



# Effects of health qigong on cervical spondylosis: A systematic review<sup>☆</sup>

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## ABSTRACT

**Aim:** Exercise therapy is a widely utilized intervention for the prevention and rehabilitation of cervical spondylosis. As a distinctive form of traditional exercise therapy in China, Health Qigong has been empirically validated to exert beneficial effects across 17 physiological systems, with particularly pronounced efficacy in addressing musculoskeletal disorders. This systematic review aims to critically evaluate the impact of Health Qigong on cervical spondylosis.

**Methods:** According to the literature search principles, works published from the publication date to November 2024 were searched. The databases used were the China National Knowledge Infrastructure, Scopus, PubMed, Web of Science, and EBSCOhost (SPORTDiscus). The study quality was evaluated using the Physiotherapy Evidence Database (PEDro) scale. The search process was documented using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)2020.

**Results:** A total of 10 studies were selected from an initial pool of 702 studies, comprising 656 participants. The PEDro scores of the 10 studies ranged from seven to eight. The findings indicate that Health Qigong exerts its therapeutic effects on cervical spondylosis primarily in four key areas: alleviating neck pain, improving cervical dysfunction, restoring cervical curvature, and enhancing cervical mobility. Specifically, for pain relief, the Visual Analog Scale(VAS) scores showed a mean reduction of 2.8–4.15 points, while the Neck Disability Index (NDI) scores significantly decreased from 6.10 to 1.4. And after intervention, the prevalence of abnormal cervical curvature decreased by 10.97%, cervical range of motion (CROM) improved by 19.78° to 67.4° on average. Furthermore, according to the Traditional Chinese Medicine (TCM) Diagnostic and Treatment Criteria, five studies reported an overall effectiveness rate exceeding 90%, with a maximum of 97.14%. Short-term intervention outcomes indicated that Ba Duan Jin showed a recurrence rate of 0%, whereas interventions using Yi Jin Jing and Wu Qin Xi exhibited recurrence rates ranging from 11.2% to 13.33%.

**Conclusion:** As an exercise-based intervention, Health Qigong not only helps alleviate cervical spondylosis-related pain and improve cervical dysfunction but also promotes the restoration of cervical curvature and enhances cervical mobility, thereby addressing limitations in neck function. However, current research exhibits certain limitations and research gaps in areas such as populations, cervical spondylosis classification, intervention design, and outcome assessment criteria. Therefore, there is an urgent need to develop more targeted intervention strategies, establish standardized outcome evaluation systems, and conduct in-depth mechanistic studies to further validate the clinical efficacy and practical application of Health Qigong in the management of cervical spondylosis.

## 1. Introduction

Cervical spondylosis is prevalent across different countries and age groups, with a global overall prevalence ranging from 10% to 17.6%,

making it a widely recognised public health concern.<sup>1–3</sup> In 2002, the American Academy of Orthopedic Surgeons (AAOS) classified cervical spondylosis into axial neck pain, cervical radiculopathy, and cervical myopathy, where neck pain was the most common clinical symptom of

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cervical spondylosis.<sup>4</sup> In 2017, the age-standardized prevalence rate of cervical spondylosis per 100,000 people worldwide was 3551.1, and 352 per 100,000 people were disabled due to cervical spondylosis.<sup>5</sup> According to the World Health Organization's 2021 Global Health Estimates (GHE) report, neck pain ranks sixth among global disease burdens.<sup>6</sup> Globally, the number of prevalent cases of neck pain reaches 288.7 million, with 28.6 million people becoming disabled annually due to this condition,<sup>5</sup> and its direct or indirect mortality rate can be as high as 9.4%.<sup>7</sup> In China, nearly 5000 individuals per 100,000 people are affected, with an average annual treatment cost exceeding 50,000 yuan per person.<sup>8</sup> In China, the physical and economic impacts of neck pain have elevated its disease burden ranking from 21st in 1990–9th in 2017.<sup>9</sup>

*Cervical spondylosis* is a clinical disease based on degenerative pathological changes and is also known as cervical degenerative disease.<sup>10</sup> The main factors contributing to cervical spondylosis onset were the degenerative cervical spine changes that occur with age. Work and study pressure and lifestyle and dietary habit changes were the main reasons for the increasing incidence of cervical spondylosis in this technological society.<sup>11</sup> The pain, changes in neck curvature and mobility, and neck dysfunction caused by cervical spondylosis seriously affected the patient's quality of life.<sup>12</sup> Research indicates that as cervical spondylosis progresses, patients may experience not only anxiety, depression, and sleep disturbances,<sup>13,14</sup> but also respiratory dysfunction,<sup>15</sup> cervicogenic cardiac syndrome,<sup>16</sup> otolaryngological dysfunction,<sup>17</sup> cognitive impairment,<sup>18–20</sup> gait abnormalities,<sup>21</sup> as well as balance issues and syncope,<sup>22,23</sup> posing a severe threat to both physical and mental well-being.<sup>24</sup> Therefore, improving and alleviating the pain and cervical dysfunction caused by cervical spondylosis have become crucial.

The clinical practice guidelines for musculoskeletal injuries developed by the Orthopedics Branch of the American Physical Therapy Association (APTA) note that non-surgical therapy was the preferred intervention method for neck diseases and have summarized the effect of different exercise interventions on neck diseases.<sup>25</sup> The "Guidelines for the Diagnosis, Treatment, and Rehabilitation of Cervical Spondylosis," released in China in 2017, also state that non-surgical treatment was the leading choice for promoting and rehabilitating cervical spondylosis. Many studies have confirmed that exercise therapy has a strong, positive effect on cervical spondylosis promotion and rehabilitation.<sup>26–28</sup> Systematic reviews with moderate-quality evidence indicate that exercise therapy (active training), manual therapy, and pharmacotherapy all have positive effects in the intervention of cervical spondylosis, with exercise therapy proving to be the most effective, followed by manual therapy, while pharmacotherapy shows relatively weaker effects.<sup>29–33</sup>

Exercise therapy is a non-surgical intervention that utilizes active or passive exercise to prevent and intervene in cervical spondylosis.<sup>34</sup> Based on the characteristics and clinical features of different diseases and following the principles of exercise and the laws of disease development, targeted active or passive exercise promotes disease recovery, alleviates accompanying symptoms, and aids the recovery of patients' physical skills and social life abilities. In China, traditional exercise therapy is mainly based on traditional sports, such as Tai Chi and Health Qigong.<sup>35</sup> Modern exercise therapy mainly includes resistance training, yoga, pilates, cervical exercises, and passive forms of suspension exercise.<sup>36</sup>

China was a representative country for traditional exercise therapy. The ancient Chinese "guiding technique" and the famous Chinese medical expert Hua Tuo's "Wu Qin Xi" were the earliest embryonic forms of exercise therapy. Health Qigong originated from these early exercise therapies, and mature guiding techniques have been developed. Its primary form was mainly physical activities, breathing, and psychological regulation, and it harmonized and unified the body, mind, and the environment through internal and external cultivation, optimizing the overall body and mind functions.<sup>37</sup> Internationally, nine types of Health Qigong routines enjoyed widespread popularity. Among

these, examples like Yi Jin Jing, Wu Qin Xi, and Baduan Jin, which were the focus of this study, were particularly renowned. The advantages of Health Qigong include simplicity and ease of learning, the fact that it is not restricted by age and venue, the ability to adapt to numerous diseases and minimal financial cost.<sup>38</sup> Although research on the Health Qigong mechanism of action was insufficiently in-depth, it was a means of exercise intervention in promotion and rehabilitation medicine research.

