

Yoga Therapy in Practice

A Protocol and Pilot Study for Managing Fibromyalgia with Yoga and Meditation

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Abstract: Fibromyalgia is a chronic syndrome characterized by widespread pain, sleep disturbance, stiffness, fatigue, headache, and mood disorders. Recent research has resulted in an improved understanding of fibromyalgia and its possible causes. This article highlights some of the current research, discusses a strategy for using yoga and meditation as a therapy for fibromyalgia sufferers, and presents the results of a preliminary 8-week study using yoga and meditation to help manage fibromyalgia symptoms. The study of 11 participants found significant improvement in the overall health status of the participants and in symptoms of stiffness, anxiety, and depression. Significant improvements were also seen in the reported number of days “felt good” and number of days “missed work” because of fibromyalgia. Nonsignificant improvements were seen in measures of pain, fatigue, and how one felt in the morning. Effect sizes were medium to large for most tested areas. This study supports the benefits of yoga and meditation for individuals with fibromyalgia and encourages further research to explore their use as standard therapies for fibromyalgia.

Key words: yoga, fibromyalgia, chronic pain, fatigue, mood, meditation, relaxation, breathing, anxiety, depression

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Background

Fibromyalgia is a disorder characterized by chronic musculoskeletal pain and tenderness. Fibromyalgia is often defined by tenderness at 11 or more of 18 specific body points (tender points), which, along with widespread pain, is used to diagnose the syndrome, in accordance with the guidelines of the American College of Rheumatology.¹ Although pain is the primary chronic symptom, individuals with fibromyalgia may also experience stiffness, sleep problems, fatigue, anxiety, and depression.

The Cost of Fibromyalgia

Scientists estimate that fibromyalgia affects five million American adults, primarily women, and most of these are diagnosed in middle age.² The symptoms of fibromyalgia negatively affect the lives of the sufferers and pose significant costs to individuals and to society. A study using a U.S. health insurance database found that the average healthcare costs of fibromyalgia patients was three times higher than for those without fibromyalgia, based on the same sex and age.³ A study conducted in Spain revealed that individuals with fibromyalgia had

Acknowledgments: The author would like to thank Mary Jo Maciejewski, PhD, for help with data interpretation and for her comments on this article, and Beth Belk, PT, DPT, RYT-500, for her helpful review of the article. She also thanks her yoga therapy trainer, Sabrina Castaneda, MS, MOT, OTR, E-RYT-500, for her enthusiastic supervision of the work of this study, and Linda King, MS, RYT-200, for her faithful assistance with teaching the classes of the study.

significantly more sick leave, premature retirement, and disability than did individuals who did not suffer from fibromyalgia.⁴ In the United States, 6% to 15% of fibromyalgia patients are on some type of disability, in contrast with 2% of the entire non-retirement-age population.⁵ In the mid-1990s, a congressional committee estimated that the direct and indirect costs of fibromyalgia in the United States were around \$13 billion—a number that has surely only risen since.⁵

Treatments for Fibromyalgia

Standard treatment for fibromyalgia may include medications for pain, anxiety, depression, and sleep disturbances, and muscle relaxants. Since these pharmacological therapies are frequently ineffective, especially on measures of daily functioning,⁶ and because of undesirable side effects, individuals with fibromyalgia often pursue complementary and alternative medicine (CAM). A study of the use of CAM providers by fibromyalgia patients under insurance coverage indicated that the use was 2.5 times higher in fibromyalgia patients than in a non-fibromyalgia group.⁷ Literature suggests that acupuncture, magnetic therapy, massage therapy, various types of exercise, biofeedback, hypnotherapy, and diet therapies have mixed results in the treatment of fibromyalgia, with best results for balneotherapy (healing baths), hydrotherapy, homeopathy, and mindfulness meditation.^{8,9}

Researchers at the Oregon Health and Science University have demonstrated that yoga with gentle stretching and meditation provides significant improvement in pain, fatigue, tenderness, sleep, and mood in fibromyalgia patients.¹⁰ Tai chi, another slow-moving meditative type of exercise, has been shown to improve scores on measurements of pain, sleep quality, and quality of life in individuals with fibromyalgia.¹¹ This paper details a yoga and meditation protocol for those with fibromyalgia, and presents evidence of its potential to alleviate a number of fibromyalgia symptoms.

