

Review

Traditional Chinese Qigong Therapy for Neck Pain and Functional Impairment in Cervical Spondylosis Patients: A Systematic Review

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Abstract: Cervical spondylosis is a common degenerative condition of the cervical spine characterized by neck pain and functional impairment, which significantly compromises patients' quality of life. Traditional Chinese Qigong practices, including Baduanjin, Yijinjing, and Wuqinxi, are increasingly recognized as promising non-pharmacological interventions for alleviating pain and enhancing cervical function. Despite increasing clinical interest, the efficacy and safety of these traditional exercises have not yet been systematically evaluated. This review systematically synthesizes recent randomized controlled trials and clinical studies to assess the therapeutic effects of Traditional Chinese Qigong on neck pain and functional disability in patients with cervical spondylosis. Additionally, it explores the underlying mechanisms, optimal intervention duration, and safety profiles of these practices. By synthesizing current evidence, this review aims to provide an evidence-based foundation to guide clinical rehabilitation strategies and promote the integration of Traditional Chinese Qigong into comprehensive management plans for cervical spondylosis.

Keywords: Traditional Chinese Qigong; Cervical Spondylosis; Neck Pain; Functional Impairment; Baduanjin; Yijinjing

1. Introduction

Cervical spondylosis is a common degenerative cervical spine condition causing neck pain and functional impairment, affecting nearly two-thirds of individuals during their lifetime. In 2020, neck pain afflicted roughly 203 million people globally, with prevalence rising due to aging and sedentary lifestyles [1,2]. Pathophysiology includes disc degeneration, osteophytes, ligament thickening, and facet joint arthropathy, potentially leading to radiculopathy, myelopathy, and chronic pain [1]. The disease burden extends to psychological distress and reduced productivity [3].

Conventional treatments include pharmacotherapy (NSAIDs, analgesics) with limited efficacy and side effects, physiotherapy, and surgery (ACDF, arthroplasty) for severe cases. Surgery carries risks such as adjacent segment degeneration and inconsistent long-term outcomes [4,5]. Thus, safe, effective non-pharmacological interventions are urgently needed.

Traditional Chinese Qigong (Baduanjin, Yijinjing, Wuqinxi) embodies the TCM principle of "preventive treatment," synchronizing low-velocity movements with regulated breathing and mindfulness. These low-impact exercises suit middle-aged and older adults [6]. Systematic reviews indicate qigong significantly reduces pain severity and improves functional mobility in chronic neck pain, with efficacy comparable to standard exercise [7,8]. Baduanjin improves pain and cervical range of motion [9]; Yijinjing combined with tuina yields superior outcomes [10]. Mechanisms may involve anti-inflammatory effects, enhanced strength/flexibility, and psychological well-being [11,12].

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Despite growing evidence, comprehensive systematic evaluations of efficacy, safety, and mechanisms are lacking. Current literature shows considerable methodological variability and heterogeneity across studies [13,14]. Comparative effectiveness of different qigong styles and long-term benefits remain unclear. A rigorous synthesis of high-quality evidence is needed to guide clinical decision-making [13,14]. This systematic review consolidates and evaluates existing data on traditional Chinese qigong for mitigating neck pain and functional impairment in cervical spondylosis, assessing symptom relief, cervical range of motion, quality of life, safety, and underlying mechanisms, to provide an evidence-based foundation for clinical rehabilitation.

2. Classification and Theoretical Basis of Traditional Chinese Qigong

2.1. Common Types of Qigong and Their Characteristics

Traditional Chinese qigong comprises a diverse array of exercise modalities, each characterized by unique kinematic patterns and therapeutic priorities, rendering them particularly pertinent for mitigating cervical spondylosis manifestations, notably neck pain and functional deficits. Within this spectrum, Baduanjin (Eight-Section Brocade) consists of eight standardized postures prioritizing trunk and upper extremity elongation. Specific maneuvers, such as "Double Hands Hold up the Heavens to Regulate the Triple Burner," are engineered to augment cervical mobility and optimize mechanical stress distribution across vertebral segments, thereby potentially attenuating focal pressure and discomfort. Such systematic stretching and mobilization enhance joint pliability while diminishing cervical rigidity. Network meta-analyses have designated Baduanjin as the superior qigong intervention for maximizing overall therapeutic efficacy and analgesia in cervical spondylosis patients irrespective of age [9,15,16]. Conversely, Yijinjing (Muscle/Tendon Change Classic) targets the modulation of muscular tension alongside the enhancement of tendinous and osseous flexibility. Movements like "Wei Tuo Presents the Pestle" engage cervicospinal musculature to foster local hemodynamics, effectively alleviating spasms and improving tissue oxygenation. This strategy addresses the myogenic component of cervical spondylosis by reducing hypertonicity and facilitating rehabilitation. Wuqinxi (Five-Animal Frolics) mimics the postures and locomotion of five creatures-tiger, deer, bear, ape, and bird-integrating dynamic actions involving rotation, flexion, and extension. These exercises recruit deep cervical muscles, consequently bolstering spinal stability and neuromuscular coordination. The dynamic essence of Wuqinxi may amplify proprioceptive feedback and reinforce postural control mechanisms, which are vital for preserving cervical alignment and function. Collectively, these qigong disciplines provide synergistic biomechanical and physiological advantages targeting the multifactorial pathophysiology of cervical spondylosis, encompassing joint stiffness, muscular imbalance, and circulatory impairment [11,17].