Although multiple studies have explored the effects of different Health Qigong routines on various symptoms of cervical spondylosis,<sup>39–45</sup> systematic reviews evaluating the role of Health Qigong as an intervention for cervical spondylosis remain limited. Therefore, this study aims to conduct a systematic review by summarizing and critically evaluating the existing literature to provide a comprehensive assessment of the effects of Health Qigong on cervical spondylosis management.

## 2. Methods

### 2.1. Qualification criteria

The inclusion criteria for this review used PICOS.<sup>46</sup> It included population, intervention, comparison, outcome, and study design (Table 1). Additionally, the following were included: (i) research containing randomized controlled trial (RCT), (ii) research subjects with cervical spondylosis (excluding those in the undiagnosed stage of neck pain), (iii) Health Qigong routines as an intervention, including all different routines and intervention measures that combine multiple routines, (iv) articles published in Chinese or English. In addition, because there were few studies on Health Qigong as a minority exercise intervention, the search scope was expanded to include studies on Health Qigong routines combined with different medical interventions (medication, acupuncture, massage therapy, and traction), the studies combining Health Qigong with other different types of sport interventions (resistance training, pilates, yoga, and tai chi) were excluded.

A search strategy was established, and the retrieved results were imported into Endnote to delete duplicate articles according to the inclusion criteria. Next, two reviewers (CL and HCM) independently screened the titles and abstracts. Then, the full-text articles that met the reading criteria were sorted based on the relevance of the search results. A third reviewer (YJM) resolved disagreements between the two reviewers. The results were based on the measurement of the effectiveness of the Health Qigong intervention in cervical spondylosis, such as the neck pain-related evaluation indicators: visual analog scale (VAS), neck pain questionnaire (NPQ), McGill pain questionnaire (MPQ), neck disability index (NDI), the cervical range of motion (CROM) and cervical curvature (CC) related to cervical mobility dysfunction, and to evaluate the effective rate (ER) and recurrence rate (RR) of comprehensive treatment efficacy.

**Table 1**  
Inclusion criteria.

Item	Detail
Participants	CS patients (male and female, without age or occupational restrictions)
Intervention	Different Health Qigong routines
Comparison	Active or passive control groups
Outcome	At least one cervical function indicator (VAS, NPQ, MPQ, NDI, CROM, or CC) or treatment efficacy measure (effective rate and recurrence rate) reflected before and after the Health Qigong intervention
Study design	Randomized control trial

CS, Cervical spondylosis; VAS, visual analog scale; NPQ, neck pain questionnaire; MPQ, McGill pain questionnaire; NDI, neck disability index; CROM, cervical range of motion; CC, cervical curvature; ER, effective rate; RR, recurrence rate.

2.2. Data source and search

This systematic review has gathered pertinent articles on Health Qigong's efficacy in treating cervical spondylosis, encompassing publications since the database's inception. The effects of Health Qigong on cervical spondylosis were summarized based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA).<sup>47</sup> The detailed search strategy for this study can be found in the attachments. The search involved the core databases of Scopus, PubMed, Web of Science, CNKI, and EBSCOhost (SPORTDiscus). The search deadline was November 2024. The keywords were determined through a systematic review of the literature's citations. As Health Qigong was a collective term for nine routines, the names of which all contain the keyword "Health Qigong" in the articles, they had a mutually inclusive relationship. For example, the full name of "Wu Qin Xi" in an article was often "Health Qigong - Wu Qin Xi." Therefore, "Health Qigong" was uniformly used in the keyword searches. The keywords searched in the five databases were consistent and as follows: ("health qigong" OR "qigong" OR "qi gong" AND "cervical spondylopathy" OR "cervical spondylosis" OR "cervical syndrome" OR "cervical spine" OR "cervical spine syndrome" OR "neck pain"). This research was approved by the International Platform of Registered Systematic Review and Meta-analysis Protocols (INPLASY ID: INPLASY2023110094).

2.3. Study selection

Literature searches were conducted on five major databases and the Google Scholar database, yielding 702 articles. Subsequently, 145 duplicate articles were deleted using Endnote. Then, 182 review articles, not journal articles, and not full text articles were excluded. 323 articles were excluded based on the qualification criteria. Finally, whole-article screening excluded 42 articles based on the strict screening criteria and definitions. The remaining articles were included in this study (Fig. 1).

2.4. Quality assessment and data extraction

The quality of the selected articles was evaluated using the Physiotherapy Evidence Database (PEDro) randomized controlled trial quality evaluation tool.<sup>48</sup> The retrieved papers were evaluated using specific methodological criteria: study design, sample size, randomization, outcome data, statistical analysis, and PEDro scale report quality. Two experienced evaluators conducted the evaluation, and a third evaluator resolved disagreements. The PEDro scale uses a 0–10 scoring standard, where the highest score was 10 points, and the first item (qualification criteria) was not in the total score. Therefore, a higher quality method results in a higher PEDro scale score, and vice versa. CL and HM searched and screened articles according to the PICOS principle and selected articles independently based on the title and abstract. Differing opinions were filtered through full-text reading. The final extracted data included the (i) participants, (ii) intervention, (iii) comparison, (iv)

