

Yoga Therapy for Management of Neck and Low Back Pain

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Abstract

Yoga has become a widely used physical, mental and spiritual exercise in the United States for both overall wellness and specific health ailments. Neck and low back pain are both ailments with high prevalence that have a significant impact on an individual's capacity for work and employment, ability to manage family and social obligations and overall well-being. Yoga therapy functions as a multimodal treatment by addressing muscular weakness, poor posture and inadequate flexibility in order to improve biomechanical imbalances contributing to pain. Furthermore, yoga's focus on mindfulness, pranayama (breathing exercises) and meditation facilitate relaxation of both muscle and mind and may contribute to decreased perception of pain. Our review of the literature has revealed several recent high quality studies which have demonstrated the superior efficacy of yoga in treating the neck and back pain when compared to controls and patients that received the typical standard of care or a self-care exercise program. Although none of those studies reported serious adverse events, yoga is not without risks. Our review also includes case reports of yoga related injuries of varying severity. Like any medical treatment, safety is of utmost concern. We offer recommendations for particular yoga asanas (postures) to address certain spine pathologies.

Yoga is a widely performed physical, mental, and spiritual practice which focuses on specific body postures or asanas while incorporating mindful breathing and meditation. Its popularity has dramatically grown in the United States over the past few decades due to its positive effects on mental health, stress reduction, improvement in flexibility and strength, and pain relief from common musculoskeletal ailments. In 2015, the Centers for Disease Control (CDC) published a National Health Statistics Report that evaluated yoga prevalence in the United States between 2002 and 2012. Combined data from 88,962 adults aged 18 and over were collected from National Health Interview Surveys that were administered in 2002, 2007 and 2012. Clarke, et al. found that yoga had a linearly rising prevalence from 5.8% to 6.7% and 10.1% in 2002, 2007 and 2012, respectively. The use of yoga had the highest prevalence over that 10 year period in adults aged 18-44 [1]. Another report by the CDC National Center for Health Statistics in 2014, found the prevalence of yoga use in the United States to be 8.4%. Regionally the prevalence was: 12.1% in the Pacific Region (AK, HI, CA, OR and WA states), 11.5% in the Mountain Region (MT, ID, WY, NV, UT, AZ, CO and NM states), 8.7% in the West North Central region (ND, SD, NE, KS, MN, IA and MO states), 8.5% in the East North Central region (WI, IL, MI, IN and OH states), 10.8% in the New England region (ME, VT, NH, MA, RI and CT states), 7.1% in the Middle Atlantic region (DC, NY, NJ, PA, DE and MD states), 6.8% in the South Atlantic region (VA, WV, NC, SC, GA and FL states), 5.9% in the West South Central region (TX, OK, AR and LA states) and 5.1% in the East South Central region (KY, TN, MS and AL states) [2].

Back pain is one of the most common complaints seen in physician offices. A survey done by the CDC in 2010 reported that back symptoms were the primary reason for 1.3% of office visits in the United States, and spinal disorders were responsible for 3.1% of diagnoses in outpatient clinics [3]. A 2012 systematic review by Hoy and Colleagues estimated that the global point prevalence of activity-limiting low back pain lasting more than a day was 12%, and the 1 month prevalence was 23% [4]. There are many muscles in the low back including larger powerful muscles such as the iliopsoas and erector spinae, as well as smaller muscles like the multifidi, semispinalis, and rotatores. These muscles along with the external and internal obliques and rectus and transverse abdominus are responsible for the stability of the spine as well as the spine's basic movements. It is important for these muscles

to not only be strong, but flexible as well. If these muscles are weak or deconditioned, they cannot efficiently stabilize the spine leading to instability and injury. Muscular imbalances in strength and tone exert uneven forces on their bony or facial attachments, contributing to poor body mechanics, injury and pain. Although the evidence on yoga therapy for the treatment and management of chronic low back pain (CLBP) is limited, there are several quality studies that suggest that yoga may be an efficacious treatment option. Yoga's focus on flexibility, strength, and stability, especially of the core muscles, makes it a favorable therapy for back pain.

Tilbrook and colleagues completed a randomized controlled trial (RCT) in 2011 that compared the effectiveness of yoga and usual care for chronic or recurrent low back pain [5]. 313 adults with CLBP were randomly assigned to either a yoga intervention group (n=156) or usual care (n=157). All patients received a back pain education booklet. The intervention consisted of a 12 class progressive yoga program that spanned 3 months. Scores were measured on the Roland-Morris Disability Questionnaire at 3, 6, and 12 months. The yoga group had better back function at 3, 6 and 12 months than the usual care group. The yoga group also had higher pain self-efficacy scores at 3 and 6 months but not 12 months. The two groups however had similar back pain and general health scores at 3, 6, and 12 months.

