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REVIEW

Is yoga effective for pain? A systematic review of randomized clinical trials

Paul Posadzki^{a,*}, Edzard Ernst^a, Rohini Terry^a, Myeong Soo Lee^{a,b}

^a *Complementary Medicine, Peninsula Medical School, University of Exeter, Exeter, United Kingdom*

^b *Division of Standard Research, Korea Institute of Oriental Medicine, Daejeon, South Korea*

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KEYWORDS

Complementary and alternative medicine;
Yoga;
Pain;
Systematic review

Summary

Objective: The objective of this systematic review was to assess the effectiveness of yoga as a treatment option for any type of pain.

Method: Seven databases were searched from their inception to February 2011. Randomized clinical trials were considered if they investigated yoga in patients with any type of pain and if they assessed pain as a primary outcome measure. The 5-point Jadad scale was used to assess methodological quality of studies. The selection of studies, data extraction and quality assessment were performed independently by two reviewers.

Results: Ten randomized clinical trials (RCTs) met the inclusion criteria. Their methodological quality ranged between 1 and 4 on the Jadad scale. Nine RCTs suggested that yoga leads to a significantly greater reduction in pain than various control interventions such as standard care, self care, therapeutic exercises, relaxing yoga, touch and manipulation, or no intervention. One RCT failed to provide between group differences in pain scores.

Conclusions: It is concluded that yoga has the potential for alleviating pain. However, definitive judgments are not possible.

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Contents

Background	282
Method	282
Results	282
Discussion	285
Conflict of interest	286
Source of funding	286
Appendix A. A detailed search strategy for MEDLINE	286
References	286

* Corresponding author. Tel.: +44 07776111891.
E-mail address: Paul.Posadzki@pcmd.ac.uk (P. Posadzki).

Background

Yoga originates from Ayurveda—ancient knowledge that aims to discover the true sense of human life and to find remedies for diseases. Yoga is regarded as a form of mind-body medicine and part of Complementary and Alternative Medicine (CAM).¹ It has been suggested that yoga creates inner, physical and emotional balance through the use of postures, called asanas, combined with breathing techniques or pranayama. Yoga has diverse clinical and non-clinical applications as a result of the degree of complexity and multidimensionality of these exercises.

Although yoga may have the potential to ameliorate both chronic and acute pain, the mechanisms by which this is effected remain hypothetical. These include an increase in tissues flexibility and oxidation, combined with relaxation effects, and release of enkefalins or endorphins.² Other possible mechanisms of action may include decreases in sympathetic nervous system activity or reductions in inflammatory markers. From a psychological standpoint, yoga may produce positive behavioral changes, increase awareness of mental and physical states, facilitate positive emotions and optimism, broaden cognitive processes and enhance self-efficacy for pain control.³ From a sociological perspective, yoga has the potential to reduce social isolation, to foster social networks and reinforce social support.³ To the best of our knowledge, the literature on yogic techniques for the management of pain has not yet been critically evaluated.

The aim of this paper is to systematically review the evidence for or against the effectiveness of yoga as a treatment option for any type of pain in human patients.

Method

We used PRISMA guidelines for systematic reviews and meta-analyses. Literature searches were performed to identify all controlled clinical trials of yoga for any type of pain. The following databases were used (from their inception to February 2011): Cochrane Central Register of Controlled Trials, Clinical Trial registry of Indian Council of Medical Research, MEDLINE, EMBASE, CINAHL, AMED, PsycINFO. The search terms were constructed over two concepts: yoga and pain, to identify all relevant published articles on the subject (see Appendix A). Experts were also contacted and asked for any unpublished data. The reference lists of all located articles were scanned for further relevant literature. Additionally, the bibliographies of relevant book chapters were hand-searched for further articles. No language barriers were imposed. Hard copies of all included articles were read in full. The mean change of pain in any pain related questionnaire compared with baseline was defined as the primary outcome measure and was used to assess the differences between the intervention and control groups. Only studies with pain as a primary outcome measure were included. Any type of control interventions were admissible.