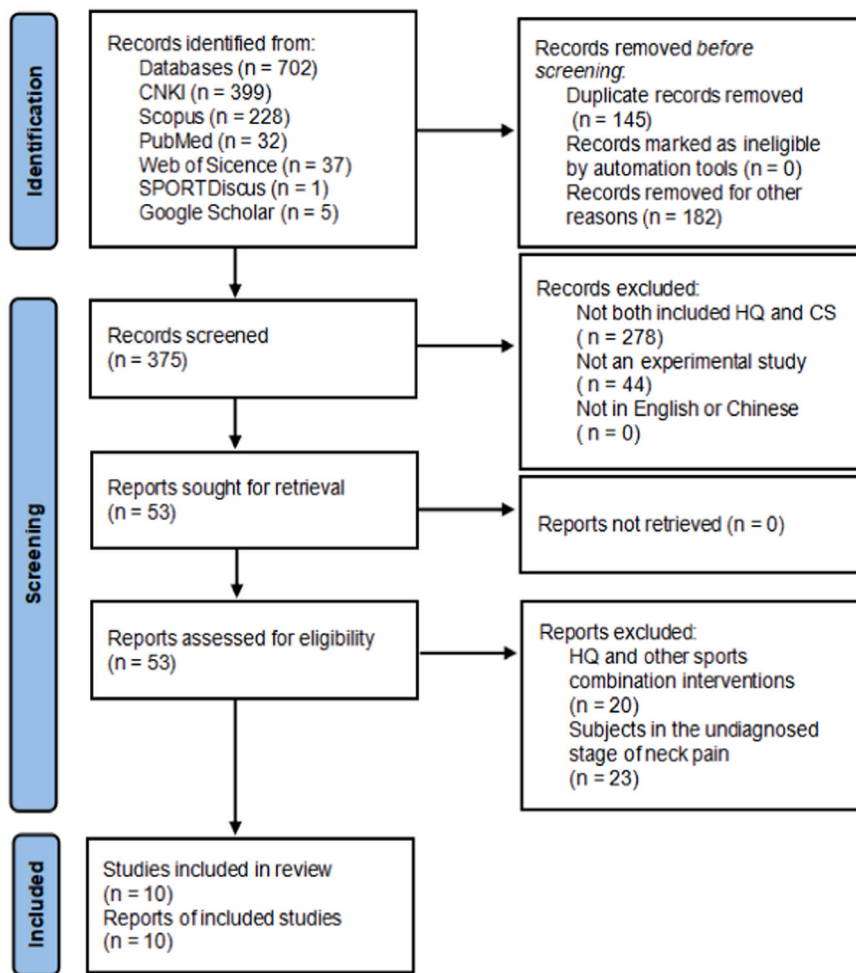


Fig. 1. PRISMA study selection process.

outcomes, and(v) study design.

### 3. Results

#### 3.1. Study selection

The article retrieval identified 702 records: CNKI (n = 399), Scopus (n = 228), PubMed (n = 32), Web of Science (n = 37), and EBSCOhost (SPORTDiscus) (n = 1). We also used Google Scholar (n = 5) for additional records, obtaining 702 articles. First, 327 duplicate articles and conference report texts were deleted. Second, 322 articles were excluded based on the research projects and inclusion criteria. Of the remaining 53 articles, 20 were excluded from combining Health Qigong with other types of sports interventions. Moreover, 23 articles were excluded as subjects in the undiagnosed stage of neck pain (those who only experienced neck pain but were not diagnosed). Finally, ten articles were selected for this review (Fig. 1).

#### 3.2. Methodical quality

The methodological quality of the included articles was evaluated using the PEDro scale, where the scores were 7–8 (mean = 7.3; median = 7; mode = 7). Based on the 11 evaluation items of the evaluation scale, a quality evaluation was conducted on the experimental research content included in the literature. The results showed that the quality of the included literature was good, with 8 points for three studies and 7 points for the remaining seven (Table 2).

#### 3.3. Characteristics of included studies

All included studies were randomized controlled trials (n = 10). The interventions mainly included the Yi Jin Jing, Wu Qin Xi, and Ba Duan Jin Health Qigong routines. The Ba Duan Jin routine was the most frequently used (n = 7). The studies involved 656 cervical spondylosis patients (310 males and 346 females). The sample size for each study was 50–94. The participants' average age range was extensive (17–75 years old) and was divided into three age groups: young people aged 19–35 years (n = 3), middle-aged people aged 36–59 (n = 4), and older adults > 60 (n = 3). All ten studies included pre-and post-tests. The primary interventions were divided into one Health Qigong routine (n = 8) and multiple Health Qigong routines (n = 2). Among these studies, interventions were further categorized into independent Health Qigong routine interventions (n = 3) and combined interventions incorporating other complementary and alternative medicine therapies (n = 7). The length of intervention was 2–24 weeks, with a frequency of 1–5 times per week. The duration of section was 15–80 min. The studies mainly focused on the effects of Health Qigong on pain (n = 8), the correlation between CC and CROM and their effect on cervical spine function (n = 5), and the efficacy of the intervention measures (n = 6) in cervical spondylosis (Table 3).

*M, Male; F, female; CG, control group; EG, experimental group; NI, no intervention; HQ, Health Qigong; BDJ, Ba Duan Jin; YJJ, Yi Jin Jing; WQX, Wu Qin Xi; MT, massage therapy; MD, medicine; AP, acupuncture; RT, rehabilitation therapy; CT, cervical traction; HAHA, Hamilton anxiety scale; JOA, Japanese orthopedic association scores; SF-MPQ, short form of McGill pain questionnaire; PPI, present pain intensity; PRI, pain rating index; NPRS, numerical pain rating scale; TYRF, Tanaka Yasuhisa rating form; ER, effectiveness rate; RR, recurrence rate. ↓, The values presented in the post-test were lower than those in the pre-test. The values presented in the post-test were higher than those in the pre-test. †, The experimental group demonstrated better positive effects than the control group.*

#### 3.4. Outcome

The ten included studies evaluated the intervention effects based on pre-test, post-test, and follow-up evaluations after the experimental

intervention. These evaluations focused on pain, neck dysfunction, cervical physiological curvature, cervical spine mobility, and the overall efficacy of the intervention. The goal was to examine the role of Health Qigong in the rehabilitation process for cervical spondylosis.

#### 3.5. Effect of health Qigong on neck pain

The included studies determined that the pain caused by cervical spondylosis was the most concerning. Eight studies evaluated the pain improvement effect of Health Qigong on cervical spondylosis through different methods<sup>43,49–52,54,55,57</sup>:

- Five studies evaluated participants for changes in visually simulated pain using a visual analog scale(VAS).
- Two studies evaluated neck pain and its effect on the participants' daily lives using the neck pain questionnaire(NPQ).
- Two studies conducted comprehensive pain assessments from three aspects: presentation pain intensity (PPI), pain rating index (PRI), and visual analog scale(VAS) using the McGill pain questionnaire(MPQ) and the short-form of McGill pain questionnaire (SF-MPQ).
- One study evaluated changes in four levels through participant self-assessment of pain levels using the numerical pain rating scale (NPRS).

Pain was the primary symptom and one of the most important clinical features in the early stages of cervical spondylosis.<sup>58</sup> Among numerous pain assessment scales, the VAS was widely used in pain-related clinical trials and had high reliability and validity.<sup>59</sup> Five studies reported the participants' VAS scores before and after intervention.<sup>49–52,54</sup> Health Qigong significantly improved the experimental group participants' pain sensation compared to before the experiment, and the VAS scores demonstrated a significant downward trend. The experimental group had significantly lower scores than the control group, indicating that Health Qigong had a good promoting role in the relief effect of cervical spondylosis pain. Guo<sup>49</sup> divided the VAS scores of experimental and control cervical spondylosis patients into three stages (day 14, day 28, and day 42 of the experiment). The VAS scores of both groups decreased significantly compared to before the experiment (from 2.72 to 0.55). However, the VAS score of the control group significantly increased on day 42 compared to day 28, while that of the experimental group did not increase. In the three testing stages post-test, the experimental group had a significantly lower VAS score than the control group. Although the score of the control group also decreased, the decrease was not significant (from 2.62 to 2.17). This result indicated that Health Qigong had a more sustained effect on relieving pain.