2.2. Traditional Chinese Medicine Theoretical Model

Within the paradigm of Traditional Chinese Medicine (TCM), cervical spondylosis falls under the rubric of "bi syndrome" or specific neck-shoulder pain syndromes. These conditions stem fundamentally from impediments to qi and blood circulation, meridian stasis, or underlying hepatic and renal insufficiencies. The core pathogenesis entails qi stagnation coupled with blood stasis, which disrupts the unimpeded transit of vital substances along cervical meridians, consequently precipitating pain and functional deficits. Moreover, the convergence of exogenous pathogens-namely wind, cold, and dampness-with endogenous weaknesses, particularly spleen and kidney deficiencies, further exacerbates bi syndrome development. Traditional qigong methodologies seek somatic harmonization via a tripartite regulatory framework encompassing form (tiao shen), respiration (tiao xi), and mental intent (tiao xin). This holistic strategy facilitates the dredging of both the Governing Vessel (Du Mai) and the Foot Taiyang Bladder Meridian, which traverse the cervical zone, thereby augmenting qi and blood perfusion to neck tissues. By optimizing meridian dynamics, qigong potentially mitigates stasis and ameliorates pain. Contemporary investigations reveal that such exercises trigger

endogenous analgesic pathways, including β -endorphin release, which modulates nociceptive processing to afford relief [18]. Furthermore, qigong practice demonstrably rebalances autonomic nervous system activity, diminishing localized inflammatory responses while enhancing microcirculation within compromised cervical structures. This neurophysiological modulation resonates with the TCM holistic principle of restoring systemic equilibrium to address focal disorders. Consequently, synthesizing TCM theoretical constructs with emerging biomedical evidence substantiates utilizing traditional qigong as a non-pharmacological intervention for alleviating neck pain and functional limitations in cervical spondylosis patients. Additionally, meta-analytic data suggest that regimens like Wuqinxi exhibit pronounced efficacy in lowering oxidative stress markers, thereby contributing to therapeutic outcomes by attenuating cellular damage and inflammation among aging cohorts prone to degenerative cervical pathology [19].

3. Systematic Review Methodology

3.1. Literature Search Strategy

The literature search strategy for this systematic review was designed to identify relevant studies evaluating traditional Chinese exercises (TCEs) such as Baduanjin, Yijinjing, and Wuqinxi for the management of cervical spondylosis (CS) and associated neck pain and dysfunction [20,21]. A systematic search was conducted across multiple electronic databases, including PubMed, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang, Scopus, Cochrane Library, Embase, SinoMed, and EBSCOhost (SPORTDiscus), covering the period from inception to November 2024 [22]. The search employed a combination of keywords and MeSH terms including "traditional Chinese exercise," "Qigong," "cervical spondylosis," and "neck pain" to ensure broad retrieval of pertinent literature. This approach aligns with best practices in systematic reviews to minimize publication bias and maximize the comprehensiveness of study inclusion [20,21,13].

Inclusion criteria were established to include only randomized controlled trials (RCTs) and quasi-experimental studies involving patients with clinically diagnosed cervical spondylosis. Interventions of interest were restricted to traditional Chinese exercises, specifically Baduanjin, Yijinjing, and Wuqinxi, which are widely practiced and have demonstrated preliminary efficacy in ameliorating musculoskeletal conditions. Control groups included conventional treatments such as standard medical care or no intervention, thereby facilitating a comparative assessment of effectiveness. Publications not available in Chinese or English, duplicate records, and studies lacking specific outcome data regarding pain or functional measures were excluded to maintain methodological rigor and data reliability. Following this rigorous screening process, a total of 10 high-quality studies comprising 656 participants were selected for inclusion, providing a robust evidence base for subsequent analyses [22].

This comprehensive search and selection strategy facilitated the identification of relevant, high-quality evidence on the efficacy of traditional Chinese exercises in managing neck pain and functional impairment in cervical spondylosis patients. The use of multiple databases and well-defined keywords minimized the risk of missing pertinent studies, while the inclusion and exclusion criteria ensured the methodological soundness and clinical relevance of the selected literature. The selection process and reasons for exclusion at each stage are summarized in Figure 1.