A meta-analysis of RCT done by Holtzman and colleagues in 2013 examined the current literature for the strongest evidence of the efficacy of yoga as a potential treatment for CLBP [6]. The inclusion criteria

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Received September 28, 2015; **Accepted** November 02, 2015; **Published** November 07, 2015

Citation: Plastaras CT, Huang LY, Metzger CJ, Sorosky S (2015) Yoga Therapy for Management of Neck and Low Back Pain. J Yoga Phys Ther 5: 215. doi:[10.4172/2157-7595.1000215](https://doi.org/10.4172/2157-7595.1000215)

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involved only RCT from published peer-reviewed journals that looked at yoga as a treatment for CLBP and reported outcome measures of pain and/or functional disability. 8 RCT met the criteria and included a total of 743 patients. Cohen's *d* effect sizes were calculated and entered in a random-effects model. The meta-analysis concluded that at post-treatment, yoga had a medium to large effect on functional disability ($d=0.645$) and pain ($d=0.623$), indicating that yoga may be an efficacious adjunctive treatment for CLBP. The strongest and most consistent evidence emerged for the short-term benefits of yoga on functional disability.

Another 2013 systematic review and meta-analysis of the literature on yoga for low back pain by Cramer et al screened studies published through 2012 that were RCT comparing yoga to control conditions in patients with CLBP [7]. The main outcome measures were pain, back specific disability, generic disability, health-related quality of life, and global improvement. Standardized mean differences (SMD) and 95% confidence intervals were calculated for each outcome. The review included 10 studies with 967 patients with CLBP. There was strong evidence for short-term effects on pain (SMD=-0.48; 95% CI, -0.65 to -0.31; $P<0.01$) and back-specific disability (SMD=-0.59; 95% CI, -0.87 to -0.30; $P<0.01$). There was also strong evidence for a long-term effect on pain (SMD=-0.33; 95% CI, -0.59 to -0.07; $P=0.01$), and moderate evidence for a long-term effect on back-specific disability (SMD=-0.35; 95% CI, -0.55 to -0.15; $P<0.01$). There was no evidence of short-term or long-term effects on health-related quality of life. Yoga was not associated with any serious adverse events in any of these studies.

In addition to LBP, neck pain is also one of the most commonly reported symptoms seen in primary care offices [8,9]. According to a study published in 2015 by Cohen et al, neck pain has an annual prevalence rate exceeding 30% and is the fourth leading cause of disability in the United States [10]. Fejer et al reported an estimated mean lifetime prevalence of neck pain in the world population to be around 50%, and the 1-month prevalence to be around 25% [11]. Because the neck has a large range of motion there is decreased stability and vulnerability to injury. The large muscles that are responsible for gross movement include the trapezius, levator scapulae, sternocleidomastoid and the splenius, while the smaller muscles that are responsible for stability and fine movements include the scalenes, rotatores, semispinalis, and longissimus; in addition the scapular stabilizers are important muscles in regards to neck function. Patients with chronic neck pain may have associated biomechanical deficits, including poor posture, contracted upper neck muscles, altered breathing patterns, and weak scapular stabilizers. Physically, yoga focuses on improving patient posture, flexibility, and strength. One of the goals of the asanas is to establish a normal cervical curve or neutral cervical spine. One achieves this by cultivating a conscious awareness of alignment throughout the yoga practice, during all standing and sitting poses. Certain muscle groups in the upper half of the human body are prone to constant isometric contraction, muscle shortening and tightness. These groups include the upper neck (upper trapezius and levator scapulae) and the anterior chest (pectoralis major and minor). Many asanas focus on flexibility and bring awareness to the upper neck muscles to reduce unconscious contraction. Other asanas focus on lifting and opening the chest. For good musculoskeletal health, a balance of strength and flexibility is needed. The yoga asanas strengthen muscles that tend to become weak and deconditioned in patients that have chronic neck pain, including the rhomboids and lower trapezius, both of which are key muscles in spine and scapular stabilization.

Yoga's effectiveness for managing chronic neck pain is becoming

more evident in the literature. In 2013, Cramer and colleagues published a RCT that evaluated the effect of Iyengar yoga compared with exercise on chronic nonspecific neck pain [12]. The study showed that yoga was more effective in relieving chronic nonspecific neck pain than a home-based exercise program. Yoga reduced neck pain intensity and disability and improved health-related quality of life. Another RCT by Michalsen and colleagues in 2012 compared a 9-week yoga program to a self-care exercise program in patients with chronic neck pain [13]. The results showed superior pain relief and functional improvements in the yoga group.