Yoga was defined as “a practice of gentle stretching, exercises for breath control and meditation as a mind-body intervention”.⁴ Although mindfulness meditation is inherited in yoga practice, for conceptual clarity (meditation can be a separate modality *per se*) we decided to exclude such

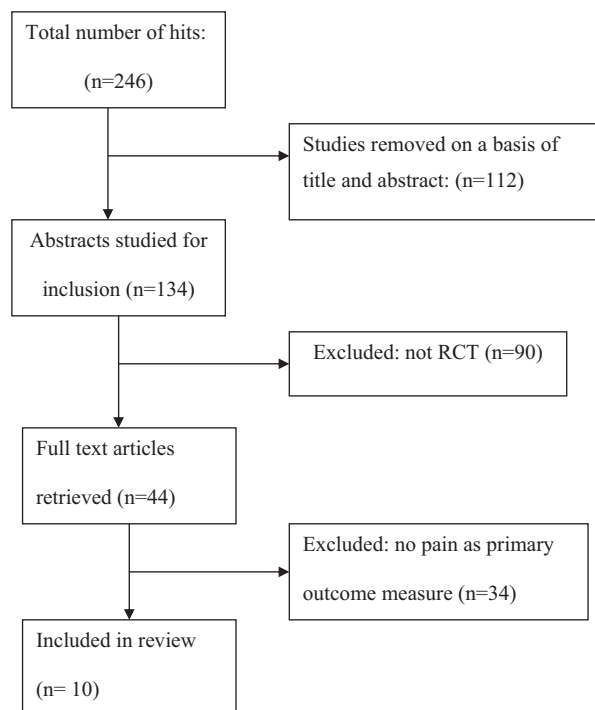


Figure 1 Flowchart of eligibility assessment and inclusion.

trials and this is in line with previous systematic reviews on the effectiveness of yoga.⁵

All retrieved data including uncontrolled trials, case studies, pre-clinical and observational studies were reviewed for safety information. Only randomized controlled clinical trials (RCTs) testing yoga in human patients of any age and sex with any pain of any duration and intensity were included. Trials were excluded if they were uncontrolled, e.g.^{6–9} non-randomized, e.g.¹⁰ or pain was not the primary outcome measure e.g.^{11–15} The protocol stipulated that quantitative meta-analysis would be carried out if the number and degree of trial heterogeneity allowed.

Two authors extracted and validated the data independently (PP,EE). For each study, trial design, randomization, blinding, dropout rate, inclusion and exclusion criteria, details of treatment method and control groups, main outcomes measures, and main results were extracted. Quality of studies was assessed using the 5-point Jadad scale.¹⁶ Clinical trials with 3 or 5 points were considered high quality. Any differences were resolved through discussion.

Results

The search strategy generated a total of 246 “hits”. After initial screening of abstracts, 134 references were considered to be potentially relevant. A total of 44 papers were retrieved for further evaluation of which 10 RCTs, involving 492 pain patients, were eligible for inclusion^{17–25} (see Fig. 1).

The 10 studies originated from Canada,²¹ India,²⁰ Thailand,¹⁷ Turkey,²⁵ Sri Lanka²⁶ and the US.^{18,19,22–24} Populations of patients with pain were heterogeneous in terms of clinical condition, ranging from labour pain,¹⁷

Table 1 Controlled studies of yoga for the treatment of pain.

