Topical Review

Yoga for persistent pain: New findings and directions for an ancient practice

Anava A. Wren, Melissa A. Wright, James W. Carson, Francis J. Keefe

1. Introduction

Currently, many clinicians treating persistent pain hear about the benefits of yoga from patients who frequent yoga centers. However, pain clinicians and researchers may not be aware of randomized controlled studies examining the efficacy of yoga for managing persistent pain. The purpose of this review is to highlight recent studies that shed light on the potential role that yoga can play in pain management for a range of conditions that can be chronically painful. The review is divided into three sections: a description of the basic components of yoga-based protocols for pain; a review of nine of the 13 randomized studies located that test the efficacy of yoga for persistent pain; and a discussion of key clinical issues and future directions for yoga-based pain research and practice.

2. Yoga-based protocols for pain management

Texts indicate that yoga originated in India and has been practiced for approximately 4000 years [15]. The term yoga is derived from the Sanskrit verb yug, which means to bind or join [6]. This refers to the overarching goal of yoga, which is to unite the mind and body in a way that promotes health. Although there are different schools of yoga, there are key elements that cut across most of these schools, including breathing exercises (pranayama), postures (asanas), and meditation (dhyana).

In popular practice, yoga is often construed as a physical exercise program. However, as applied to the management of persistent pain, yoga protocols are more comprehensive. Recent controlled studies of yoga for managing pain have been based on Hatha or Iyengar yoga. Studies that have used Hatha yoga have concentrated on relaxation techniques and gentle postures tailored to specific patient populations [8,9]. Typical Iyengar yoga protocols have included several basic elements such as physical postures designed for particular patient populations, use of props to cultivate awareness of body regions, breath control techniques, and home practice [10,19,24,25]. In addition, many studies have modified these standard yoga protocols to create integrated programs containing practices such as hymns [21], neti pot [12], didactic presentations [2], and therapeutically oriented poses [20,27]. The format for delivering yoga protocols varies but typically involves hourly group sessions led by a trained yoga practitioner once or twice weekly for approximately 12 weeks.

3. Controlled studies of yoga for managing persistent pain

In one of the earliest controlled studies of a yoga-based protocol, Garfinkel et al. [10] assigned 42 patients having pain from carpal tunnel syndrome to either an Iyengar-based Hatha yoga protocol or to a control condition (wrist splint). Yoga classes focused on training in postures and relaxation techniques adjusted for the patient population. When compared with the control, patients receiving yoga showed significant reductions in pain and an increase in grip strength. Trends toward improvement were reported in motor nerve conduction time, Tinel sign, and sleep disturbance among the yoga group, although these were not significant. Garfinkel et al. [9] also conducted a controlled study with hand osteoarthritis (OA) patients showing that Iyengar-based Hatha yoga tailored to the patient population produced significant improvements in pain during activity, joint tenderness, and finger range of motion compared with the control. There were no significant differences in hand pain at rest, hand function, hand grip strength, or circumference of finger joints. Taken together, these studies [9,10] were important in stimulating research on yoga for pain control. Although studies appearing in the late 1990s and early years of the 21st century supported the potential efficacy of yoga for managing pain conditions, these studies did not use randomized controlled designs [5,11,13].