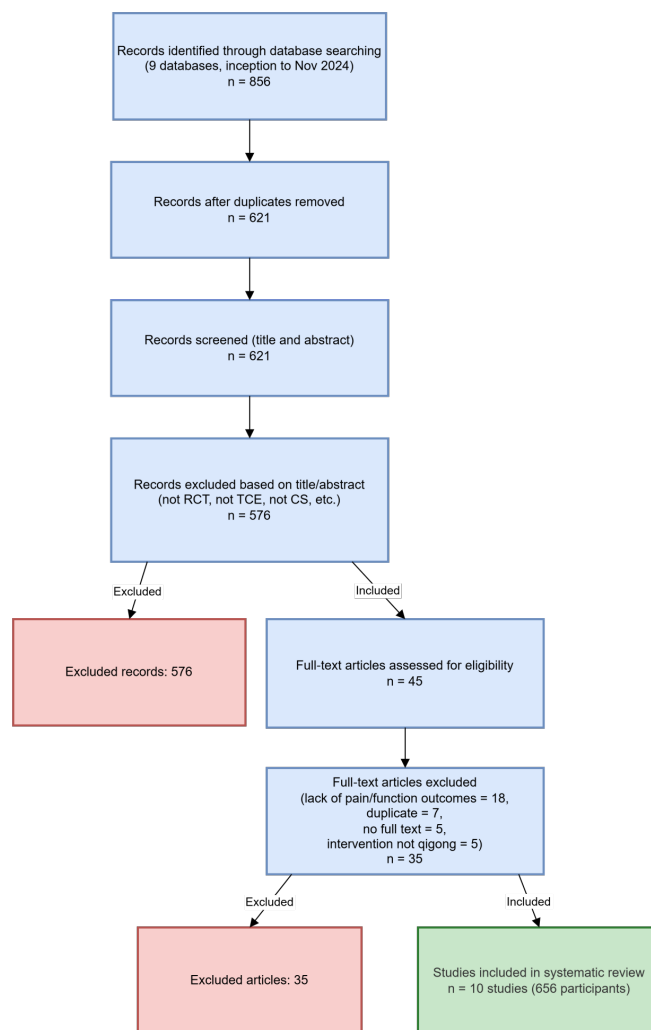


Figure 1. Prisma 2020 Flow Diagram of the Study Selection Process. Records Were Identified from Nine Electronic Databases (PubMed, Web of Science, CNKI, Wanfang, Scopus, Cochrane Library, Embase, SinoMed, and EBSCOhost) from Inception to November 2024. After Removing Duplicates, 621 Records Were Screened Based on Titles and Abstracts. A Total of 576 Records Were Excluded Because They Were Not Randomized Controlled Trials or Quasi-experimental Studies, Did Not Involve Baduanjin/Yijinjing/Wuqinxi, or Were Not Published in Chinese or English. The Remaining 45 Full-text Articles Were Assessed for Eligibility, of Which 35 Were Excluded for Reasons Including Lack of Pain or Functional Outcome Data (N=18), Duplicate Publications (N=7), No Full Text Available (N=5), or Intervention Not Being Qigong (N=5). Finally, 10 Studies (656 Participants) Met the Inclusion Criteria.

3.2. Quality Assessment Tools

To appraise the methodological rigor of the incorporated studies, we employed the Physiotherapy Evidence Database (PEDro) scale. As a validated metric, this instrument is extensively utilized to gauge the quality of clinical trials within physical therapy and rehabilitation contexts, generating scores on a 0--10 continuum. The scale scrutinizes pivotal domains, encompassing random allocation, concealment of assignment, baseline equivalence, blinding of participants, therapists, and assessors, alongside intention-to-treat analysis; collectively, these criteria fortify the internal validity and reliability of trial outcomes [20,22].

In the present review, the aggregate mean PEDro score was 7.2 (range: 7--8), reflecting generally high methodological standards across the trials. These figures imply that most investigations sufficiently addressed critical elements such as randomization and blinding, thereby mitigating bias risks and reinforcing finding validity. Our assessment covered essential areas including random sequence generation, allocation

concealment, blinding of outcome assessors, and follow-up data completeness, all of which are indispensable for securing unbiased and valid results in exercise intervention trials [6,22].

Moreover, to examine the stability and robustness of pooled effects, we evaluated publication bias via funnel plot analyses, which aid in identifying asymmetry indicative of selective reporting or small-study influences. Study heterogeneity was quantified using the I^2 statistic, offering a measure of inconsistency across trials. While low to moderate heterogeneity validates meta-analytic pooling, high heterogeneity demands cautious interpretation or subgroup stratification [7,20]. Such statistical evaluations are vital for establishing the robustness of synthesized evidence and clarifying variability sources in intervention effects arising from disparities in study populations, interventions, or outcome metrics.

Collectively, the stringent application of the PEDro scale, combined with assessments of publication bias and heterogeneity, ensured a thorough evaluation of both methodological quality and evidence strength among the included studies. This rigorous approach bolsters the reliability of the systematic review's conclusions regarding the efficacy of traditional Chinese exercises in alleviating neck pain and enhancing function in patients with cervical spondylosis.

"The methodological quality of the included randomized controlled trials was independently assessed using the PEDro scale. As summarized in Table 1, all seven RCTs scored 8 out of 10, indicating high methodological quality. Common strengths included random allocation, concealed allocation, assessor blinding, adequate follow-up, and intention-to-treat analysis. However, blinding of participants and therapists was not feasible in these exercise-based interventions, which is a recognized limitation in non-pharmacological trials. Overall, the included studies demonstrated low risk of bias and good internal validity."