First author year	Study design	Characteristics of participants (n)	Experimental intervention	Control intervention	Primary outcome measures for pain	Main result
Attanayake (2010)	RCT with 2 parallel groups	12 patients with low back pain	3 weeks of Hatha yoga and pranayama 60 min per week	Diet and lifestyle modification	Pain intensity on VAS-like scale (0–4)	Significant improvements in subjective pain ($P < 0.01$)
Chuntharapat (2008)	RCT with 2 parallel groups	66 patients with labour pain	6, 1 h sessions of yoga program at the 26–28th, 30th, 32nd, 34th, 36th, and 37th week of gestation	SC	(i) VASTC (ii) VASPS (iii) PBOS	Significantly less subject evaluated labour pain in yoga group ($P < 0.05$)
Garfinkel (1994)	RCT with 2 parallel groups	17 patients with osteoarthritis of the hands	10 weeks, 60 min sessions (8 times only)	No intervention	(i) Dolorimeter (ii) VAS intensity	Significantly less pain during activity in the yoga group ($P = 0.004$)
Garfinkel (1998)	Single blind RCT with 2 parallel groups	42 elderly patients with carpal tunnel syndrome	8 weeks of Iyengar yoga, twice a week	SC + wrist splint	VAS intensity	Significant reduction in pain in the yoga group ($P = 0.02$)
John (2007)	RCT with 2 parallel groups	72 patients with migraine headaches	12 weeks of integrated yoga approach, 5 days a week for 60 min	Self care	MPQ	Significantly less pain in the yoga group ($P < 0.001$)
Kuttner (2006)	RCT with 2 parallel groups	25 adolescents with irritable bowel syndrome	1 h instructional session of Hatha yoga and Iyengar yoga, followed by 4 weeks of daily home practice guided by a 10 min video	Wait list	(i) 10 points NRS	No between group analysis provided due to a significant differences between groups at baseline ($P < 0.10$)
Saper (2009)	RCT with 2 parallel groups	30 patients with moderate-to-severe CLBP	12 weeks of Hatha yoga, once a week for 75 min	SC	11 points NRS	Significantly less pain scores (from 6.7 to 4.4) ($P = 0.02$) in yoga group
Sherman (2005)	RCT with 3 parallel groups	101 CLBP adults	12 weeks of Viniyoga for 75 min	Conventional therapeutic exercise classes or a self-care book	Pain bothersome on 11-point scale	Significantly less pain ($P < 0.001$) in yoga group
Williams (2009)	Single blind RCT with 2 parallel groups	90 patients with CLBP	24 weeks of Iyengar yoga for 90 min	SC	VAS intensity	Significantly greater reductions in functional disability and pain intensity were observed in the yoga group ($P < 0.001$)
Yurtkuran (2007)	Single blind RCT with 2 parallel groups	37 patients with hemodialysis	30 min a day, twice a week of Hatha yoga for 3 months	No intervention	VAS intensity	Significant improvements in pain levels in the yoga group ($P < 0.05$)

CLBP, chronic low back pain; NRS, Numeric Rating Scale; MPQ, McGill pain questionnaire; PBOS, The pain behavioral observation scale; SC, standard care; VAS, Visual Analogue Scale; VASPS, The visual analogue sensation of pain scale; VASTC, The visual analogue scale to total comfort.

Table 2 Quality assessment of the included studies (Jadad score).

Study (year)	Domain					Sum (Jadad score)
	Random sequence generation	Appropriate randomization	Blinding of participants or personnel	Blinding of outcome assessors	Withdrawals and dropouts	
Attanayake (2010)	1	0	0	0	0	1
Chuntharapat (2008)	1	0	0	0	1	2
Garfinkel (1994)	1	0	0	0	1	2
Garfinkel (1998)	1	0	0	1	1	3
John (2007)	1	1	0	0	1	3
Kuttner (2006)	1	1	0	0	1	3
Saper (2009)	1	1	0	0	0	2
Sherman (2005)	1	1	0	0	1	3
Williams (2009)	1	1	1	0	1	4
Yurtkuran (2007)	1	1	1	0	1	4

Points were awarded as follows: study described as randomized, 1 point; appropriate randomization, 1 point; subjects blinded to intervention, 1 point; evaluator blinded to intervention, 1 point; description of withdrawals and dropouts, 1 point.

Table 3 Adverse events reported in RCTs.