Several recent randomized controlled studies have tested the efficacy of Iyengar and Hatha yoga for persistent low back pain. Persistent low back pain is a particularly appropriate model for yoga research because it is common and related to musculoskeletal problems (e.g., pain-avoidant posturing) and psychosocial stress. Williams et al. [25] tailored their Iyengar yoga intervention to address back pain, providing the following specific protocol adjustments: (a) patients practiced poses that used props to relieve tension and bring awareness to body regions; (b) training progressed to lengthen, strengthen, and relax core muscle groups in the spine and pelvis; and (c) training was provided over a graded series of movements involving twisting, bending, and stretching. Compared with an education control, patients receiving yoga showed significant reductions in pain, functional disability, and pain medication at post-treatment and 3 month follow-up. No significant between-group differences were reported in spinal range of motion, fear of movement, pain attitudes, self-efficacy, and coping strategies. In another study, Williams et al. [24] reported that...
lyengar yoga, tailored to chronic low-back pain patients, produced significant reductions in pain, physical disability, and depression. The yoga group demonstrated a higher success rate than controls in decreasing pain medication, although this was nonsignificant. At 6-month follow-up, these benefits were maintained, with 68% of patients in the yoga condition reporting regular home practice. At 6-month follow-up, these benefits were maintained, with 68% of patients in the yoga condition reporting regular home practice. In another low-back pain study, Sherman et al. [20] found that Viniyoga, a therapeutically oriented school of yoga, was significantly more effective than either aerobic exercise or an educational control in decreasing the bothersomeness of low-back pain and pain-related disability. This study did not find any significant improvements on the SF-36. In addition, Saper et al. [17] reported that a Hatha yoga program designed for low-back pain significantly reduced pain scores, back-related function, and pain medications among a diverse population of patients with low-back pain (83% racial/ethnic minority). No significant differences were reported on SF-36 scores.

Recently, Carson et al. [4] conducted a controlled study evaluating the efficacy of a tailored yoga program (Yoga of Awareness), derived from Kripalu yoga, for female fibromyalgia patients. Compared with the control, the yoga group showed significant improvements in fibromyalgia outcomes including pain, fatigue, vigor, mood, acceptance, pain catastrophizing, and other coping strategies. No significant between-group differences were reported on symptoms of tenderness, balance duration, poor sleep, and distancing and confrontation coping strategies.

The efficacy of yoga for pain control has also been tested among disease populations with conditions that can be chronically painful. Pain symptoms are a primary complaint among end-stage renal disease patients, which has led to a randomized yoga intervention for end-stage renal disease-related pain, as well as other symptoms. Yurtkuran et al. modified a Hatha yoga protocol to address the fatigue and physical deconditioning experienced by this chronically ill population (e.g., progressively increasing practice from 15 to 30 minutes, moving from chair-based yoga to standing postures) [27]. To enhance access to treatment, yoga training was provided in the hemodialysis clinic. Compared with standard care, yoga significantly decreased pain, fatigue, and sleep disturbance, and improved grip strength, cholesterol, urea, creatinine, and alkaline phosphatase levels, as well as erythrocyte and hematocrit counts. No significant between group changes in calcium, phosphorus, HDL-cholesterol, or triglyceride levels were found. The authors suggest that yoga not only enhances pain management but also has physical benefits similar to those seen with aerobic exercise.

Although interest in yoga for cancer-related pain management is growing, many studies are uncontrolled [3,6,16]. Recently, Carson et al. [2] conducted a randomized study of yoga for breast cancer survivors, based on Kripalu yoga (Yoga of Awareness). Compared with a wait-list control, a yoga intervention, which was tailored for breast cancer survivors, produced significant improvements in joint pain, symptom-related bother, fatigue, sleep disturbance, vigor, and hot flashes posttreatment. No significant between-group differences were reported for negative mood, relaxation, acceptance, or night sweats posttreatment. Interestingly, at 3-month follow-up, significant improvements were reported for patients in the yoga condition for negative mood, relaxation, and acceptance, in addition to the maintenance of previous treatment gains. Daily analyses showed that those individuals who spent more time practicing yoga had the largest improvements in pain-related symptoms.

Of the 4 RCTs identified and not described in the text of this review, 3 had positive findings on pain-relevant outcomes [12,19,21] and 1 RCT reported nonsignificant outcomes [8]. These studies were not included in the text because in 3 studies pain was not a primary outcome measure (e.g., measured via pain-related disability) [8,19,21], and in 2 studies the yoga intervention was less generalizable to clinical settings (e.g., 8 hours daily for 1 week) [12,21] (see Table 1 for a review of all studies).

4. Key issues

To date, most of the yoga-based studies have been conducted in populations of middle-aged, Caucasian women who are moderately disabled by chronic back pain. Yet, as we have seen, yoga protocols can be beneficial for patients from varying ethnic or racial backgrounds having disease-related pain and/or who are highly disabled. An advantage of yoga is that it can be modified to meet the specific needs of patients who are quite ill or limited in physical ability (e.g., by using props).

