



Review

## Effects of yoga on chronic neck pain: a systematic review of randomized controlled trials

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**Abstract.** [Purpose] The aim of this study was to investigate the effectiveness of yoga in the management of chronic neck pain. [Subjects and Methods] Five electronic databases were searched to identify randomized controlled trials (RCTs) of yoga intervention on chronic neck pain. The trials were published in the English language between January 1966 and December 2015. The Cochrane Risk of Bias Tool was used to assess the quality of the trials. [Results] Three trials were identified and included in this review. A critical appraisal was performed on the trials, and the result indicated a high risk of bias. A narrative description was processed because of the small number of RCTs. Neck pain intensity and functional disability were significantly lower in the yoga groups than in the control groups. [Conclusion] Evidence from the 3 randomly controlled trials shows that yoga may be beneficial for chronic neck pain. The low-quality result of the critical appraisal and the small number of trials suggest that high-quality RCTs are required to examine further the effects of yoga intervention on chronic neck pain relief.

**Key words:** Chronic neck pain, Yoga

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### INTRODUCTION

Chronic neck pain is an important global public health problem. The prevalence of this pain has been reported to be up to 20% in the working populations worldwide<sup>1, 2)</sup>. With increasing economic development, the prevalence of chronic neck pain rises. In turn, the negative socio-economic effects associated with this condition also increase<sup>3-5)</sup>. These findings imply that low-cost, effective management is necessary to manage chronic neck pain. Previous studies suggested that most patients with chronic neck pain use alternative or complementary methods for their pain relief<sup>1-3, 6)</sup>.

Yoga is used to alleviate various types of pain<sup>7-18)</sup>. This safe and cost-effective intervention<sup>7)</sup> comprises physical postures, breathing exercises, meditation, and relaxation. The practice of yoga has been suggested to relieve pain by downregulating the hypothalamic pituitary adrenal axis and the sympathetic nervous system<sup>7)</sup>. Yoga has been increasingly used for pain relief, but the effectiveness of the practice must be confirmed by clinical evidence<sup>1-3, 6)</sup>. The rigor of the study methods, safety of the participants, outcomes, and effect sizes in studies on yoga interventions must be examined. Therefore, the aim of this review was to assess the evidence for the effectiveness of yoga in the management of chronic neck pain.

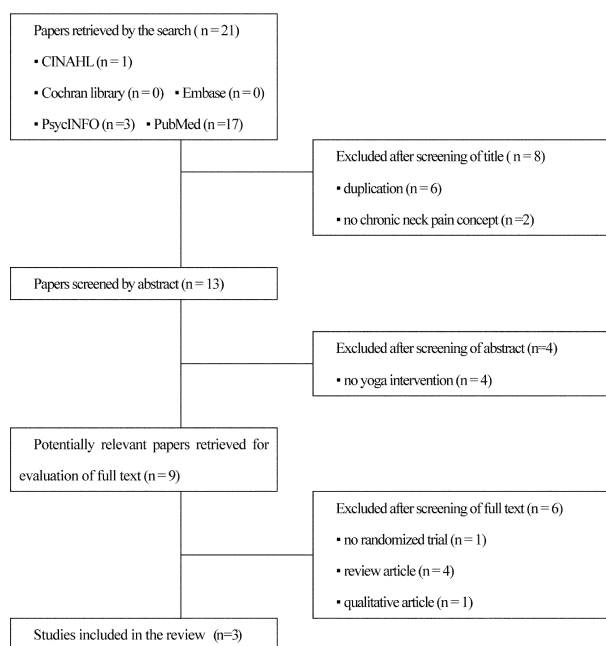
### SUBJECTS AND METHODS

This review was planned and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines<sup>19)</sup> and the Consolidated Standards of Reporting Trials guidelines for reporting parallel group randomized trials<sup>20)</sup>. Electronic databases, namely, Cochrane Library, CINAHL, Embase, PsycINFO, and PubMed, were searched to identify randomized controlled trials (RCTs) published between January 1966 and December 2015. The search terms were yoga and chronic neck pain. All potentially eligible studies were retrieved, and the full papers were reviewed to

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**Fig. 1.** Flowchart of studies included through the literature searches

determine whether they satisfied the selection criteria.