Study (year)	Adverse events
Attanayake (2010)	NIP
Chuntharapat (2008)	NIP
Garfinkel (1994)	NIP
Garfinkel (1998)	NIP
John (2007)	NIP
Kuttner (2006)	NIP
Saper (2009)	“One yoga participant reported transient worsening of low back pain that improved after discontinuing yoga. No other significant adverse events were reported”
Sherman (2005)	“No serious adverse events were reported. One participant discontinued yoga classes because postures that required her to move her head below her heart precipitated her migraine headaches. One participant in the exercise class strained her back during class and sought care from a chiropractor”
Williams (2009)	NIP
Yurtkuran (2007)	“No side-effects were declared during the exercise intervention”

NIP, no info provided.

osteoarthritis,¹⁸ carpal tunnel syndrome,¹⁹ migraine,²⁰ irritable bowel syndrome,²¹ chronic low back pain,^{24,26} and hemodialysis.²⁵ Control interventions included standard or usual care,^{17,19,22,24} self care,²⁰ therapeutic exercises,²³ diet and lifestyle modification²⁶ or no intervention.^{18,21,25} Primary outcome measures included Visual Analogue Scale (VAS),^{19,24,25} Numeric Rating Scale,^{21,22} pain bothersome on 11 points NRS,²³ McGill Pain Questionnaire,²⁰ The VAS relating to Total Comfort and Sensation of Pain,¹⁷ or VAS-like scales.²⁶ The methodological quality of the trials ranged from 1 to 4 on the Jadad scale.

Attanayake et al.²⁶ aimed to evaluate selected yogic procedures on individuals with low back pain. They reported significant improvement in pain intensity following yogic interventions. The main sources of bias included the small sample size, lack of appropriately described randomization, drop-out rate, intention to treat analysis and blinding. We scored it as 1.

Chuntharapat et al.¹⁷ aimed to examine the effects of a yoga program during pregnancy, on maternal comfort, labour pain, and birth outcomes. They reported significantly less labour pain in yoga group. This study lacked appropriately described randomization, blinding, power calculations and intention to treat analysis. We scored it as 2.

Garfinkel et al.¹⁹ aimed to determine the effectiveness of a yoga-based regimen for relieving symptoms of carpal tunnel syndrome. They reported a significant pain reduction in yoga group. Lack of clearly described randomization and intention to treat analysis may have increased the risk of bias. We scored it as 3.

Garfinkel et al.¹⁸ aimed to collect controlled observations of the effect of yoga on the hands of patients with osteoarthritis (OA). They reported that the yoga treated group improved significantly more than the control group in pain during activity and tenderness. This study lacked blinding, allocation concealment, appropriately described

randomization, intention to treat analysis and was of small sample size. We scored it as 2.

John et al.²⁰ aimed to investigate the effectiveness of holistic yoga therapy for migraine treatment compared to self-care. They reported significantly lower pain ratings in the yoga group compared to the self-care group. This study lacked power calculations, blinding and intention to treat analysis. We scored it as 3.

Kuttner et al.²¹ aimed to conduct a preliminary randomized study of yoga as treatment for adolescents with irritable bowel syndrome. They reported that adolescents had significantly lower scores for gastrointestinal symptoms and emotion-focused avoidance following the yoga intervention. However, they were unable to provide post-intervention estimates in pain due to a significant difference in pain intensity between the two groups at baseline. The sources of bias in this study included lack of blinding, power calculations and small sample size. We scored it as 3.

Saper et al.²² aimed to assess the feasibility of studying yoga in a population with chronic low back pain. They concluded that yoga may be more effective than usual care for reducing pain and pain medication use. This study lacked power calculations and was of small sample size. We scored it as 2.

Sherman et al.²³ aimed to determine whether yoga is more effective than either conventional therapeutic exercise or a self-care book for patients with chronic low back pain. They reported that yoga was more effective than a self-care book for improving function and reducing chronic low back pain. This study lacked allocation concealment and blinding. We scored it as 3.

Williams et al.²⁴ aimed to evaluate Iyengar yoga therapy on chronic LBP and reported that yoga improves functional disability, pain intensity and depression and reduces medication usage in adults with chronic low back pain. Outcome assessors were not blinded. We scored it as 4.