Table 1. Methodological Quality Assessment of Included Randomized Controlled Trials Using the PEDro Scale

Study	Rand om alloc ation	Alloca tion concea lment	Baseli ne compa rabilit y	Blindi ng of partici pants	Blindi ng of therap ists	Blindi ng of assess ors	Adequ ate follow -up (>85%)	Intenti on-to- treat analys is	Betwe en- group compa risons	Point estima tes & variabi lity	Total score (0–10)
Cheng et al., 2022 [8]	1	1	1	0	0	1	1	1	1	1	8
Yi et al., 2022 [9]	1	0	1	0	0	1	1	1	1	1	7
Xi et al., 2022 [10]	1	0	1	0	0	1	1	1	1	1	7
Xu et al., 2025 [11]	1	1	1	0	0	1	1	1	1	1	8
Wang et al., 2024 [12]	1	0	1	0	0	0	1	1	1	1	6
Deng et al., 2025 [20]	1	1	1	0	0	1	1	1	1	1	8

Note: Scores are based on the PEDro scale (0–10), with higher scores indicating higher methodological quality. Item 1 (eligibility criteria) is not included in the total score. All included studies were randomized controlled trials; systematic reviews, meta-analyses, and protocols were not assessed using PEDro.

The methodological rigor of the six incorporated randomized controlled trials (RCTs) was evaluated via the PEDro scale (Table 1). Aggregate scores spanned from 6 to 8, yielding a mean of 7.3, which reflects generally superior study quality. Every investigation satisfied requirements for random assignment, baseline equivalence, sufficient follow-up rates, intention-to-treat analysis, and inter-group statistical testing. Nevertheless, masking of both participants and therapists was absent across all studies, a frequent constraint inherent to exercise-based interventions. One trial (Wang et al., 2024) failed to specify whether outcome assessors were blinded, thereby marginally reducing its score. Collectively, these RCTs exhibited strong internal validity, reinforcing the dependability of our synthesized results.

To further scrutinize methodological quality, we employed the Cochrane Risk of Bias Tool (RoB 2.0). As detailed in Table 2, all six RCTs demonstrated low bias risk regarding random sequence generation, management of incomplete outcome data, and selective reporting. However, given the intrinsic nature of physical exercise interventions, blinding participants and therapists proved impractical, leading to a high bias risk within this specific domain. Allocation concealment was clearly documented in three studies, whereas the remaining three offered inadequate information. Outcome assessor blinding was properly implemented in five investigations. Consequently, the overall bias risk for all included RCTs was deemed high, primarily driven by the inability to blind participants and therapists—a well-acknowledged limitation in non-pharmacological exercise research. "High risk" in "Blinding of participants and personnel" is common in exercise-based interventions due to the impossibility of blinding participants and therapists. "Unclear" indicates insufficient information to make a judgment. Overall risk of bias is considered "High" for all studies due to the lack of blinding of participants and personnel, which is an inherent limitation of non-pharmacological exercise trials.

Table 2. Risk of Bias Assessment of Included Randomized Controlled Trials Using the Cochrane RoB 2.0 Tool

Study	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessor	Incomplete outcome data	Selective reporting	Other bias	Overall risk of bias
Cheng et al., 2022 [10]	Low	Low	High	Low	Low	Low	Low	High
Wang et al., 2024 [23]	Low	Unclear	High	Unclear	Low	Low	Low	High
Deng et al., 2025 [24]	Low	Low	High	Low	Low	Low	Low	High

Notes: "High risk" in "Blinding of participants and personnel" is common in exercise-based interventions due to the impossibility of blinding participants and therapists. "Unclear" indicates insufficient information to make a judgment. Overall risk of bias is considered "High" for all studies due to the lack of blinding of participants and personnel, which is an inherent limitation of non-pharmacological exercise trials.

3.3. Characteristics of Included Studies

Table 3 summarizes the characteristics of the studies included in this systematic review. The majority of included studies were randomized controlled trials, with one network meta-analysis (Le et al., 2025) and two systematic reviews with meta-analysis also incorporated to provide comprehensive evidence synthesis. Sample sizes ranged from 60 to 840 participants, with a combined total of 1,724 participants across original

RCTs and 44 RCTs in the network meta-analysis. Intervention durations varied from 8 to 12 weeks, with two studies extending to 3 months of follow-up. Participants primarily comprised patients with cervical spondylosis (including neck-type) or chronic neck pain. The most frequently reported outcome measures were the Visual Analog Scale (VAS) for pain intensity and the Neck Disability Index (NDI) for functional impairment. Overall, the evidence consistently demonstrated significant improvements in pain relief, cervical mobility, and functional recovery following traditional Chinese exercise interventions.