In addition to pain assessment, other issues caused by cervical spondylosis pain were also addressed. Two studies<sup>43,52</sup> evaluated neck pain and its effect on the participants' daily lives using the NPQ, which includes nine items related to neck pain severity, sleep, and daily life. A higher final evaluation value indicated a higher neck pain and effect level, and vice versa. These two studies reported a significantly better NPQ score for the Health Qigong group and more sustained intervention effects on post-test and follow-up evaluations. Lin<sup>52</sup> reported that the NPQ score of the experimental group decreased from 33.89 to 16.33, while that of the control group decreased from 33.42 to 20.13. Additionally, Shang<sup>43</sup> reported that the NPQ score of the experimental group decreased from 35.41 to 16.42, while that of the control group decreased from 34.79 to 19.97. Moreover, the researchers evaluated the pain levels (mild, moderate, severe, and inability to fall asleep or wake up) before and after the intervention using the NPRS. Regardless of whether the evaluation index demonstrated > 2-fold reduction or a significant improvement in pain levels, the results indicated that Health Qigong had an excellent improvement effect on a series of issues, such as pain and poor sleep, caused by cervical spondylosis.

Finally, two studies<sup>55,57</sup> evaluated the intervention effect of Health

**Table 2**  
Summary of methodology quality assessment scores.

References	Eligibility criteria	Random allocation	Allocation concealment	Baseline comparability	Blind participants	Blind therapist	Blind assessor	Follow-up	Intention to treat analysis	Between-group comparisons	Point measure and variability	Total PEDro score
W Guo et al. (2023) <sup>49</sup>	1	1	1	1	0	0	1	1	1	1	1	8
Kunpeng Y et al. (2021) <sup>50</sup>	1	1	1	1	0	0	1	1	1	1	1	8
Liming W et al. (2019) <sup>51</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Qiu L (2015) <sup>52</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Yong Z et al. (2011) <sup>53</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Changle C et al. (2020) <sup>54</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Fu X (2020) <sup>55</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Yong J et al. (2019) <sup>56</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Pengcheng Z et al. (2015) <sup>57</sup>	1	1	1	1	0	0	0	1	1	1	1	7
Yuehui S et al. (2017) <sup>43</sup>	1	1	1	1	0	0	1	1	1	1	1	8

**Table 3**  
Sample features, main outcomes, and participant characteristics.

References	Participants	Frequency & Duration	Comparison	Measurement	Outcomes	Main Findings	
W Guo et al. (2023) <sup>49</sup>	N 60 Gender Mixed M = 14 F = 46 Age EG:17.2 ± 2.31 CG:17.27 ± 2.18	Freq:3times/ week Time: > 30 min Length:6weeks	CG=Walking EG:HQ-YJJ	NDI VAS CC	CG 6.63 ± 0.42↓6.27 ± 0.57/ CI= 5.01–7.32 2.62 ± 0.1↓2.17 ± 0.16/ CI= 1.87–2.50 30 %	EG 6.10 ± 0.43↓1.4 ± 0.26/ CI= 0.88–1.92 2.72 ± 0.15↓0.55 ± 0.12/ CI= 0.30–0.80 33 %	Compared to walking exercise, Yi Jin Jing demonstrates better effectiveness in alleviating pain, improving cervical function, and enhancing cervical curvature, with more sustained therapeutic effects.
Kunpeng Y et al. (2021) <sup>50</sup>	55 Mixed M = 27 F = 28 EG:49.62 ± 7.83 CG:46.45 ± 9.91	Freq:7times/ week Time:15 min Length:2weeks	CG:PT EG:PT+HQ- BDJ	VAS HAMA	6.57 ± 2.26↓3.02 ± 0.73 17.71 ± 6.04↓10.19 ± 5.89	6.13 ± 2.45↓1.98 ± 1.05 16.78 ± 5.46↓6.21 ± 3.19	Ba Duan Jin has been shown to alleviate cervical pain and reduce anxiety levels in patients with radiculopathy-type cervical spondylosis.
Liming W et al. (2019) <sup>51</sup>	68 Mixed M = 33 F = 35 EG:57.8 ± 5.61 CG:56.3 ± 5.32	Freq:3–5times/ week Time:30–40 min Length:8weeks	CG:NI EG:HQ-BDJ	NDI VAS CROM ER	43.7 ± 7.23↓31.9 ± 6.31 5.71 ± 2.43↓3.39 ± 2.7 42.23°↑ 84.8 %	44.2 ± 6.45↓22.9 ± 5.68 5.52 ± 2.03↓1.84 ± 2.41 67.4°↑ 91.4 %	Ba Duan Jin can effectively enhance cervical muscle function, stabilize the cervical spine, and facilitate patient rehabilitation.It demonstrates significant therapeutic efficacy in the intervention of cervical-type cervical spondylosis.
Qiu L (2015) <sup>52</sup>	50 Mixed M = 24 F = 26 EG:40.33 ± 7.33 CG:39.98 ± 8.34	Freq:5–6times/ week Time:80 min Length:10weeks	CG:MT EG:HQ-Mixed	VAS NPQ CROM RR	5.92 ± 1.76↓3.01 ± 1.56 33.42 ± 9.97↓20.13 ± 6.66 19.78°↑ 23.1 %	5.96 ± 1.82↓2.03 ± 1.29 33.89 ± 9.32↓16.33 ± 7.33 57.57°↑ 11.2 %	Compared to massage therapy and pharmacological interventions, Health Qigong exhibits better and more sustained improvements in cervical pain relief and cervical range of motion.It exhibits effective therapeutic outcomes in the intervention of cervical-type cervical spondylosis in middle-aged and elderly individuals.
Yong Z et al. (2011) <sup>53</sup>	60 Mixed M = 33 F = 27 21.5 ± 3.35	Freq:5times/ week Time:30 min Length:24weeks	CG:MT/MD EG:HQ-BDJ	CC ER	8.6 % 55 %	12.85 % 90 %	The rehabilitative effects of Ba Duan Jin intervention on cervical spondylosis in university students are superior to those of massage therapy and pharmacological treatment.
Changle C et al. (2020) <sup>54</sup>	94 Mixed M = 43 F = 51 CG:40.5 ± 8.6 EG:38.7 ± 8.4	Freq: > 5times/ week Time:30 min Length:12weeks	CG:AP EG:AP+HQ- Mixed	VAS PPI TYRF ER	6.41 ± 1.72↓4.25 ± 0.61 2.87 ± 0.61↓1.28 ± 0.29 8.18 ± 2.09↓10.22 ± 2.05 86.96 %	6.79 ± 1.26↓3.01 ± 0.57 2.92 ± 0.73↓0.97 ± 0.21 8.4 ± 2.31↓12.05 ± 3.92 93.75 %	Health Qigong serves as an adjunctive therapy for radiculopathy-type cervical spondylosis, contributing to the enhancement of cervical muscle strength and endurance, thereby promoting cervical joint stability and mechanical balance.
Fu X (2020) <sup>55</sup>	84 Mixed M = 52 F = 32 CG:55.98 ± 6.71 EG:56.34 ± 6.45	Freq:7times/ week Time:20–30 min Length:12weeks	CG:AP+MD EG: AP+MD+HQ- BDJ	JOA NPQ MPQ ER	11.05 ± 1.89↑13.21 ± 1.43 68.02 ± 5.76↓24.56 ± 3.98 16.97 ± 3.01↓7.33 ± 1.21 83.33 %	11.03 ± 2.01↑15.01 ± 1.04 66.87 ± 6.65↓17.41 ± 3.44 17.02 ± 2.76↓5.65 ± 1.09 92.86 %	Ba Duan Jin, as an adjunct therapeutic approach, has been shown to effectively alleviate cervical pain and enhance cervical spine function in patients with cervical spondylosis.
Yong J et al. (2019) <sup>56</sup>	60 Mixed M = 30 F = 30 CG:44 ± 9.54 EG:42.87 ± 8.8	Freq:5times/ week Time:20 min Length:4weeks	CG:RT EG =RT+ HQ- WQX	CC	3.88 ± 1.98↑6.81 ± 2.36	4.08 ± 1.89↑8.98 ± 2.43	Wu Qin Xi has been shown to enhance muscle strength and coordination, restore exogenous dynamic balance, and improve cervical spine stability, demonstrating positive therapeutic effects in the management of cervical-type cervical spondylosis.