The Fibromyalgia Puzzle

Designing a yoga practice for fibromyalgia sufferers requires a good understanding of not only the syndrome's characteristics, but also the scientific research that points to its possible underlying causes. Fibromyalgia has long been an enigma for physicians, partly because it has no identifiable cause or definitive diagnostic test. Formerly called fibrositis, because scientists thought it was an inflammation of connective tissue, the name was changed to fibromyalgia in 1976¹² after muscle biopsies did not indicate inflammation to be the cause. With fibromyalgia research still in its early stages—the first controlled clinical study with validation of known symptoms and tender points was published in 1981¹²—there is still much to learn about the condition's causes. However, a growing body of information suggests that a hyperaroused nervous system is a probable underlying cause.

Researchers often describe fibromyalgia pain as *allodynia*, the perception of pain resulting from a stimulus that would not normally be painful. Many scientists believe that the allodynia associated with fibromyalgia is a result of abnormal pain processing in the central nervous system (CNS), which consists of the brain and spinal column.

During the last few years, advanced brain-imaging techniques, such as functional magnetic resonance imaging (fMRI) and magnetic resonance spectroscopy (MRS), have made it possible to study how the brain processes the pain experience. In 2002, the first report of an fMRI study with fibromyalgia patients demonstrated that pressure stimuli that evoked similar levels of *perceived* pain in fibromyalgia and control subjects evoked similar activity in regions of the brain associated with pain processing. However, the fibromyalgia patients perceived greater pain intensity with significantly less pain pressure than the controls.¹³ Those findings were subsequently supported by a similar study, in which heat stimuli were used instead of pressure stimuli. Fibromyalgia patients required lower temperatures than the controls to elicit similar patterns of brain activation,

Elevated levels of pain neurotransmitters	Lower levels of pain neuromodulators
Substance P (SP)	Serotonin
Nerve-growth factor (as SP facilitator)	Dopamine
Glutamate	Norepinephrine

Table 1. *Abnormal neurochemical levels in fibromyalgia patients.*

and warm temperatures evoked significantly greater activity of brain regions associated with pain in the fibromyalgia group.¹⁴

An MRS study of fibromyalgia patients indicated significant dysfunction in the hippocampi of patients compared to controls.¹⁵ Because the hippocampus is an area of the brain that plays important roles in the maintenance of cognitive function, sleep regulation, and pain perception, the researchers concluded that a metabolic dysfunction in the hippocampus might be implicated in the appearance of certain fibromyalgia symptoms.

Prior to advances in brain-imaging techniques, researchers had begun to identify abnormalities in the CNS of fibromyalgia patients, as shown in Table 1. Studies of the cerebrospinal fluid (CSF) of fibromyalgia patients reveal abnormally high levels of neurotransmitters involved in pronociception, the chemical process that makes us aware of pain. The first report on significantly elevated levels of the neurotransmitter substance P (SP) in fibromyalgia patients was published in 1988,¹⁶ and others have found levels of SP that are two to three times higher in fibromyalgia patients than in normal control groups.^{17,18,19} Nerve growth factor (NGF), a facilitator of SP, was shown to be four times higher in fibromyalgia patients than in healthy controls.²⁰ Another powerful neurotransmitter involved in pain processing, glutamate, was elevated in fibromyalgia subjects compared to healthy controls.²¹

Besides the overproduction of neurochemicals that signal pain, fibromyalgia sufferers appear to lack neurochemicals that help to dampen pain. Studies reveal lower CSF levels of serotonin, norepinephrine, and dopamine,^{22,23} all neuromodulators involved in antinociception, the neurochemical process that would normally inhibit pain awareness. Fibromyalgia sufferers therefore face a doubly distressing situation: a hyperaroused nervous system that processes seemingly innocuous sensory information as painful, combined with a failure of the body's pain modulation system.

A Therapeutic Yoga Protocol for Managing Fibromyalgia Symptoms

When teaching to any special population, we increase the benefits of yoga by planning the therapy for the specific concerns and issues most common within that population. Table 2 outlines a strategy for the most common fibromyalgia symptoms. An educated yoga therapist brings to the instruction not only an awareness of specific fibromyalgia symptoms but also their possible overlap or causal relation-

ships. Although the connection among coexisting symptoms of fibromyalgia is not always clear, a longitudinal study concluded there is a causal impact from many symptoms on other symptoms: disturbed sleep increases pain, pain worsens physical functioning, and worse physical functioning increases depression.²⁴ Intuitively, we can also assume other relationships among symptoms: widespread pain is likely to interfere with sleep quality; pain and insomnia can result in anxiety; and anxiety interferes with sleep. Addressing any one of the symptoms may lead to meaningful improvements in other symptoms.