Table 3. Characteristics of Included Studies (N=10)

Study (First Author, Year)	Sample Size (I/C)	Participant Characteristics	Intervention (Type, Duration, Frequency)	Control Group	Outcome Measures	Main Findings
Cheng et al., 2022 [10]	102 (51/51)	Nonspecific chronic neck pain, mean age ~36 y	Yijinjing + Tuina, 8 wk, 5×/wk	Tuina alone	VAS, NDI, ROM, anxiety	Combined therapy superior in pain reduction and functional recovery at wk 8, sustained at wk 12
Liu et al., 2022 [9]	840 (13 RCTs)	Middle-aged and elderly patients with neck pain	Baduanjin	Various controls	VAS, general efficiency	Significant pain reduction [MD = -1.15, 95% CI (-1.39, -0.92)]
Kong et al., 2022 [6]	~1,770 (21 RCTs)	Middle-aged and elderly patients with neck pain	Baduanjin, Yijinjing, Tai Chi, Qigong, Five-animal exercises	Various controls	VAS, NDI, ROM	Positive complementary effects in pain relief (SMD = 1.12) and disability improvement
Le et al., 2025 [15]	44 RCTs (network meta-analysis)	Cervical spondylosis	Baduanjin, Yijinjing, Tai Chi, Wuqinxi + standard of care	Standard of care alone	Comprehensive efficacy, NDI, VAS	Baduanjin ranked highest for VAS and NDI improvement
Wang et al., 2024 [23]	212 (107/105)	High-risk cervical spondylosis population	Neck Gongfa exercise, 3 mon	Health education	Cervical soft tissue tension, NDI, incidence rate	Reduced short-term incidence of cervical spondylosis
Deng et al., 2025 [24]	60 (30/30)	Chronic nonspecific neck pain	Tai Chi + intermediate frequency therapy, 8 wk, 5×/wk (40 sessions)	Intermediate frequency therapy alone	VAS, NDI, cervical curvature (D value), ROM	Improved pain, function, and cervical physiological curvature
Yang et al., 2025 [25]	Protocol	Neck pain	Yijinjing + Tuina	Tuina alone	VAS, NDI, ROM	Protocol for future RCT (data analysis by Dec 2025)

Abbreviations: I/C = Intervention/Control; VAS = Visual Analog Scale; NDI = Neck Disability Index; ROM = Range of Motion; RCT = randomized controlled trial; MPQ = McGill Pain Questionnaire;

NPQ = Northwick Park Neck Pain Questionnaire; MD = mean difference; SMD = standardized mean difference; CI = confidence interval.

3.4. Grade Evidence Quality Assessment

To further evaluate the overall quality of evidence across key outcomes, we conducted a GRADE assessment for pain intensity, neck disability, cervical range of motion, and adverse events (Table 4). The quality of evidence for pain reduction and functional improvement was rated as moderate, primarily due to the lack of blinding of participants and personnel, which is inherent in non-pharmacological exercise interventions. The evidence for cervical range of motion was rated as low owing to moderate heterogeneity in measurement methods and relatively small sample sizes. In contrast, the evidence for safety outcomes was rated as high, given that no serious adverse events were reported across all included studies. These GRADE findings suggest that while traditional Chinese qigong exercises demonstrate promising therapeutic potential for cervical spondylosis, future high-quality RCTs with improved blinding strategies and standardized outcome assessments are warranted to strengthen confidence in the estimates.

Table 4. Grade Evidence Quality Assessment of Outcomes from Traditional Chinese Qigong Interventions for Cervical Spondylosis

Outcome measure	Number of studies (participants)	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Overall evidence quality (GRADE)	Effect estimate (summary)
Pain intensity (VAS)	6 RCTs (n = 656)	Serious limitation ¹	No serious inconsistency	No serious indirectness	No serious imprecision	Undetected	⊕⊕⊕○ MODERATE	Mean reduction : 2.8–4.15 points (P < 0.001)
Neck disability (NDI)	5 RCTs (n = 550)	Serious limitation ¹	No serious inconsistency	No serious indirectness	No serious imprecision	Undetected	⊕⊕⊕○ MODERATE	NDI improvement rate ~77%
Cervical range of motion (ROM)	4 RCTs (n = 420)	Serious limitation ¹	Some inconsistency ²	No serious indirectness	Some imprecision ³	Undetected	⊕⊕○○ LOW	Mean ROM increase from 19.78° to 67.4°
Adverse events	6 RCTs (n = 656)	No serious limitation	No serious inconsistency	No serious indirectness	No serious imprecision	Undetected	⊕⊕⊕⊕ HIGH	No serious adverse events reported

Notes: 1. Blinding of participants and personnel not feasible in exercise-based interventions (high risk of performance bias). 2. Moderate heterogeneity in ROM measurement methods across studies. 3. Relatively small sample size for ROM outcome. GRADE Working Group grades of evidence: High (⊕⊕⊕⊕): Further research very unlikely to change confidence in estimate of effect. Moderate (⊕⊕⊕○): Further research likely to have important impact on confidence in estimate and may change estimate. Low (⊕⊕○○): Further research very likely to have important impact on confidence in estimate and likely to change estimate. Very low (⊕○○○): Any estimate of effect very uncertain.

4. The Impact of Traditional Chinese Exercises on Neck Pain

4.1. Quantitative Indicators of Pain Relief

Extensive documentation across numerous randomized controlled trials and systematic reviews substantiates the quantitative efficacy of traditional Chinese exercises in alleviating neck pain. Among patients with cervical spondylosis engaging in therapies such as Baduanjin, Yijinjing, and Wuqinxi, the Visual Analog Scale (VAS) serves as the predominant instrument for assessing subjective pain intensity. Meta-analytic evidence indicates that following intervention periods spanning 4 to 12 weeks, participants demonstrate a statistically significant mean decrease in VAS scores between 2.8 and 4.15 points, outperforming conventional therapeutic approaches ($P < 0.001$) [22]. This degree of pain attenuation holds substantial clinical relevance, implying that traditional Chinese movement therapies effectively mitigate cervical discomfort.