(continued on next page)

Table 3 (continued)

References	Participants	Frequency & Duration	Comparison	Measurement	Outcomes	Main Findings	
Pengcheng Z et al. (2015) <sup>57</sup>	60 Mixed M = 30 F = 30	55–75 Freq:6times/week Time: > 30 min Length:24weeks	CG:MD EG:MD+HQ- WQX	SF-MPQ (VAS/PPI)	10.7 ± 2.7 4.0 5 ± 1.17 2.20 ± 0.63 1.25 ± 0.65 47.25 ± 15.32 24.3 ± 16.78	10.4 ± 2.75 4.9 6 ± 1.01 2.18 ± 0.47 1.34 ± 0.52 56.29 ± 15.55 24.12 ± 17.08	Wu Qin Xi has been shown to effectively alleviate cervical pain symptoms in middle-aged and elderly individuals with cervical-type cervical spondylosis.
Yuehui S et al. (2017) <sup>43</sup>	65 Mixed M = 26 F = 39	CG:31.01 ± 11.58 EG:28.97 ± 10.33 Time:20–30 min Length:12weeks	CG:CT EG:CT+HQ- BDJ	NPRS NPQ CROM ER RR	6.73 ± 2.01 4.58 ± 1.48 34.79 ± 11.2 19.97 ± 7.15 32.47°↑ 80 % 13.33 %	7.01 ± 1.96 3.47 ± 1.35 35.41 ± 10.33 16.42 ± 5.63 59.89°↑ 97.14 % 0 %	The combination of Ba Duan Jin and cervical traction has been shown to effectively reduce pain, improve cervical joint range of motion, and promote rehabilitation in patients with cervical-type cervical spondylosis.

Qigong by assessing the changes in neck pain intensity caused by cervical spondylosis. The two studies comprehensively evaluated the participants' pain levels according to the PPI, PRI, and VAS. These three combined scales were collectively known as the MPQ and the SF-MPQ and were also commonly used scales for cervical spondylosis pain assessment.<sup>60</sup> These two studies were based on drugs or acupuncture and moxibustion to study the auxiliary treatment effect of Health Qigong on cervical spondylosis. The results demonstrated that the score of the experimental group with Health Qigong was significantly lower than that of the control group. Furthermore, the experimental group participants' pain degree and pain grading index significantly improved.

### 3.6. Effect of health Qigong on neck dysfunction

Four studies addressed the issue of neck dysfunction caused by cervical spondylosis.<sup>49,51,54,55</sup> Two studies evaluated cervical spine dysfunction changes among participants using the NDI scale.<sup>49,51</sup> One study comprehensively evaluated neck function using the Tanaka Yasuhisa rating form (TYRF).<sup>54</sup> One study evaluated cervical joint ability using a scoring scale developed by the Japanese Orthopedic Association (JOA).<sup>55</sup>

When cervical spondylosis developed further from the onset of initial pain to the imbalance of cervical dynamic balance, it also led to neck dysfunction. Headache, neck pain, poor attention, poor sleep quality, and poor quality of daily life were typical symptoms of cervical spine dysfunction. Of 10 studies, four<sup>49,51,54,55</sup> focused on this issue, but the measurement and evaluation of its intervention effects differed. Two studies<sup>49,51</sup> used the NDI scale reported by Howard Vernon in 1991,<sup>61</sup> which covers ten items and focuses on the related symptoms and daily living abilities caused by cervical spondylosis. The scale yields scores of 0–5 points. A higher severity of neck dysfunction results in a higher evaluation score, and vice versa. In these two studies, the post-test results demonstrated that the experimental group had a significantly lower cervical dysfunction index score than the control group. Additionally, the decreasing trend of the NDI score of the experimental group was significantly better than that of the control group.

Guo<sup>49</sup> reported that the cervical dysfunction index score of the experimental group decreased from 6.10 to 1.4, while the score of the control group decreased from 2.62 to 2.17. Wu<sup>51</sup> also reported similar results. Additionally, the control group's NDI score directly increased to near pre-intervention levels during the third stage (day 42 after intervention). In contrast, that of the experimental group remained at the post-test level. Another study<sup>54</sup> used the TYRF to comprehensively evaluate participants' functionality from clinical features, neck functional status, and daily behavioral ability. The results demonstrated that cervical function was significantly better after the intervention, and the intervention score increased from 8.4 to 12.05.

Finally, another study<sup>55</sup> evaluated neck dysfunction using the JOA scale. The JOA scale mainly evaluates joint movement ability, sensory perception ability, and other aspects. A higher score indicates better function, and vice versa. The JOA scale was commonly used in functional assessments of cervical spondylosis myelopathy.<sup>60,62</sup> The study evaluated the cervical dysfunction index by combining neck pain issues. The results demonstrated that the JOA score of the experimental group increased from 11.03 to 15.01 compared to before the intervention. Therefore, whether based on cervical dysfunction index score changes or cervical spine function evaluation, Health Qigong effectively alleviated cervical spine dysfunction issues and improved cervical spine function.

### 3.7. Effect of health Qigong on cervical curvature

Cervical Curvature(CC) changes were another common clinical symptom of cervical spondylosis, which could be caused by weakened muscle function, changes in the cervical spine static balance structure, and cervical spine structural abnormalities.<sup>63</sup> Massage techniques were not practical for restoring CC,<sup>64</sup> while neck extension exercise,<sup>65</sup> neck traction,<sup>66</sup> surgery,<sup>67</sup> and exercise therapy had more advantages for restoring CC. Three of the included studies<sup>49,53,56</sup> focused on CC, and all measured CC using the Borden method. The results all demonstrated that CC improved after intervention.

Guo<sup>49</sup> reported that the experimental group participants' CC improved significantly compared to before the experiment. The number of cervical spondylosis and straightening decreased, and the number of cervical spondylosis cases gradually returning to normal also increased from one to nine. Another study reported 10.97 % decreased CC among the experimental group participants after a six-month intervention.<sup>53</sup> The changes before and after the experiment were significantly different. Finally, Jiang<sup>56</sup> measured and evaluated the participants' depth of CC before and after the experiment. After the intervention, both participants demonstrated an increasing trend in cervical chord distance. In contrast, the experimental group exhibited a more significant increase trend than the control group, with an increased value of 1.97. These results demonstrated that Health Qigong significantly improved the cervical spine physiological curvature and can be used as an intervention measure for abnormal CC in cervical spondylosis.