The inclusion criteria were as follows. (1) neck pain intensity of each participant was at least 40 mm on a 100-mm visual analog scale or  $\geq 3/10$  on the numeric pain rating scale, and the duration of each participant's chronic neck was longer than 3 months<sup>17, 21</sup>. (2) Yoga was used as an intervention to reduce symptoms associated with chronic neck pain, and a group of patients with chronic neck pain who did not practice yoga was used as control. (3) The outcomes measured were chronic neck pain intensity and functional disability.

The quality of the articles was assessed with the Cochrane Risk of Bias Tool for RCTs, which is recommended by the Cochrane Handbook for Systematic Reviews of Interventions<sup>22</sup>. This tool comprises six items: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting, and other potential sources of bias. Each item is rated as "yes," "no," or "unclear." According to the Cochrane Handbook and previous study, the quality of clinical trials can be divided into 3 levels<sup>22</sup>. An A-level study fully meets all 6 criteria, and thus, is considered to have a low risk of bias. The B level is assigned if 1 or more criteria are partially met. If 1 or more criteria are not met, the study is defined as C level<sup>23</sup> and is considered to have a high risk of bias. Meta-analysis was not performed because of the small number of RCTs.

The literature retrieval process is depicted in Fig. 1. Twenty-one titles related to the search terms were screened. Among these titles, 1 potential trial was identified from CHINAL, 3 from PsycINFO, and 17 from the PubMed databases. After the retrieval of titles, 21 studies were excluded either because they were duplicates or because chronic neck pain was not examined. Of the remaining studies, 1 was excluded for not being an RCT, 1 for being a review article, 1 for being a qualitative article, and 4 because yoga was not used as an intervention.

## RESULTS

The characteristics of the included studies are presented in Table 1. One RCT was conducted in the USA<sup>1</sup>, and 2 were conducted in Germany<sup>2, 3</sup>. The combined sample size of the trials totaled 184 participants, of whom 158 were female and 26 were male. The mean ages of the participants were 55.6, 47.8, and 47.9 years, and all of them had chronic neck pain.

Two types of yoga programs were examined in the trials<sup>1-3</sup>. The participants in 2 of the trials followed the Iyengar program<sup>2, 3</sup>. They practiced poses to lengthen and strengthen muscles in the neck and shoulders and to improve stability, flexibility, alignment, and mobility in muscles, joints, and tendons<sup>2, 6</sup>. The participants in the other trial followed a yoga program that comprised regulated breathing and poses to improve alignment, strength, flexibility, and relaxation<sup>1</sup>. In the 2 Iyengar trials, participants practiced 90 min/day, once a week for 9 weeks. In the other trial, participants practiced 60 min/day, 5 days a week for 3 months. Yoga was performed under the supervision of a yoga instructor or a physiotherapist.

In all 3 trials, the yoga intervention groups were compared with the control groups to evaluate the effect on chronic neck pain. Chronic neck pain intensity ( $p < 0.05$  in two trials,  $p < 0.001$  in one trial) and functional disability ( $p < 0.05$  in two trials,  $p < 0.001$  in one trial) were significantly lower in the intervention group than in the control group (Table 1). Adverse effects were reported in both Iyengar trials (Table 1). The quality assessments for all 3 trials were level C (Table 2).