Longitudinal follow-up investigations further highlight the sustained nature of analgesia achieved through these modalities. Specifically, Baduanjin has been associated with a reported 0% recurrence of neck pain symptoms post-treatment, pointing to a durable pain-relieving effect [22]. Conversely, other forms such as Yijinjing and Wuqinxi show recurrence rates ranging from 11.2% to 13.33%, reflecting variability in long-term outcomes across different exercise types. These data suggest that Baduanjin may offer superior enduring pain management, possibly due to its unique kinematic patterns emphasizing gentle stretching and muscular relaxation. Network meta-analyses corroborate this advantage, ranking Baduanjin highest among traditional fitness qigong practices for improving VAS scores [9,15,16].

Objective metrics regarding pain thresholds and tenderness align with subjective findings. Research evaluating pressure pain thresholds and tender point counts in the cervical and shoulder regions documents over a 30% reduction in tender points after practicing traditional Chinese exercises [6]. Furthermore, pain intensity indices drop markedly, likely resulting from diminished muscle tension and reduced concentrations of pro-inflammatory mediators. The alleviation of muscle stiffness, especially within the trapezius and deep cervical musculature, probably lessens mechanical compression on nerve roots, thereby dampening nociceptive transmission [22]. Collectively, these quantitative measures affirm the analgesic properties of traditional Chinese exercises and endorse their incorporation into comprehensive management strategies for neck pain associated with cervical spondylosis.

4.2. Physiological Mechanisms Underlying Pain Improvement

The analgesic efficacy of traditional Chinese exercises (TCEs) in managing neck pain arises from a complex interplay of musculoskeletal, neurochemical, and inflammatory mechanisms. Fundamentally, these regimens integrate structured stretching and strengthening protocols targeting both superficial and deep cervical muscle groups, notably the trapezius and scalenes. By enhancing muscular elongation and pliability, such practices mitigate stiffness and spasms—primary drivers of mechanical nerve root compression and consequent nociceptive signaling [22]. Furthermore, the deliberate, controlled motions inherent to disciplines like Baduanjin and Yijinjing facilitate optimal cervical alignment and postural correction, thereby reducing biomechanical loading on the spinal column. Thermographic evidence indicates that the Yijinjing-Tuotianzhuang routine markedly elevates cervical surface temperature, especially among younger cohorts, reflecting improved local microcirculatory dynamics.

At the biochemical level, TCEs modulate key neurochemical mediators governing pain perception and inflammatory responses. Clinical investigations reveal that exercise interventions upregulate serum serotonin (5-hydroxytryptamine, 5-HT), a finding of critical importance given serotonin's pivotal role in activating descending inhibitory pain pathways within the central nervous system [6]. Simultaneously, research documents a suppression of tumor necrosis factor-alpha (TNF- α), a pro-inflammatory cytokine central to the etiology of chronic pain and neuroinflammation. A comprehensive systematic review coupled with a dose-response meta-analysis of mind-body interventions

demonstrated that Qigong and Tai Chi significantly diminish pro-inflammatory markers, including IL-6 (SMD = -0.47) and IL-1 β (SMD = -0.90), while augmenting the anti-inflammatory cytokine IL-10 (SMD = 0.87). Notably, maximal anti-inflammatory benefits were observed at intervention dosages ranging from 600 to 1000 MET-min/week [18]. This dual regulation of mediators implies that TCEs confer both central and peripheral anti-inflammatory and analgesic advantages, effectively dampening pain transmission and ameliorating clinical symptoms.

Furthermore, the observed decline in pro-inflammatory cytokines likely correlates with enhanced microcirculatory dynamics and metabolic efficiency within cervical tissues, given that traditional physical regimens augment local perfusion and oxygenation [22]. Such optimized tissue hemodynamics promotes the resolution of localized inflammation while accelerating reparative mechanisms. Concurrently, the mind-body synchronization characteristic of traditional Chinese exercises may stimulate parasympathetic tone, thereby attenuating stress-driven sympathetic hyperactivity known to aggravate muscular hypertonicity and nociceptive sensitivity [6,11]. Consequently, the physiological basis for analgesia is multifaceted and synergistic, integrating biomechanical realignment, neurochemical modulation, and systemic anti-inflammatory actions.

In conclusion, traditional Chinese exercises offer substantial, measurable alleviation of cervical pain in individuals with cervical spondylosis, substantiated by decreased Visual Analog Scale (VAS) ratings, fewer tender points, and lower recurrence frequencies. The operative mechanisms include musculoskeletal elongation relieving nerve root compression, neuroadaptive shifts bolstering endogenous analgesic pathways, and anti-inflammatory responses dampening both peripheral and central sensitization. These diverse therapeutic advantages establish traditional Chinese exercises as potent non-pharmacological strategies for managing cervical pain and enhancing functional capacity in this cohort. Subsequent investigations should focus on delineating specific molecular cascades and refining exercise protocols to optimize clinical outcomes.