Anxiety

Anxiety has been observed in one-third of fibromyalgia sufferers.^{25,26} Posttraumatic stress syndrome (PTSD), a severe form of anxiety, is also common. A study by Cohen et al. found that 57% of fibromyalgia patients had clinically significant levels of PTSD symptoms.²⁷ With the frequency of these disorders, it is not surprising to find rapid, shallow breathing, even hyperventilating, with beginning students. Even if one could remove all other sources of anxiety, pain itself, the primary characteristic of fibromyalgia, tends to inhibit deep breathing. Therefore, the yoga class for individuals with fibromyalgia should always begin with at least 5 minutes of centering and calming breaths. It is important to encourage students to use that same breath as a guide throughout the practice. Reminding them that there is wisdom in the breath allows them to recognize when to back off from *asanas* (poses) that provoke anxiety.

Rapid, energizing breathing such as *kapalabhati* (skull shining breath) may exacerbate anxious feelings, but calming exercises such as *nadi shodhana* (alternate-nostril breathing) can be very helpful. Physiologically, this slow, expansive breathing helps to balance the parasympathetic and sympathetic branches of the autonomic nervous system response, and override the “fight or flight” response of the sympathetic nervous system. For students who continue to remain anxious during *nadi shodhana*, a good alternative is several minutes of left-nostril breathing—inhaling through the left nostril and exhaling through the right. Some researchers believe that breathing through the left nostril more effectively induces the relaxation response of the parasympathetic nervous system.^{28,29}

Depression

A multicenter investigation found that 69% of fibromyalgia patients have experienced major depression in their lifetime, with 22% currently experiencing depression.²⁶ A yoga practice that includes plenty of chest-opening and

Symptom	Yoga Strategy	Examples	Benefits for Fibromyalgia
<i>Anxiety, Shallow Breathing</i>	<ul style="list-style-type: none"> Begin with centering, calming <i>pranayama</i> “Grounding” <i>asanas</i> Focus on in-breath and out-breath during each <i>asana</i> Meditation and/or guided <i>savasana</i> 	<ul style="list-style-type: none"> <i>Nadi shodhana</i> (alternate nostril breathing) or left nostril breathing <i>Tadasana</i> (mountain pose), <i>vrksasana</i> (tree pose) Mindfulness meditation or <i>yoga nidra</i> 	<ul style="list-style-type: none"> Increases parasympathetic response and decreases CNS hyperactivity Cultivates sense of being firmly planted Calms the mind and draws it away from anxious thoughts
<i>Depression</i>	<ul style="list-style-type: none"> Backward-bending and chest-opening <i>asanas</i> Meditation that promotes feelings of acceptance 	<ul style="list-style-type: none"> <i>Setu bandha sarvangasana</i> (bridge), <i>ustrasana</i> (camel), <i>anuvittasana</i> (standing backbend) Restorative: supported <i>supta virasana</i> (reclining hero) and <i>supta baddha konasana</i> (reclining bound angle) Loving-kindness meditation 	<ul style="list-style-type: none"> Opens the heart and chest Emotionally uplifting and affirming Lifts the spirit
<i>Pain</i>	<ul style="list-style-type: none"> Slow, gentle <i>asanas</i> with breath awareness Meditation 	<ul style="list-style-type: none"> Slow-paced <i>vinyasa</i> (flowing yoga) or modified <i>surya namaskar</i> (sun salutation) Healing images meditation Mindfulness meditation 	<ul style="list-style-type: none"> Increases parasympathetic response Decreases pain and distress
<i>Stiffness</i>	<ul style="list-style-type: none"> Classes scheduled later in the day, after morning stiffness <i>Asanas</i> that increase mobility throughout the body 	<ul style="list-style-type: none"> <i>Bitilasana-marjariasana</i> (cow-cat), <i>adho mukha svanasana</i> (downward-facing dog), <i>supta padangusthasana</i> (reclining big-toe pose) 	<ul style="list-style-type: none"> Mobilizing joints/increasing range of motion
<i>Sleep Disturbance</i>	<ul style="list-style-type: none"> Restorative <i>asanas</i> Meditation 	<ul style="list-style-type: none"> Bolster- or blanket-supported <i>asanas</i>: <i>supta baddha konasana</i> (reclining bound angle), <i>viparita karani</i> (legs up the wall), <i>bala-sana</i> (child’s pose) <i>Yoga nidra</i> mindfulness meditation, or other meditation practices 	<ul style="list-style-type: none"> Supported deep relaxation helps induce sleep <i>Yoga nidra</i> calms the mind, promotes sleep
<i>Headaches</i>	<ul style="list-style-type: none"> Avoid inversions and deep forward bends for migraine sufferers 	<ul style="list-style-type: none"> Modified <i>uttanasana</i> (standing forward bend) with torso parallel to floor, head in line with spine <i>Adho mukha svanasana</i> (downward-facing dog) with hands on a chair seat, head in line with arms 	<ul style="list-style-type: none"> Prevents migraine headaches induced by head-down position