In traditional yogic practice, structure is given to the practice by the Eight Limbs, which include yama (societal conduct), niyama (personal conduct), asana (postures), pranayama (breath), pratyahara (control of the senses), dharana (concentration), dhyana (meditation) and samahdi (mental stillness and ultimate awareness). Although asana is the primary focus of western based yoga, it serves as an entry point to the other limbs, which have demonstrated beneficial properties to addressing the associated symptoms of stress, anxiety and depression that frequently accompany chronic neck and back pain. Pranayama (breath) is a powerful way to promote relaxation and a pivotal first step towards relieving muscle tension. Ujjayi breathing, which is conscious slow breathing using airway constriction at a rate of approximately 2-4 breaths per minutes, stimulates the vagus nerve which in turn promotes parasympathetic dominance and a sense of calmness [14]. In a novel 1982 study, Kabat-Zinn, et al. demonstrated a pain reduction score of greater than 50% in a cohort study of 51 patients suffering from chronic low back, headache, neck and shoulder pain by treating them with a 10-week stress reduction and relaxation program that included hatha yoga, mindfulness, self-regulation, meditation and detached observation [15]. In a follow up 1987 study using the same methods of stress reduction, Kabat-Zinn, et al followed 225 subjects treated with 12 cycles of classes over a 4 year period. 60% to 72% of subjects rated their pain as "moderately" or "greatly improved," 30% to 55% rated their pain as "greatly improved," 1% to 15% reported their pain as worse, 25% rated their pain as the same, 86% of subjects reported they gained something of lasting value. At 4 years, 81% of respondents reported they still meditated and 40-70% reported they still practiced yoga [16]. More recently, Rosenwaig and colleagues investigated the effects of 8 weeks of mindfulness training on 133 subjects in 2010. The intervention of mindfulness training included meditation techniques, body scanning, breath awareness, emotional awareness, mindful yoga, mindful eating, mindful walking and mindful listening. Significant improvement on 6 out of 8 Medical Outcomes Study 36-Item Short-Form Health indices (including bodily pain) was demonstrated in subjects with neck or back pain ($n=35$) [17].

As with any physical activity, there are risks of injury to be aware of before starting a yoga practice. It was reported in a New York Times article in 2012 by William Broad that even the most experienced of yoga practitioners injure themselves frequently due to a lack of insight into underlying weaknesses and muscular imbalances that make injury all but inevitable [18]. Glenn Black, a world renowned yoga instructor of greater than four decades, discusses in the article how numerous factors that have converged over the years have heightened the risk of practicing yoga. The most notable factor is the demographic shift in those who study the art. The original practitioners of yoga were from India, where sitting cross-legged and squatting were part of daily life; many modern yoga poses stem from these basic postures. Modern practitioners of yoga are frequently "urbanites" who sit in office chairs for prolonged periods but can only attend classes inconsistently, where they strain to contort themselves into increasingly difficult postures

despite their lack of flexibility and other physical problems. In addition, with the growth of popularity of yoga, there is now an abundance of studios lead by part-time instructors who lack the deeper training necessary to recognize when students are headed toward injury.

In 2012, Corroller et al. performed a retrospective review of radiology database of a tertiary care center over a 9 year period to assess yoga related injuries [19]. Of the 2 million reports searched, 56 contained the term ‘yoga’; 38 patients were included after duplicates were excluded. Injuries included: partial thickness tears in the peroneus brevis tendon, Achilles tendon and supraspinatus tendon; full thickness tears of the supraspinatus tendon; medial meniscal tears; acetabular labrum tears; lumbar disc annular tear with extrusion; acetabular liner displacement from hip arthroplasty hardware; proximal phalanx fracture of the hallux; and transient patellar dislocation. The prevalence of injuries is not well studied, however as non-life threatening musculoskeletal injuries are more likely to present to local urgent care centers and outpatient medical offices rather than large tertiary care centers. In addition to musculoskeletal injuries, one of the more serious types of injuries reported in the literature is injury to the vertebral artery. Sudden movements in asanas involving excessive neck flexion or extension and inversions with or without predominant weight bearing on the head can lead to vertebral artery injuries by way of mechanical stretching [20]. These injuries include: artery dissection, hemorrhage, thrombus formation (clots), swelling, stenosis (constriction) and stroke.