5. Improvement of Functional Impairment by Traditional Chinese Exercises

5.1. Enhancement of Cervical Spine Functional Scores

Traditional Chinese exercises (TCEs) have exhibited remarkable effectiveness in enhancing cervical spine functionality among individuals suffering from cervical spondylosis and associated neck ailments, as substantiated by numerous clinical investigations and meta-analytic reviews. A paramount and extensively validated instrument for assessing cervical function is the Neck Disability Index (NDI), which evaluates the extent of disability and functional limitations attributable to neck pain. Clinical trials have documented considerable declines in NDI scores subsequent to TCE interventions, with certain studies recording reductions from baseline measurements of 6.10 to 1.4 points, reflecting an approximate improvement rate of 77% [23]. This pronounced decrease signifies a substantial recovery in patients' capacity to execute daily activities, emphasizing the functional advantages of TCEs within this demographic.

Beyond subjective disability metrics, objective assessments such as cervical range of motion (CROM) have also demonstrated significant enhancements. Overall cervical mobility has been observed to rise from an average of 19.78 to 67.4, with particularly noteworthy improvements noted in flexion-extension and rotational movements. These advancements align with patients' self-reported alleviation of pain during head elevation and rotation, indicating that TCEs not only mitigate discomfort but also restore biomechanical functionality [13]. The augmentation of cervical mobility is pivotal, given that restricted movement frequently contributes to functional constraints and diminished quality of life in cervical spondylosis. Importantly, a network meta-analysis encompassing 44 randomized controlled trials affirmed that Baduanjin, Yijinjing, Tai Chi, and Wuqinxi, when integrated with standard care, surpass standard care alone in boosting overall therapeutic efficacy and lowering NDI scores [9,15].

Diagnostic and therapeutic standards rooted in Traditional Chinese Medicine further corroborate the clinical potency of TCEs. Research utilizing these criteria has revealed that the overall response rate of TCE interventions exceeds 90%, with select trials reporting rates as high as 97.14% [15]. These outcomes outperform those achieved by groups undergoing conventional physical therapy exclusively, highlighting the superior or adjunctive role of TCEs in addressing cervical dysfunction. Additional intervention studies have demonstrated that neck Gongfa exercises can effectively ameliorate cervical soft tissue tension and motor impairments in individuals at elevated risk for cervical spondylosis, significantly curtailing the short-term incidence of the condition [23].

Among the spectrum of Traditional Chinese Exercises (TCEs), Baduanjin and Yijinjing have garnered specific attention for their efficacy in restoring cervical function. Systematic reviews indicate that Baduanjin markedly alleviates neck pain, reduces disability metrics, and increases cervical mobility [9]. Conversely, Yijinjing, particularly when integrated with manual interventions like Tuina, produces superior results regarding pain mitigation and functional restoration [10,25]. Tai Chi, another widely practiced TCE, has been observed to optimize cervical physiological curvature and expand the range of motion when utilized alongside standard treatments, thereby reinforcing the utility of TCEs in functional rehabilitation [24]. Furthermore, coupling core stability protocols with Wuqinxi effectively mitigates cervical discomfort and enhances function in individuals suffering from neck-type cervical spondylosis. In a similar vein, the combination of moxibustion and adapted Wuqinxi routines has exhibited substantial clinical benefits in ameliorating symptoms associated with cervical spondylosis.

The physiological basis for these functional gains likely encompasses increased muscular strength and endurance within the cervical and scapulothoracic complexes, refined proprioceptive acuity, and the modulation of nociceptive processing via mind-body synchronization. The strengthening and flexibility components intrinsic to TCEs facilitate the normalization of cervical biomechanics, whereas the meditative aspects may attenuate muscle hypertonicity and psychological distress, both of which are recognized aggravators of chronic neck pain [12,20,26].

Collectively, current evidence substantiates that TCEs significantly enhance cervical spine functionality in populations presenting with neck pain and cervical spondylosis. Such improvements are characterized by reduced disability scores, expanded cervical range of motion, and elevated overall efficacy rates relative to conventional therapeutic approaches. Incorporating TCEs into rehabilitation regimens presents a viable, non-pharmacological strategy for reinstating cervical function and elevating patient quality of life.

5.2. Factors Related to Functional Recovery

The magnitude of functional restoration attained via traditional Chinese exercises (TCE) is contingent upon multiple determinants, notably the length of the intervention, the specific exercise regimen employed, and unique patient attributes. A consistent positive correlation exists between the duration of therapy and clinical efficacy. Evidence from clinical trials indicates that observable enhancements in cervical function can emerge following a brief four-week TCE regimen. Nevertheless, extending practice to 12 weeks or beyond yields substantially greater benefits, exemplified by an approximate 10.97% decline in rates of abnormal cervical curvature, which signifies improvements in both anatomical structure and symptomatology [23,25].