### 3.8. Effect of health Qigong on cervical range of motion

Cervical intervertebral space changes and decreased neck superficial muscle strength were often accompanied by abnormal cervical mobility, which affected the dynamic balance of the cervical spine and accelerated cervical spondylosis development.<sup>68</sup> Three studies<sup>43,51,52</sup> used an arm-type protractor to assess the cervical range of motion (CROM) from six angles: flexion, extension, lateral flexion, and rotation. Wu<sup>51</sup>

reported that both groups demonstrated a significant increase in CROM after the intervention, but the experimental group had a significantly greater growth trend than the control group. The other two studies reported similar results<sup>43,52</sup> and in the follow-up. The measurement results 3–6 months after the intervention revealed that the experimental group participants continued to have better cervical spine activity than the control group, maintained at the post-test level, indicating that Health Qigong had an enduring effect on improving cervical spine activity.

### 3.9. Comprehensive treatment efficacy of health Qigong on cervical spondylosis

Efficiency was the most direct means of assessing intervention effectiveness. Five studies<sup>43,51,53–55</sup> compared the effectiveness of Health Qigong programs after the intervention. Four studies evaluated the comprehensive effects<sup>43,51,53,54</sup> concerning the “Diagnostic Efficacy Standards for Traditional Chinese Medicine Diseases.” The evaluation of therapeutic effects for cervical spondylosis in the standards was divided into four situations. First, in cured patients, the clinical symptoms disappear, the cervical spine function returns to a normal living state, and there is no recurrence for three months. Second, the effect was significant, clinical symptoms were significantly relieved, and cervical function was significantly improved, but recurrence might still occur under inducement. Third, there was some improvement in clinical symptoms and cervical spine function. Fourth, the intervention was ineffective, and the clinical symptoms and cervical spine function were not improved. The remaining study<sup>55</sup> referred to the “Guiding Principles for Clinical Research of New Chinese Medicine Drugs (Trial)”, but there was almost no difference in the overall efficacy evaluation content and details compared to the standards adopted in the above four studies.

After comparing the comprehensive effects, the studies reported that the experimental group had a higher effective rate than the control group, with an effective rate of > 90 % and the highest rate was 97.14 %, all of which were 6.6–17.4 percent points higher than those of the control group.<sup>43,51,53–55</sup> These results demonstrated that Health Qigong had a significant and stable effect on cervical spondylosis intervention as the up and down, front and back, and left. Right neck movements correctly pulled the shoulder and neck muscle tissues and the cervical spine and spine joints. This result enhanced the strength of the neck muscles to improve neck fatigue damage, strengthened cervical spine stability, increased cervical joint activity, and improved the intervention effectiveness.

In clinical research, the cure and recurrence rates were essential indicators for testing the persistence of interventions. Among the ten included studies, two studies<sup>43,52</sup> explicitly raised the issue of the recurrence rate. Both studies continuously tracked and monitored participants in both groups for one month after the experiment ended. The subsequent evaluation results demonstrated that the control group had a much higher cervical spondylosis recurrence rate than the experimental group. Shang<sup>43</sup> reported that the recurrence rate in the control group was 13.33 % three months after the intervention, while there was no recurrence in the experimental group.

Lin<sup>52</sup> reported that the recurrence rate in the experimental group was 11.2 % six months after the intervention, while that of the control group was 23.1 %, 11.9 percent points higher than the experimental group. In the early stage of cervical spondylosis formation and the later stage of intervention treatment, attention should focus on cervical spondylosis prevention and recurrence. Although much research was needed to prove that Health Qigong was decisive in preventing cervical spondylosis, it was undoubtedly a good choice for preventing cervical spondylosis recurrence.

## 4. Discussion

### 4.1. Pain of cervical spondylosis: a public health concern

Neck pain ranked fourth among the causes of human disability.<sup>69</sup> Approximately 20–50 % of adults experience neck pain every year, with a continuously increasing trend.<sup>5</sup> The numerous neck issues and clinical symptoms caused by cervical spondylosis have become a severe public health issue, especially the accompanying persistent pain and long treatment process, which impose tremendous mental pressure and an economic burden on patients. Additionally, when cervical spondylosis further develops to the point where surgical treatment is required, not only the patient’s age and physical condition need to be considered, but also surgical risks such as paralysis and death will be faced.<sup>70,71</sup> Health Qigong had dual functions of medicine and sports and was an essential component of traditional Chinese sports with ethnic characteristics. Health Qigong is guided by traditional Chinese medicine and health preservation. It combines physical exercise with breathing to regulate the mind internally and the body externally, improving overall physiological functions and effectively enhancing the quality of life.<sup>37</sup>

Aerobic exercise was beneficial for improving neck pain.<sup>72</sup> Accordingly, the aerobic exercise of Health Qigong was an effective health-promoting exercise.<sup>73</sup> Lee’s review reported that many experimental results have demonstrated that Health Qigong has an excellent promoting effect in the treatment process for different age groups and diseases. Health Qigong affects blood lipid levels, blood pressure, and limb movement and is preventive in skeletal diseases, improving quality of life.<sup>38,73,74</sup> Furthermore, the Health Qigong Exercise Management Center of the General Administration of Sport of China officially began research on Health Qigong prescriptions in 2020, which included research on exercise prescriptions for cervical spondylosis. This review explored the effect of exercise intervention therapy such as Health Qigong on cervical spondylosis. It provided effective Health Qigong plans for populations with different clinical cervical spondylosis symptoms to improve their clinical symptoms effectively.

Research across various countries has confirmed that multiple factors, including physiological, pathological, and environmental elements, influence cervical spondylosis. Physiological factors include age, gender, genetics, and congenital cervical spine abnormalities, while environmental and lifestyle factors encompass occupation, climate, heavy lifting, and poor posture. Pathological factors include degenerative changes, trauma, mechanical imbalance, ischemia, fluorosis, and inflammatory infections.<sup>75–77</sup> The neck mainly comprises the cervical spine, muscles, ligaments, and intervertebral arteries. The neck is a crucial connection between the trunk and brain, and the most prominent feature of cervical spondylosis was the disease of the cervical spine, which was the primary damage area. The corresponding interventions must be implemented when the imbalance of vertebral joint instability and the neck muscle group causes clinical reactions.

### 4.2. Effectiveness of different health Qigong routines in managing cervical spondylosis

The ten studies in this review mainly included three routines: Health Qigong - Yi Jin Jing, Wu Qin Xi, and Baduan Jin. Each routine had its characteristics and effects. Our review demonstrated that all three routines effectively improved the pain, neck dysfunction, CC changes, and abnormal cervical mobility caused by cervical spondylosis. However, specific Health Qigong routines had different improvement effects on a particular symptom. The interventions in the included studies focused on cervical-type cervical spondylosis (CTCS, n = 7), followed by cervical spondylotic radiculopathy (CSR, n = 2) and mixed cervical spondylosis (MCS, n = 1), which was similar to the research characteristics of exercise therapy for cervical spondylosis. Indeed, most studies on exercise intervention strategies focused on CTCS. Thus, other intervention measures should be implemented when cervical spondylosis develops to a

more severe degree and presents more severe clinical features.