Yurtkuran et al.²⁵ aimed to evaluate the effects of a yoga-based exercise program on pain, fatigue, sleep disturbance, and biochemical markers in hemodialysis patients. They reported that after a 12-week intervention, significant improvements were seen in pain. This study was well designed in terms of randomization, drop-out rate, partial blinding. However, it lacked power calculations and intention to treat analysis. We scored it as 4.

Discussion

Although a recent literature review on yoga for chronic pain conditions concluded that 'yoga offers a relatively low cost and easily assessable CAM intervention', it was unsystematic and failed to include the totality of the available data.²⁷ Another review of yoga for low back pain concluded that 'yoga has a positive effect on low back pain and function'²⁸; however, it was burdened with high risk of bias due to low quality of the included studies, lack of high quality RCTs, a critical assessment of the methodology. A recently published overview of yoga reported unanimously positive conclusions relating to pain.²⁹ The authors also suggested that those reviews in which primary focus was on menopausal symptoms and epilepsy were of poor quality.²⁹

The purpose of the present review was to critically evaluate the totality of the evidence from RCTs for or against the effectiveness of yoga as a treatment for any type of pain in human patients. Nine (out of 10) trials that met our eligibility criteria suggested that yoga is effective for pain.^{15,17–20,22–26} One trial did not provide results on pain due to significant between groups differences in pain at the baseline.²¹ The evidence from RCTs of yoga for treating pain is thus encouraging but any definite claims should be avoided for several reasons. Firstly, there was a vast heterogeneity of the patients populations with pain, study comparators, and primary outcome measures used in all RCTs. For instance, this review included clinical conditions as diverse as labour pain,¹⁷ osteoarthritis,¹⁸ carpal tunnel syndrome,¹⁹ migraine,²⁰ irritable bowel syndrome,²¹ chronic low back pain,^{24,26} or hemodialysis.²⁵ Secondly, yoga interventions were heterogeneous too ranging from Iyengar yoga,^{19,24} Hatha yoga,^{22,25,26} Viniyoga,²³ to Integrated yoga.²⁰ The duration, frequency and intensity of yoga sessions also differed across RCTs from 1 h instructional session, followed by 4 weeks of unsupervised home practice guided by a video²¹ to 24 weeks in the study of Williams.²⁴ Given such variability in terms of length, intensity and frequency of yoga based interventions, type of yoga classes themselves it is difficult to draw any definite conclusions. Too, the fact that yoga interventions cannot control for placebo effects limits an ability to differentiate between specific and non-specific mechanisms of action. Although the specific yoga techniques varied across programs, some elements are common to all of them include specific stretching, breathing, relaxation exercises, and specific attention to alignment of body structures (Table 1).

The methodological quality of the trials varied; two RCTs scored '4', 5 scored '3', and 4 scored '2' or less out of a possible '5' on the Jadad scale for methodological quality (Table 2). Six trials (60%) were of high quality (3 or more on the Jadad scale) and 4 trials (40%) were of low methodological quality (2 or less on the Jadad scale). Of those higher quality trials five (out of 6) trials (83%) favoured yoga and one did not provide results on pain. Other possible sources of bias in the included studies include lack of patient or/and assessor blinding.^{17,18,20–23} Four trials were of small sample size.^{18,21,22,25,26} The study of¹⁷ lacked standardized outcome measures for pain.

Adverse events (AEs) were not mentioned in most of the trials (Table 3).^{17–21,24} Two studies mentioned AEs and reported that none had occurred.^{23,25} In the study of Saper²², one participant discontinued trial due to worsening of pain. More research seems warranted to more extensively explore the safety of these interventions. In our view, the fact that the majority of the included studies failed to report AEs may highlight the generally poor reporting of yoga studies. It might even be seen as a violation of research ethics.