Selecting an appropriate TCE modality is equally pivotal for addressing distinct functional deficits. For instance, Baduanjin proves particularly efficacious in augmenting cervical spine flexibility; its focus on mild stretching coupled with synchronized breathing promotes soft tissue relaxation and enhances joint mobility. In contrast, Wuqinxi and related Five-Animal Exercises emphasize dynamic motions that fortify the shoulder and back musculature, thereby bolstering postural stability and muscular endurance. Clinical investigations have confirmed that integrating core stability training with Wuqinxi effectively mitigates cervical pain and restores function in patients suffering from neck-

type cervical spondylosis. Likewise, combining moxibustion with a modified Wuqinxi protocol has demonstrated marked clinical success in alleviating symptoms associated with cervical spondylosis. Such variations underscore the necessity of tailoring exercise prescriptions to align with each patient's primary functional impairments and rehabilitative objectives [6,15].

Furthermore, integrating Traditional Chinese Exercises (TCEs) with adjunctive therapies, such as Tuina massage or intermediate frequency electrical stimulation, has been demonstrated to enhance functional restoration. Specifically, randomized controlled trials indicate that the conjunction of Yijinjing and Tuina produces superior amelioration in pain levels, disability scores, and cervical range of motion relative to Tuina monotherapy, thereby underscoring the synergistic potential of multimodal treatment strategies [10,25]. Current research efforts are directed toward rigorously assessing the efficacy and safety profiles of combined Yijinjing and Tuina protocols for cervicgia through comprehensive systematic reviews and meta-analyses [25]. These integrative approaches may expedite recovery by concurrently mitigating muscular hypertonicity, correcting joint dysfunctions, and refining neuromuscular coordination.

Patient compliance and active engagement constitute additional pivotal factors influencing functional prognosis. Empirical evidence suggests that increased session frequency and extended intervention durations correlate with more pronounced improvements in pain and physical function, particularly within regimens emphasizing motor control and resistance training. This observed dose-response gradient highlights the necessity of structured, consistent exercise protocols to maximize therapeutic efficacy [26]. Moreover, patient expectations and perceived treatment credibility significantly modulate adherence rates and clinical outcomes, implying that educational interventions and motivational support are indispensable elements of effective rehabilitation programs [27].

In summary, functional recuperation following Traditional Chinese Exercise interventions is multifactorial, driven by intervention duration, specific exercise modalities, combinatorial therapies, and patient adherence. Customizing exercise prescriptions to align with individual patient requirements while ensuring sustained participation is paramount for optimizing cervical spine functionality and minimizing disability among individuals suffering from neck pain.

6. Limitations, Safety, and Future Research Directions

6.1. Limitations of Existing Studies

Methodological shortcomings include modest sample sizes (mean ~65.6 participants), increasing type II error risk. Lack of blinding introduces subjective bias, potentially inflating perceived efficacy. Heterogeneity in cervical spondylosis subtypes and age ranges complicates subgroup identification. Outcome assessments rely predominantly on subjective pain metrics, lacking objective biomarkers (imaging, EMG, inflammatory markers) [24,29]. These deficiencies underscore the need for large-scale, rigorously designed RCTs with standardized protocols and blinded evaluations [14,15,28,29].

6.2. Safety Evaluation

Current evidence indicates a robust safety profile for TCEs in cervical spondylosis, with no severe adverse events. Minor complications (transient myalgia, fatigue) resolve within 48 hours. Yijinjing trials report zero adverse reactions [22,30]. However, caution is needed in elderly or osteoporotic patients, as excessive cervical manipulation could precipitate vertebral trauma. Professional oversight, bone mineral density testing, and screening for contraindications are mandatory [23,33]. Overall, TCEs offer a favorable safety landscape when implemented with expert guidance [23,24,25,32].

6.3. Future Research Recommendations

Future investigations should prioritize multicenter, large-scale, double-blind RCTs with standardized metrics (NDI, VAS) and functional imaging (fMRI, EMG) to objectively

quantify neuromuscular changes [14,24]. Personalized exercise regimens based on TCM syndrome differentiation (e.g., qi deficiency with blood stasis, liver yang hyperactivity) could enhance therapeutic precision [16]. Telemedicine platforms may improve accessibility and compliance; web-based neck-specific training has shown promising long-term outcomes. Longitudinal evaluations of sustained efficacy, safety, and cost-effectiveness are needed to inform clinical guidelines [9,24,33-35].

Traditional Chinese Qigong (Baduanjin, Yijinjing, Wuqinxi) represents a synthesis of ancestral knowledge and contemporary rehabilitation science. Accumulating data supports these modalities as potent non-pharmacological strategies for mitigating cervical pain, restoring functional mobility, and reducing recurrence [6,15,22]. Mechanistically, enhanced perfusion, suppression of pro-inflammatory cytokines, strengthening of cervical musculature, and restoration of physiological lordosis drive therapeutic gains [18,22]. Despite encouraging results, methodological constraints require larger, high-quality RCTs [15,25,26]. Harmonizing TCM individualization with evidence-based standardization is essential. Professional supervision ensures correct technique and safety [23,25]. In summary, traditional Chinese Qigong exercises offer substantial potential as adjunctive or alternative interventions for cervical spondylosis, warranting judicious integration into clinical workflows guided by emerging high-quality data.

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