Referral sources for yoga are increasingly available. It is important that a yoga practitioner be certified (e.g., in the United States, certification is offered through the Yoga Alliance, www.yogaalliance.org), and have experience with patients’ painful medical conditions. To ensure safety and to minimize risk, the referring health care provider should inform the patient and yoga specialist about physical limitations. Insurance coverage for complementary medical services is increasing; however, many patients pay for inexpensive yoga classes in community settings.

Several mechanisms could potentially explain the benefits of yoga for persistent pain conditions. First, it has been speculated that yoga can produce physiological changes that alter the pain experience: decreases in sympathetic nervous system activity (e.g., decreases in heart rate) [22], reductions in inflammatory markers (e.g., tumor necrosis factor, interleukin-2, C-reactive protein) [1,14] and stress markers (e.g., cortisol) [26], and increases in flexibility, strength, circulation, and cardiorespiratory capacity [10,27].

Second, yoga may produce behavioral changes that influence pain. Yoga, often delivered in a group format, has the potential to reduce social isolation and to foster social networks that reinforce improvements in activity. Yoga home practice sessions build regular physical activity (something many patients avoid) into the day, and could effectively communicate to others that the patient can be active. Interestingly, at least one yoga study has shown that the duration of daily practice is related to same-day improvements in pain as well as next-day improvements in pain, fatigue, invigoration, acceptance, and relaxation [3].

Finally, research has demonstrated that yoga can produce psychological changes, such as increased awareness of mental and physical states [3,8], which may help patients to better understand their pain. Yoga has also been shown to increase the frequency of positive emotions [23], which could potentially undo the physiological effects of negative emotions, broaden cognitive processes (e.g., taking a broader perspective on problems), and build physical (e.g., improved sense of health), social (e.g., improved social support), and psychological (e.g., optimism) resources [7]. Yoga may also increase pain acceptance, i.e., the willingness to experience pain and to acknowledge negative thoughts and emotions [3], while remaining committed to pursuing valued goals. Finally, it is possible that yoga can lead to improvements in self-efficacy for pain control.