In general, patients with a history of recent injury related to a fall or motor vehicle collision should be evaluated by a health care professional before beginning a yoga practice. In addition patients who have symptoms of radicular pain, numbness and/or tingling, weakness,

dizziness, or gait instability should also seek medical evaluation and clearance before starting a yoga routine. Historical risk factors for vertebrobasilar insufficiency include patients with neck pain who also report dizziness, lightheadedness, nystagmus, face paresthesias, or blurred vision. The most common reported cause of sudden-onset vertebrobasilar insufficiency is trauma, especially following a high-velocity trauma with a whiplash mechanism [21]. Individuals at risk for vertebral artery injury should be identified in order to avoid potentially harmful poses and catastrophic injuries. Practitioners should seek immediate medical care if they experience sudden onset headache, blurred or double vision, difficulty speaking or focal weakness.

‘Primum non nocere,’ or ‘first do no harm,’ is an adage applicable across the health and wellness continuum from teacher to therapist to physician. Individuals with a history of injury and/or complex medical problems should always seek a class with an experienced and certified instructor. As an extension of mindfulness, individuals should receive education and reinforcement on acknowledging and listening to messages of pain or discomfort from their bodies. Furthermore, the use of props and equipment can be utilized to emphasize safety and proper alignment in order to avoid overstrain and injury. The authors have included suggested asanas to consider as well as those to avoid if there are certain spine pathologies present as well as figures demonstrating a sample of yoga poses (Tables 1) (Figures 1-5). For patients with low back pain worse in flexion, it is recommended to avoid poses that might introduce high pressures in the intervertebral disc such as bending forward with combined twist. For individuals with low back pain worse in extension, extended poses with backward bending should be avoided. For neck conditions, end range cervical range of motion poses and inversions putting biomechanical forces directly through the cervical

Medical Condition	Recommended Postures	Postures to Avoid (may aggravate symptoms)	Contraindicated Postures
Low Back & Radicular Leg Pain Worse in Flexion (ie Lumbar Disc Herniation)	Shalabhasana (locust pose)	Paschimottanasana (seated forward fold)	Sheershasana (headstand)
	Bhujangasana (cobra pose)	Janu Sirsasana (head to knee pose)	Parivrta Trikonasana (revolved triangle pose)
	Salamba Bhujangasana (sphinx pose)	Utanasana (standing forward fold)	
	Bitilasana (cow pose)		
	Urdhva Mukha Svanasana (upward facing dog)		
	Setu Bandhasana (bridge pose)		
Low Back & Radicular Pain Worse in Extension (ie Spinal Stenosis, Zygapophysial Joint Pain)	Balasana (child's pose)	Ushtrasana (camel pose)	Chakrasana (wheel pose)
	Adho Mukha Svanasana (downward facing dog)	Dhanurasana (bow pose)	
	Prasarita Padottanasana (wide legged forward fold)	Bhujangasana (cobra pose)	
	Paschimottanasana (seated forward fold)		
	Marjaryasana (cat pose)		
Neck Pain* (ie Cervical Degenerative Disc Disease, Zygapophysial joint pain)	Balasana (child's pose)	Dhanurasana (bow pose)	Sheershasana (headstand)
	Marjaryasana (cat pose)	Setu Bandhasana (bridge pose)	Urdhva Sarvangasana (supported shoulder stand)
	Bhujangasana (cobra pose)	Ushtrasana (camel pose)	Halasana (plow pose)
	Salamba Bhujangasana (sphinx pose)	Ardha Matsyendrasana (seated twisting pose)	Chakrasana (wheel pose)
	Shalabhasana (locust pose)		
	Urdhva Mukha Svanasana (upward facing dog)		

Table 1: *Neck pain from these pathologies is best managed by limiting prolonged pose at end range of cervical motion.

region should be avoided. In the absence of any contraindications and utilizing the proper cautions in patients with spine pain, it is evident that properly performed yoga postures are helpful in diminishing



Figures 1: cow pose.



Figures 2: cobrapose.



Figure 3: upword dog pose.



Figure 4: Sphinx pose.



Figure 5: Locust Pose.

pain, improving function, and reducing stress and anxiety in patients with chronic back and neck pain. As with many treatment modalities, better controlled randomized controlled studies are needed to further evaluate the role of yoga in managing chronic back and neck pain.

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Citation: Plastaras CT, Huang LY, Metzger CJ, Sorosky S (2015) Yoga Therapy for Management of Neck and Low Back Pain. J Yoga Phys Ther 5: 215. doi:[10.4172/2157-7595.1000215](https://doi.org/10.4172/2157-7595.1000215)

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