Pain was prevalent in the entire cervical spondylosis process, seriously affecting the patient's physical and mental state and quality of life. Among the ten studies, eight evaluated pain changes, and Ba Duan Jin was the most commonly used intervention technique ( $n = 4$ ). Without considering differences in the populations and types of cervical spondylosis, an analysis of the pain-related evaluation indicators revealed that Ba Duan Jin stood out as the most optimal choice for pain alleviation. The results of six selected VAS evaluations of pain changes demonstrated that the VAS score underwent the most significant change after the Ba Duan Jin intervention, directly decreasing by 4.15 points.<sup>50</sup> The findings regarding the NPQ and MPQ indicators also indicated a substantial reduction in NPQ score by approximately 49.46 following Ba Duan Jin intervention, compared to a mere reduction of about 17.79 observed with the three routine combinations. Similarly, regarding the MPQ score, the Ba Duan Jin intervention group exhibited a noteworthy decrease of 9.64, surpassing the 6.65 decrease observed in the Wuqinxi intervention group. These results demonstrated Ba Duan Jin's superior efficacy in reducing pain index and intensity compared to other routines.

Moreover, differences in the type of cervical spondylosis and intervention content may have affected the study results. Because the typical symptom of CRS was persistent pain, and the pain index and intensity are much higher than CTCS, after intervention, participants' somatosensory differences in pain changes were relatively large, resulting in significant score differences before and after the experiment. Regarding intervention content, some studies directly used a complete routine of Health Qigong for intervention.<sup>49,57</sup> In contrast, other studies only used targeted actions.<sup>50</sup> Some studies extracted a combination of one of the three routines for the intervention.<sup>52,54</sup> Some studies have even selected other combined intervention therapies,<sup>43,50-57</sup> which might explain the difference in results.

Therefore, without considering differences in populations, types of cervical spondylosis, and differences in combined intervention content, Ba Duan Jin had more significant advantages than other intervention routines in improving pain caused by cervical spondylosis. The comprehensive results indicated that Ba Duan Jin strengthened the neck and shoulder muscles (such as the deep semispinalis and shallow trapezius) through eight symmetrical stretching movements and also improved muscle fascial strain, promoted blood circulation in the neck arteries, stimulated the absorption of inflammation, and ultimately relieved shoulder and neck pain.<sup>78</sup> These measures resulted in Ba Duan Jin having more significant advantages in improving pain than other intervention methods.

Abnormal CC and CROM result from cervical dynamic imbalance and were among the objective diagnostic criteria of cervical spondylosis.<sup>79</sup> CC and CROM changes positively correlated with cervical spondylosis development. A higher probability of abnormality indicates a higher severity of cervical spondylosis, and the two were mutually influential.<sup>56</sup> The analysis of results from three studies<sup>49,53</sup> with similar age groups and consistent types of cervical spondylosis studied revealed that the Yi Jin Jing routine had a better effect than Ba Duan Jin on CC changes, where the proportion of cervical vertebrae that returned to normal increased to more than 30%, which was higher than the proportion of post-recovery after the Ba Duan Jin intervention. These three studies used complete routine movements with a single intervention duration of 30 min. The Yi Jin Jing intervention cycle was three times a week, with a total intervention duration of six weeks, while the Ba Duan Jin intervention was five times a week with an entire intervention duration of 24 weeks.

The above analysis demonstrated that the choice of intervention routines was the main influencing factor of CC changes, not intervention frequency and total duration. During practice, the Yi Jin Jing routine improved CC by emphasizing human spine rotation, flexion, and extension. The routine uses 12 movements to pull and rotate the limbs from top to bottom, causing the muscles to contract centripetal, centrifugal, isometric, and isotonic, improving skeletal muscle flexibility

and enhancing muscle strength.<sup>80</sup> Therefore, the Yi Jin Jing routine improves spinal stability by strengthening neck muscle strength and endurance while relaxing the neck and shoulder muscles, which is highly beneficial for enhancing cervical stability and resolving cervical dynamic imbalance.

The Ba Duan Jin routine demonstrated better results in improving cervical mobility. A complete Ba Duan Jin routine strengthens the neck and shoulder muscle groups, enhancing their load-bearing capacity, increasing CROM, and maintaining a stable mechanical balance of the cervical spine. The Ba Duan Jin routine improves cervical spine stability while increasing CROM in six directions.<sup>81-86</sup> Two studies<sup>51,52</sup> focused on the middle-aged and elderly population, and the type of intervention was for CTCS. The single intervention duration of the combined three routines was as long as 80 min, exceeding five interventions per week, and the total intervention duration was ten weeks. Contrastingly, the Ba Duan Jin intervention frequency was 3-5 times per week, with each intervention lasting 30 min, and the total intervention duration was eight weeks. Although the intervention duration and frequency of the former were higher than those of the latter, the results demonstrated that the improvement effect of the CROM after the Ba Duan Jin intervention remained more significant than that of the combination intervention. This result could have been due to the need for targeted intervention action and the lack of evaluation of the CROM in studies on the Yi Jin Jing intervention.<sup>49</sup>

Functional exercise promotes neck muscles and can improve the cervical active status of cervical spondylosis patients and prevent and impede cervical spondylosis development.<sup>87</sup> During cervical dysfunction, patients might experience neck discomfort symptoms and life-related issues, such as low sleep quality, impaired attention, and decreased behavioral ability. The included studies demonstrated that the Ba Duan Jin intervention significantly affected the cervical spine dysfunction index. The age difference of the intervention group might be the reason for this difference. Although both studies focused on CTCS, Guo's study<sup>49</sup> involved participants between 12 and 21 years old, while Wu's study<sup>51</sup> involved participants > 55 years old. Due to the positive correlation between cervical degenerative changes and age, the degree of cervical dysfunction in the middle-aged and elderly population was more severe than that in the adolescent population, which influenced the cervical dysfunction index improvement during the intervention. However, another study on mixed cervical spondylosis in middle-aged and elderly patients<sup>55</sup> reported that the JOA scale results demonstrated that Ba Duan Jin had a significant advantage in improving cervical function.

The effectiveness and recurrence rates were essential indicators for testing the effectiveness and sustainability of intervention strategies.<sup>88</sup> Summarization and analysis of the effectiveness and recurrence rates determined that Health Qigong demonstrated > 90% efficacy in CTCS, cervical spondylosis radiculopathy, and mixed cervical spondylosis. The effectiveness rates of the Ba Duan Jin intervention for mixed cervical spondylosis and CTCS were 92.86% and 97.14%, respectively. In comparison, the effectiveness rate of the three combined routines for cervical spondylosis radiculopathy was 93.75%. Additionally, the recurrence rate of cervical spondylotic radiculopathy treated with the three combined routines was 11.2%, while the recurrence rate of CTCS treated with Ba Duan Jin was 0%. There were two reasons for the differing results. First, the observation times of the recurrence rate differed. The combined intervention study followed the recurrence rate six months after the end of the intervention, while the other study observed recurrence three months after the end of the intervention. The second factor was that the cervical spondylosis type affected the recurrence incidence, where CTCS was the initial stage and had the mildest clinical symptoms compared to radiculopathy. Furthermore, the probability of recurrence was lower after effective intervention.