Our review has several limitations. Firstly, the potential incompleteness of the reviewed evidence we may have limited the validity of the results. Secondly, publication and location biases may also influence the results of this systematic review. Thirdly, the total number of trials included in our review and analysis and the total sample size are too small to allow definitive judgments. Fourthly, statistical pooling was not possible due to heterogeneity of the included studies and lack of reporting of sufficient raw data.

However, this review has several strengths either, including the comprehensive search strategy, the inclusion of only the highest quality trial design and use of suggested methods for systematic reviews of interventions for pain.

Future studies assessing the effectiveness of yoga for the management of pain should be in line with accepted standards of trial design and reporting, for example, those outlined in CONSORT guidelines. In particular, studies should be of adequate sample size based on power calculations, use validated outcome measures, control for non-specific effects and minimize other threats to internal and external validity such as lack of blinding of outcome assessors. Reporting of these studies should be such that results can be independently replicated.

In conclusion, the evidence that yoga alleviates pain is encouraging. However, the quantity and quality of the existing evidence prevents firm conclusions.

Conflict of interest

None.

Source of funding

PP has a fellowship from Pilkington Family Trusts.

Appendix A. A detailed search strategy for MEDLINE

All "Yoga" terms

Yog\$.ti,ab

Ayurved\$. ti,ab

All "Pain" terms

Ache\$.ti,ab

Cramp\$.ti,ab

discomfort.ti,ab

uncomfort\$.ti,ab

Nocicept\$.ti,ab

Sore\$.ti,ab

Spasm\$.ti,ab

Pain\$.ti,ab

(Analges\$ or alges\$).ti,ab

algiatr\$.ti,ab

(Anaesthet\$ or Anesthet\$).ti,ab

anodyn\$.ti,ab

(hyperalges\$ or hypoalges\$).ti,ab

(hyperesthes\$ or hyperaesthes\$ or hypoesthes\$ or hypoaesthes\$).ti,ab

(Anti-inflam\$ or inflam\$).ti,ab

Angina.ti,ab

(arthralgi\$ or arthrit\$ or osteoarthritis\$ or metatarsalgi\$).ti,ab

(causalgi\$ or (reflex adj2 dystroph\$) or (Sudeck\$ adj2 atroph\$) or algoneurodystroph\$).ti,ab.

(Dyesthes\$ or parasthes\$ or Allodynia or neuritis or noxious).ti,ab

Dysmenorrh\$.ti,ab

(earache\$ or ear-ache\$ or colic\$).ti,ab

(fibromyal\$ or fibrositis or myalgi\$).ti,ab

(glossalgi\$ or toothache\$ or tooth-ache\$ or odontalgi\$).ti,ab

(headache\$ or cephalalg\$ or cephalea\$ or cerebralg\$ or encephalalg\$ or cephalodyn\$).ti,ab
(mastalgia or mastodynia or mammalg\$).ti,ab
(migrain\$ or hemicrani\$).ti,ab
(neuropath\$ OR neuralgi\$).ti,ab
(sciatic\$ or Lumbago or (Carpel Tunnel Syndrome)).ti,ab
(Sprain\$ or bruise\$ or fractur\$ or strain\$ or osteopor\$).ti,ab
(Surg\$ or operat\$).ti,ab
(Tendinopath\$ or Synoviopath\$ Bursopath\$ or Ligamentopath\$ or Enthesopath\$ or Enthesit\$ or arthropath\$).ti,ab
(parturition or parodynia or childbirth or Labo?r).ti,ab
Exp Pain/
exp analgesia/or exp anesthesia/
exp analgesics/or anesthetics, local/

RCTs filter

(randomized controlled trial).pt.

(clin\$ adj5 trial\$).ti,ab.

((singl\$ or doubl\$ or tripl\$ or trebl\$) adj5 (blind\$ or mask\$)).ti,ab

random\$.ti,ab

Control\$.ti,ab.

prospectiv\$.ti,ab.

exp randomized clinical trial/

follow-up studies/or prospective studies/

double-blind method/or random allocation/or single-blind method/

exp Research Design/

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