Table 2. *Yoga strategies for fibromyalgia.*

back-bending poses may help promote feelings of openness, acceptance, and courage. Helpful *asanas* include *setu bandha sarvangasana* (bridge pose), *bitilasana* (cow pose), *urdhva mukha svanasana* (upward-facing dog), and *anuvittasana* (standing backbend). Restorative chest-opening and back-bending poses can also be beneficial, including *supta baddha konasana* (reclining bound angle) and *supta virasana* (reclining hero), each supported on the back with bolsters or blankets.

Meditation can have a profound effect on depression as well as pain. Used for centuries in the Buddhist tradition, *metta* (loving-kindness) meditation uses specific silent mental phrases or *mantras* directed at oneself and others. Because this meditation promotes compassion, an awareness of the goodness within us, and an appreciative joy in our relationships with other beings, it is a powerful tool for relieving feelings of isolation and sadness. The meditation protocol known as mindfulness-based stress reduction (MBSR), developed by Jon Kabat-Zinn of the Stress Reduction Clinic at the University of Massachusetts Medical Center, has been the focus of several studies that show a marked improvement in depression and anxiety.³⁰⁽³³⁶⁻⁷⁾ MBSR includes gentle yoga movements, along with meditation practices that focus on being in the present moment and on merely observing and releasing thoughts without being caught up in them. One study found that mindfulness meditation significantly relieved depressive symptoms in fibromyalgia patients compared to a control group.³¹

Pain

Since pain is the hallmark symptom of fibromyalgia, it is critical that the yoga practice does not make it worse. While physical exercise is generally considered beneficial for fibromyalgia,^{6,32} exercise-induced pain in fibromyalgia patients is common.³³ To avoid the likelihood that the student will abandon the yoga practice altogether when over-striving increases the pain, it is important to begin slowly and gently. *Vinyasa* (flowing yoga) is fine, but at a slower pace than is used with the general population. The yoga therapist should frequently remind fibromyalgia students, even more than in a class of the general population, that calming *asanas* of their choice, such as *balasana* (child's pose), are always an option when the practice becomes uncomfortable or painful.

Encouragingly, the literature is full of studies showing the benefits of yoga and meditation for chronic pain sufferers.³⁴ As mentioned previously, mindfulness meditation taught alongside gentle yoga practices has consistently been shown to reduce suffering in individuals with chronic pain. In working with patients at the Stress Reduction Clinic,

Kabat-Zinn and his team report several studies showing dramatic reductions in pain level after an 8-week training period in MBSR.³⁰⁽²⁸⁸⁻²⁹⁰⁾ In one study, 72% of patients with chronic pain achieved at least a 33% reduction on the McGill-Melzack Pain Rating Index, and 61% achieved at least a 50% reduction. A clinical study using control groups with female fibromyalgia patients found significant improvements in visual analog pain and in coping with pain after an 8-week MBSR intervention.³⁵ Not surprisingly, that study also reported significant improvements in quality of life, anxiety, and depression.

Because meditation benefits fibromyalgia sufferers in several ways other than pain relief (see Table 2), a therapeutic yoga practice will ideally include guided meditation before and after *asanas*. Along with *metta* and mindfulness practices, meditations that uses healing or calming images (e.g., healing light, being in nature) can be very helpful in reducing pain.

Stiffness

The National Fibromyalgia Association states that morning stiffness is one of the more common complaints doctors hear about from fibromyalgia patients.³⁶ While gentle morning stretches are encouraged, morning stiffness may make it difficult to ease into some *asanas*, which may result in discouragement and loss of interest in the practice. To avoid this possibility, it might be preferable to schedule the yoga practice later in the day, after the body has become more malleable with the day's movement. Since the stiffness of fibromyalgia is not confined to any one part of the body, gentle yoga *asanas*, such as those listed in Table 2, are recommended to help to increase flexibility throughout the body.