The included studies involved relatively few Wu Qin Xi interventions. Although the results of the Wu Qin Xi intervention were not optimal, they played a specific role in the clinical symptoms of cervical

spondylosis. The main movement characteristics of Wu Qin Xi were the symmetrical left and proper joint traction and rotation. The routine includes four cervical flexion and extension movements and left and proper rotation. These movements promote blood circulation in the neck, accelerate inflammation recovery, achieve smooth joint movement, and relieve muscle spasms. Furthermore, the Wu Qin Xi routine can adjust the balance of the cervical spine's mechanical system, improving cervical spine stability. The Wu Qin Xi routine can also relieve pain while increasing the CROM, ultimately restoring cervical spine physiological balance.<sup>28,56,57</sup>

#### 4.3. Future directions in health Qigong prescription and cervical spondylosis management

The physical and mental damage and economic burden caused by diseases seriously affect patients' quality of life. Scientific exercise intervention reduces the financial burden caused by diseases and effectively delays disease development.<sup>89</sup> The main issues in cervical spondylosis treatment and rehabilitation were easy recurrence and the challenging cure. Therefore, combining preventive and rehabilitation medicine research has more profound significance. This review validated the promoting effect of Health Qigong in cervical spondylosis rehabilitation and revealed the best improvement effect of different Health Qigong routines on cervical spondylosis clinical symptoms. The results demonstrated that the Health Qigong intervention effectively relieved cervical spondylosis-induced clinical signs such as pain, cervical dysfunction, CC, and CROM. The Ba Duan Jin routine was the most widely used Health Qigong routine in the included studies ( $n = 7$ ), mainly because it was most commonly used in soft tissue and bone joint diseases and had the best effect.<sup>16</sup>

#### 4.4. Study limitation

This study selected ten articles from the Scopus, PubMed, CNKI, Web of Science, EBSCOhost (SPORTDiscus), and Google Scholar databases. As a traditional Chinese exercise system, Health Qigong research has been predominantly conducted in China, with limited empirical evidence available from international studies. Consequently, this study highlights several critical limitations in the existing research landscape:

### 5. Impact of limited population

Although this study included 10 trials with a total of 656 participants, the sample size for each individual study ranged from 50 to 94 subjects, which may result in low statistical power and an increased risk of error. Moreover, the definition, classification, and diagnostic criteria for cervical spondylosis have not been standardized internationally, leading to inconsistencies in the included studies—some followed Traditional Chinese Medicine (TCM) diagnostic criteria, while others adhered to modern medical standards. This discrepancy exacerbates population heterogeneity, as there are significant differences in age, gender, and cervical spondylosis subtypes across the studies. These variations may influence the measurement of intervention effects, ultimately reducing the reliability and external validity of the findings.

#### 5.1. Geographic constraints of included studies

All the included studies were conducted in China, leading to a homogeneous research environment and a lack of geographically diverse, representative data. Given the demographic, cultural, and lifestyle differences across regions, factors such as dietary habits, social behaviors, and healthcare accessibility may influence both the acceptance and adherence to Health Qigong practice, as well as its physiological effects. These geographical constraints limit the generalizability of the findings, making it difficult to determine whether Health Qigong's therapeutic benefits extend to populations outside of China.

#### 5.2. Effects of intervention heterogeneity

First is diversity in intervention protocols. The included studies exhibited substantial variation in Health Qigong intervention methodologies, including different routines (e.g., Ba Duan Jin, Wu Qin Xi, Yi Jin Jing), varying intervention frequencies (1–5 sessions per week), session durations (15–80 minutes per session), and total intervention periods (ranging from 2 to 24 weeks). These discrepancies hinder direct comparison across studies.

Second is complexity in intervention design. Some studies implemented Health Qigong as a standalone intervention, while others combined it with other traditional treatments such as acupuncture, massage, or pharmacotherapy, making it difficult to isolate the independent effects of Health Qigong.

Finally is inconsistencies in outcome measurement tools. The studies employed different evaluation indicators, measurement instruments, and assessment criteria, complicating the ability to perform cross-study comparisons or meta-analytical synthesis of intervention effectiveness.

#### 5.3. Potential sources of bias

First is selection bias. Although all included studies were randomized controlled trials (RCTs), some did not implement blinding procedures, and discrepancies existed in participant inclusion criteria, potentially affecting the accuracy of intervention effect estimates.

Second is reporting and publication bias. As Health Qigong is primarily rooted in traditional Chinese exercise systems, its international clinical research and promotion remain limited. Consequently, nearly all included studies originated from China, increasing the risk of publication bias, where studies reporting positive outcomes are more likely to be published, potentially skewing the findings of this systematic review.

Generally, these study limitations highlight key directions for future research. First, establishing a unified definition, classification system, and diagnostic criteria for cervical spondylosis is essential to ensure comparability across studies and international applicability of research findings. Second, expanding sample sizes and enhancing population representativeness is necessary to achieve a more balanced distribution across age, gender, and cervical spondylosis subtypes, thereby improving the external validity and global generalizability of the results. Finally, refining intervention design by implementing standardized Health Qigong protocols, including fixed routines, intervention frequency, and session duration, for different cervical spondylosis subtypes or similar clinical manifestations will enhance study comparability and facilitate a clearer assessment of the independent therapeutic effects of Health Qigong.

### 6. Conclusion

From this systematic review, traditional exercise therapies such as Health Qigong may significantly improve the pain of cervical spondylosis, cervical curvature, cervical joint mobility, and cervical spine dysfunction. However, the lack of a unified definition of cervical spondylosis internationally and the lack of scientific promotion of Health Qigong have resulted in limited evidence of the effect of this exercise therapy on cervical spondylosis. Persistent pain, a lengthy treatment process, implications for social life, substantial economic burden, and the risks associated with surgical treatment were all issues for cervical spondylosis patients.<sup>5, 97</sup> Therefore, exercise therapies such as Health Qigong should be recognized and promoted to the public. They may play a good role in preventing and rehabilitating cervical spine diseases, reducing the economic burden on patients, and improving their quality of life.

#### CRedit authorship contribution statement

**Hucheng Ma:** Validation. **Kim Lam Soh:** Writing – review & editing,

Supervision, Conceptualization. **He Sun:** Validation, Software, Conceptualization. **Su Peng Loh:** Data curation, Conceptualization. **Kim Geok Soh:** Validation, Supervision. **Cong Liu:** Writing – original draft, Visualization, Formal analysis, Data curation. **Yujin Ma:** Project administration, Investigation, Funding acquisition.

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