5. Future research directions

The patient samples in the majority of studies reviewed are predominantly white (86%), middle-aged (mean age 46.7 years) women (72%) of higher socioeconomic status. Future studies (e.g., see work by Saper et al. [18]) need to determine whether yoga protocols are efficacious for patients who come from more diverse backgrounds with respect to ethnicity, age, gender, and socioeconomic status. Research also needs to compare the efficacy of...
Table 1
Characteristics of included studies.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design/ methods</th>
<th>Mean age</th>
<th>Pain population</th>
<th>Type of yoga intervention</th>
<th>Outcome measures</th>
<th>Significant findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garfinkel et al. 1998 [10]</td>
<td>RCT</td>
<td>49</td>
<td>Carpal tunnel syndrome</td>
<td>Hatha yoga</td>
<td>• Pain intensity • Grip strength • Sleep disturbance • Phalen sign • Tinel sign</td>
<td>Yoga group improved more than control in pain reduction and grip strength</td>
</tr>
<tr>
<td>Garfinkel et al. 1994 [9]</td>
<td>RCT</td>
<td>52–79a</td>
<td>Osteoarthritis of the hands</td>
<td>Iyengar-based Hatha yoga</td>
<td>• Pain intensity • Functional disability • Pain medication usage • Pain-related attitudes • Pain-related behaviors • Spinal range of motion</td>
<td>Yoga group showed greater reductions than control in pain intensity, functional disability, and pain medication at post-treatment (3-month follow-up)</td>
</tr>
<tr>
<td>Williams et al. 2005 [25]</td>
<td>RCT</td>
<td>48</td>
<td>Chronic low-back pain</td>
<td>Iyengar yoga</td>
<td>• Pain intensity • Functional disability • Pain medication usage • Depression</td>
<td>Yoga group showed greater reductions than control in pain, physical disability, and depression</td>
</tr>
<tr>
<td>Williams et al. 2009 [24]</td>
<td>RCT</td>
<td>48</td>
<td>Chronic low-back pain</td>
<td>Iyengar yoga</td>
<td>• Pain intensity • Functional disability • Pain medication usage • Depression</td>
<td>Yoga group showed greater reductions than control in pain, physical disability, and depression</td>
</tr>
<tr>
<td>Sherman et al. 2005 [20]</td>
<td>RCT</td>
<td>44</td>
<td>Chronic low-back pain</td>
<td>Viniyoga</td>
<td>• Pain-related disability • Bothersomeness of pain • Health status</td>
<td>Yoga group showed greater reductions than control in pain-related disability and bothersome ness of pain</td>
</tr>
<tr>
<td>Saper et al. 2009 [18]</td>
<td>RCT</td>
<td>44</td>
<td>Chronic low-back pain</td>
<td>Hatha yoga</td>
<td>• Pain scores • Back-related function • Medication use • Global improvement • Quality of life • FM symptoms • FM functional deficits • Pain coping strategies</td>
<td>Yoga group improved more than control in fibromyalgia outcomes of pain, fatigue, vigor, mood, acceptance, pain catastrophizing, and coping strategies</td>
</tr>
<tr>
<td>Carson et al. 2010 [4]</td>
<td>RCT</td>
<td>54</td>
<td>Fibromyalgia</td>
<td>Yoga of awareness</td>
<td>• Hot flashes • Joint pain • Fatigue • Negative mood • Sleep disturbance • Night sweats • Symptom-related bother • Relaxation • Vigor</td>
<td>Yoga group improved more than control in joint pain, symptom-related bother, fatigue, sleep disturbance, vigorous, and hot flashes post-treatment</td>
</tr>
<tr>
<td>Yurtkuran et al. 2007 [27]</td>
<td>RCT</td>
<td>38</td>
<td>Hemodialysis</td>
<td>Modified Hatha yoga</td>
<td>• Pain intensity • Fatigue • Sleep disturbance • Grip strength • Biochemical variables</td>
<td>Yoga group improved more than control in pain reduction and grip strength</td>
</tr>
<tr>
<td>Carson et al. 2009 [2]</td>
<td>RCT</td>
<td>54</td>
<td>Breast cancer survivors</td>
<td>Yoga of awareness</td>
<td>• Pain intensity • Functional impairment • Pain-related disability • Depression</td>
<td>Yoga group improved more than control in pain-related disability and spinal flexibility</td>
</tr>
<tr>
<td>Sareen et al. 2007 [19]</td>
<td>RCT</td>
<td>50</td>
<td>Chronic pancreatitis</td>
<td>Iyengar yoga</td>
<td>• Quality of life (including bodily pain items) • Mood • Stress • Headache frequency • Migraine severity • Pain • Anxiety • Depression • Medication usage</td>
<td>Yoga group improved more than control in overall quality of life, mood, and symptoms of stress</td>
</tr>
<tr>
<td>John et al. 2007 [12]</td>
<td>RCT</td>
<td>34</td>
<td>Migraine</td>
<td>Modified yoga program (postures, breathing, neri pot)</td>
<td>• Pain • Anxiety • Depression • Medication usage • Functional impairment • Pain-related disability • Depression</td>
<td>Yoga group improved more than control in frequency and intensity of migraine, pain, medication use, anxiety, and depression</td>
</tr>
<tr>
<td>Galantino et al. 2004 [8]</td>
<td>RCT</td>
<td>30-65a</td>
<td>Chronic low back pain</td>
<td>Hatha yoga</td>
<td>• Pain-related disability • Depression • Spinal-related disability • Spinal flexibility</td>
<td>No significant between-group differences</td>
</tr>
<tr>
<td>Tekur et al. 2008 [21]</td>
<td>RCT</td>
<td>49</td>
<td>Chronic low back pain</td>
<td>Integrated approach to yoga therapy (IAYT)</td>
<td>• Pain-related disability • Depression • Spinal-related disability • Spinal flexibility</td>
<td>Yoga group improved more than control in pain-related disability and spinal flexibility</td>
</tr>
</tbody>
</table>

* This study did not include a mean age; thus an age range is provided.

