2025[47]	II	1	1	0	1	0	0	1	1	1	1	1	7
Wang *et al*, 2022[44]	II	1	1	1	1	0	0	1	1	1	1	1	8

[1]PEDro items: 1, eligibility criteria were specified; 2, subjects were randomly allocated to groups; 3, allocation was concealed; 4, the groups were similar at baseline regarding the most important prognostic indicators; 5, all subjects were blinded; 6, all therapists who administered the therapy were blinded; 7, all assessors who measured at least one key outcome were blinded; 8, measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups; 9, all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by "intention to treat"; 10, results of between-group statistical comparisons were reported for at least one key outcome; 11, the study provided both point estimates and measures of variability for at least one key outcome. PEDro, Physiotherapy Evidence Database; RCT, randomized controlled trial.

Chi studies observed no significant change in PDQ-39 scores.[37,50] Two Qigong studies reported significant within-group changes in PDQ-39 in both Qigong and control groups,[44,47] whereas three Qigong studies reported no significant QoL changes.[45,49,52]

Discussion

In this scoping review, we identified 18 RCTs that reported the impact of Tai Chi and Qigong interventions on non-motor symptoms in patients with PD. Most studies were of good quality according to PEDro scoring (PEDro ≥ 6), but they were also classified as pilot/early efficacy trials because of their small sample sizes. Thus, no strong clinical recommendation can be made for either Tai Chi or Qigong interventions, as early efficacy trials are intended to determine intervention feasibility and ascertain outcome trends. Small sample sizes and insufficient statistical power are often important factors for the lack of significance in pilot study outcomes. Therefore, we focus our discussion on the reported outcome trends.

These clinical trials showed a strong trend toward beneficial effects of Tai Chi or Qigong interventions on sleep quality and cognition, a moderate trend in depression, anxiety, and QoL, and a weak/unclear trend in fatigue and other non-motor symptoms. This scoping review suggests a strong trend to support Tai Chi interventions on sleep quality as all three Tai Chi trials showed positive results,[38,41,51] and a strong trend supporting Qigong interventions on sleep quality as three of four Qigong studies reported positive results.[42,45,46] There is a strong trend towards Tai Chi intervention improving cognitive function as supported by five out of seven studies.[35,38,39,41,51] A moderate trend is suggested for Qigong intervention on cognitive function as three Qigong studies reported positive,[43] unclear,[44] or no-effect results.[45] Tai Chi and Qigong interventions showed a moderate trend towards improving depression and anxiety symptoms, as three Tai Chi studies reported positive findings,[38–40] and three studies reported no significant findings.[41,50,51] Similarly, three of six Qigong trials reported a positive effect,[44,47,48] whereas the other three did not show significant changes.[45,49,52] There appears to be a weak trend for Tai Chi and no trend for Qigong intervention on improving fatigue, as only one Tai Chi study reported on fatigue outcomes with a positive result,[41] and two Qigong trials reported no significant changes in fatigue.[42,45] For other non-motor symptoms, the trends are weak or unclear because only one or two studies evaluated those other symptoms. A moderate trend of Tai Chi and Qigong interventions for improvement in QoL is suggested as half of the studies reported positive results,[36,38,40,44,47] and the other half did not find significant differences.[37,45,49,50,52] In summary, future large-scale clinical trials are needed to determine the effectiveness of Tai Chi and Qigong interventions on non-motor symptoms including sleep, cognition, depression, anxiety, and QoL. Meanwhile, more early efficacy studies are needed to further identify the trends of Tai Chi and Qigong interventions on fatigue and other non-motor symptoms.

This review revealed variability in Qigong and Tai Chi intervention styles and control-group interventions that ranged from sham Qigong to other forms of exercise and routine activity.[42,45,52] Intervention duration and frequency also varied, ranging from short-term,[40,45,46,49] medium-term,[35,43,47,51] and long-term interventions.[41,42,52] Some trials incorporated additional elements, such as daily home practice.[45,46,51] Most reviewed trials also failed to examine and monitor intervention fidelity. Any variability in intervention fidelity can substantially affect outcomes. Variability in outcome measurement tools was also common. For instance, cognitive function was measured in different studies by using ERP P3, TMT, MMSE, MoCA, PDCRS, FAB, Clock Drawing test, etc.[35–39,41,43–45] Some of those measurements, such as TMT, highly depend on motor performance and can result in significant measurement bias in the PD population. Several studies also had high dropout rates.[40,41,45]

Limitations

We acknowledge several limitations of this scoping review. First, because most of the reviewed studies had small sample sizes (<50 participants per group), the conclusions drawn from their results are preliminary, and only trends can be ascertained.

Moreover, some studies that reported significant within-group differences,[38,43–45,47,51] in the Tai Chi/Qigong group also reported significant within-group differences in the control group, reducing the impact of these results. These limitations may be related to the small sample sizes of many of the reviewed studies, which allowed us to identify only trends rather than robust conclusions. Additionally, variability in intervention type, fidelity, duration, frequency, and outcome measurement tools threaten the validity of the study results, underscoring the need for future studies to adopt more standardized procedures to minimize potential bias. Given the high clinical and methodological heterogeneity as well as variability in type and scale of measurements, pooling data from all reviewed studies may be misleading rather than informative.[56–60] Therefore, we did not proceed with conducting a meta-analysis. Finally, because we searched only English-language studies, we may be missing relevant studies from other languages.

Conclusions

This scoping review found that Tai Chi/Qigong interventions in patients with PD may improve sleep quality and potentially cognitive function. However, the evidence is insufficient to support their effectiveness in alleviating other non-motor symptoms, such as depression, anxiety, and fatigue. The reviewed studies also had limitations related to the variability of the protocols and the generally small sample sizes that constitute most of the existing evidence in this field. These limitations make it difficult to compare results across studies. Moreover, findings that other exercise interventions yield greater improvements in depression than Tai Chi/Qigong suggest that the observed benefits may not be specific to the mind-body interventions themselves. Future studies should use large, rigorous trials with standardized protocols, focusing primarily on sleep and cognitive outcomes.

Supporting information

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Author contributions

Conceptualization (ZL, IVS, WL), visualization (ZL, IVS), writing – original draft (ZL, DY), writing – review & editing (IVS, WL), supervision (WL). All authors have approved the final version and publication of the manuscript.

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