**Table 1.** Characteristics of included randomized controlled trials

Author, year, location	Participants	Interventions		Outcome measures	Main results	Adverse events	Limitations
		Experimental group	Control group				
	Population sample size, N (EG/CG) Gender, n (male/female) Mean age, years (EG/CG) Drop out, n (%)	Interventions Delivery method- Duration Interventionist					
Dunleavy et al., 2015, USA/Detroit	Patients with CNP56 (19/20/17) 56 (7/49) 55.6 (-/-/-) 32 (57.1)	Yoga 60 min/day Pilates 60 min/day Physio-therapist Physio-therapist	None	Pain intensity (NRS) Functional disability (NDI)	(p<0.05) (p<0.05)	None	Absence of placebo groups. No blinding. All subjective outcome measures. No long-term follow-up data.
Cramer et al., 2013, Germany/Essen	Patients with CNP51 (25/26) 51 (9/42) 47.8 (46.2/49.5) 3 (5.9)	Iyengar yoga 90 min/week once a week Yoga instructor and physiologist	Exercise 10 min/ay 9 weeks Self-care manual	Pain intensity (VAS) Functional disability (NDI)	(p<0.05) (p<0.05)	Minor adverse effect; a transient worsening of neck pain or muscle soreness, limb pain, migraine, and vertigo after practice	No guide for the control group. Lack of long-term follow-up. No blinding
Michalsen et al., 2012, Germany/Essen	Patients with CNP77 (38/39) 77 (10/67) 47.9 (48.3/47.5) 24 (31.1)	Iyengar yoga 90 min/week once a week Yoga instructor	Exercise 10 to 15 min/ 3 times a week Self-care manual	Pain intensity (VAS) Functional disability (NDI)	(p<0.001) (p<0.001)	Minor adverse effect; a transient low back pain and muscle soreness after practice	Small sample size. A higher study dropout rate. The research assistant who collected the data were not blinded to the treatment allocations.

CNP: chronic neck pain; EG: experimental group; CG: control group; N: number; NDI: neck disability index; VAS: visual analog scale; SF: short-form; NRS: numeric rating scale

**Table 2.** Quality appraisal summary of included trials

Authors, year	Random allocation	Allocation concealment	Blinding	Incomplete outcome	Selective reporting	Other bias	Quality level
Dunleavy et al., 2015	+	+	-	+	+	+	C
Cramer et al., 2013	+	+	-	+	+	+	C
Michalsen et al., 2012	+	+	-	+	+	+	C

+: criteria met; -: criteria were not met; ?: unclear whether criteria were met

## DISCUSSION

This review was performed to investigate the effectiveness of yoga interventions on chronic neck pain. A meta-analysis that combines the results from all the trials was not possible because of the small number of RCTs. The yoga interventions used in the trials include breathing, postures, and relaxation. The results in a previous study suggested that poses to strengthen and stretch the cervical and scapula-thoracic areas of the neck and the upper quarters of the shoulders provide effective relief<sup>1</sup>. Significant decreases in chronic neck pain intensity and functional disability for the yoga group were found in all of the trials. These findings support the practice of yoga as an evidence-based treatment for chronic neck pain<sup>1-3, 6, 24</sup>.

However, despite the positive effects of yoga on chronic neck pain, a strong conclusion could not be drawn because of the small sample sizes and issues with conducted methods. The high risk of bias was attributed to non-blind trials. Clients cannot be blind to treatment allocation, as suggested in previously published articles<sup>1-3</sup>). However, not being able to blind the participants may affect the validity of a study. In addition to the openness of the trials, the absence of placebo groups and the lack of self-care guidance for the control groups may also have skewed the results. Furthermore, all of the outcome measures

were subjective. Follow-up data were not available for any of the trials; thus, the long-term effects of these treatments are unknown. The small number of trials and small sample sizes limit the likelihood that the results reflect the general population. Finally, minor adverse effects were associated with the yoga practices. Some of these adverse effects are transient worsening of neck pain, limb pain, migraines, vertigo, low back pain, and muscle soreness after practice. The numerous limitations in this review indicate that more rigorously designed studies that limit the risk of bias are needed on this topic. Other issues, such as frequency, duration, and intensity of yoga practice to achieve benefits, must also be investigated. In addition, follow-up studies must be conducted to determine the long-term effects of yoga for chronic neck pain, and programs specifically for female patients are necessary.

Only 3 trials were examined in this review, but the findings from these RCTs show that yoga may be beneficial for chronic neck pain and create a strong basis for future studies. Yoga was also suggested to provide a safe, effective therapy for chronic neck pain relief. Furthermore, the results of this review demonstrate that patients with chronic neck pain can manage their condition themselves.

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