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protocols based on specific schools of yoga and to test whether
techniques tailored to specific patient populations are more efficac-
ya than those relying on standard approaches.

Future studies also need to compare yoga protocols with active
treatment control conditions (e.g., aerobic exercise, cognitive-
behavioral therapy). In addition, research needs to examine the
effective dose of yoga therapy required to achieve improvements
in pain and pain-related outcomes. Finally, long-term follow-up
assessments are needed to assess the maintenance of treatment
improvements.

6. Conclusions

Yoga for managing persistent pain is an ancient practice. A
small but growing body of randomized clinical trials suggests
that yoga may have promise for persistent pain conditions.
Methodologically rigorous research in this area is in its early
stages, and further research is needed. Yet, clinicians should
be aware that yoga could be used as a tool to help patients better
address the biological, social, and psychological aspects of persist-
ten pain.

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References

[1] Carlson LE, Speca M, Patel KD, Goody E. Mindfulness-based stress reduction in
relation to quality of life, mood, symptoms of stress, and immune parameters
with metastatic breast cancer: results from a pilot study. J Pain Symptom Manage
2007;33:331–41.
with metastatic breast cancer: results from a pilot study. J Pain Symptom Manage
2007;33:331–41.
randomized controlled trial of the yoga of awareness program in the management
[5] Dash M, Telles S. Improvement in hand grip strength in normal volunteers and
rheumatoid arthritis patients following yoga training. Indian J Physiol Pharmacol
125–30.
[7] Fredrickson BL, Tugade MM, Waugh CE, Larkin GR. What good are positive
emotions in crises? A prospective study of resilience and emotions following the
2003;84:365–76.
Farrar JT. The impact of modified hatha yoga on chronic low back pain: a pilot
a yoga based regimen for treatment of osteoarthritis of the hands. J Rheumatol
Yoga-based intervention for carpal tunnel syndrome: a randomized trial. JAMA
treatment of migraine without aura: a randomized controlled trial. Headache
Iyengar yoga for treating symptoms of osteoarthritis of the knees: a pilot
[14] Pullen PR, Nagamia SH, Mehta PK, Thompson WR, Benardot D, Hammond R,
Parrott JM, Sola S, Khan BV. Effects of yoga on inflammation and exercise capacity
Hirshberger N, Selm S, Spiegel D. Cancer supportive care, improving the
quality of life for cancer patients. A program evaluation report. Support Care
Cancer 2004;12:293–301.
[17] Saper RB, Eisenberg DM, Davis RB, Culpepper L, Phillips RS. Prevalence and
patterns of adult yoga use in the United States: results of a national survey.
Yoga for chronic low back pain in a predominantly minority population: a pilot
exercise, and a self-care book for chronic low back pain: a randomized,
yoga program on pain, functional disability and spinal flexibility in chronic low
[22] Telles S, Yoshio M, Dash M, Raghuraj P, Vaneen KV, Nagendra HR. An evaluation of
the ability of yoga and walking to reduce the heart rate after a month of yoga
[23] Yadav JS, Rao MR, Nagarathna R, Nagendra HR, Rekha M, Vanitha N,
Gopinath KS, Srinath BS, Vishweshwara MS, Madhavi YS, Ajakumar RS,
Bilimagga SR, Rao N. Effects of yoga program on quality of life and affect in early
breast cancer patients undergoing adjuvant radiotherapy: a randomized
Cross R, Kelly G, Cooper L. Evaluation of the effectiveness and efficacy of
Kolar MM, Cross R, Steinberg L. Effect of Iyengar yoga therapy for chronic low
adults with elevated symptoms of depression. Altern Ther Health Med
[27] Yurtkuran M, Alp A, Dilek K. A modified yoga-based exercise program in
hemodialysis patients: a randomized controlled study. Complement Ther Med