Sleep Disturbance

Pain alone could explain why individuals with fibromyalgia experience insomnia. In fact, since pain and nonrestorative sleep go hand-in-hand, the sufferer may complain that it is not clear which symptom came first—the pain or the insomnia. A longitudinal study found that about 95% of fibromyalgia patients scored within the range of problem sleepers.²⁴⁽⁹⁶³⁾ Interestingly, higher levels of the neurochemical SP, discussed earlier as one possible cause of abnormal pain processing in fibromyalgia, may also influence sleep and mood. In separate studies, intravenously given SP negatively affected sleep quality and mood in healthy young men,³⁷ and intracerebral SP administration in mice produced sleep disturbances.³⁸

Restorative *asanas* that help to ratchet down the “fight-or-flight” responses of the sympathetic nervous system and

promote the calming effects of the parasympathetic system are best for helping to induce sleep in fibromyalgia sufferers. These include *asanas* supported with a bolster or folded blankets, such as *supta baddha konasana* (reclining bound angle), *viparita karani* (legs up the wall), *balasana* (child's pose), and *savasana*. Ideally, supported restorative *asanas* are held for at least 5 minutes, and they follow more active *asanas*. A practice that ends with guided *yoga nidra* (yogic sleep) is an excellent way to help individuals with fibromyalgia relax physically and mentally, which may result in more restful sleep.

Headaches

Chronic headaches are a typical fibromyalgia symptom, observed in one study in 76% of fibromyalgia patients; 63% of those were diagnosed as migraines.³⁹ Because inversions cause more blood to flow to the head, they can either exacerbate or trigger a migraine headache. Most fibromyalgia suf-

ferers will already know from everyday movement if inverted positions are a problem for them, even if they have never practiced yoga. Therefore, in the confidential information form that you provide for new students, it is a good idea to include a question about headaches and what triggers them. Offer modifications, such as supported *uttanasana* (forward bend) or *adho mukha svanasana* (downward-facing dog) with the hands on a chair seat, head in line with the arms and the spine.

Other Teaching Considerations

Besides the classic fibromyalgia symptoms, certain neurologic signs are common, as demonstrated by Watson and colleagues, in which fibromyalgia patients underwent examinations by a neurologist blinded to the disease status.⁴⁰ The significant signs and symptoms can help guide yoga therapy for this population. For example, 63% of the fibromyalgia patients had poor balance compared with only 4% of the controls. Yoga therapy should therefore include standing balancing *asanas* that build lower body and core strength and help to increase a sense of groundedness. Good choices are *vrksasana* (tree) and standing *ardha pavana muktasana* (wind relieving). The yoga therapist should always offer the option to begin by placing one hand on the wall or the back of a chair to help build confidence in standing balancing *asanas*. Watson's study of neurological symptoms also reported that 70% of fibromyalgia patients were sensitive to bright lights, compared with only 6% of the controls. The yoga therapist therefore should always dim or turn off overhead lights, especially during supine positions.

Q2: Of the 7 days in the past week how many days did you feel good? 0 1 2 3 4 5 6 7

Q3: How many days last week did you miss work, including housework, because of fibromyalgia? 0 1 2 3 4 5 6 7

For the remaining items on this page mark the point on the line that best indicates how you felt overall **the past week**:

Q4: When you worked, how much did pain or other symptoms of your fibromyalgia interfere with your ability to do your work, including housework?

•-----•
No problem with work Great difficulty with work

Q5: How bad has your pain been?

•-----•
No pain Very severe pain

Q6: How tired have you been?

•-----•
No tiredness Very tired

Q7: How have you felt when you get up in the morning?

•-----•
Awoke well rested Awoke very tired

Q8: How bad has your stiffness been?

•-----•
No stiffness Very stiff

Q9: How nervous or anxious have you felt?

•-----•
Not anxious Very anxious

Q10: How depressed or blue have you felt?

•-----•
Not depressed Very depressed

Figure 1. Questions of FIQ administered in the study.

Dizziness was also common, found in 53% of the fibromyalgia group, compared with 4% of controls. Lightheadedness was reported in 52% of fibromyalgia patients, compared with 0% in the controls. Therefore, most inverted *asanas* are contraindicated in fibromyalgia, except for supported *viparita karani* (legs up the wall), which is a milder inversion that may help to induce sleep. Some forward-bending *asanas*, even *balasana* (child’s pose), may induce or exacerbate dizziness or lightheadedness in fibromyalgia students. The same modifications noted for inversion-induced headaches apply for problems with dizziness or lightheadedness. A bolster or folded blankets to support the head may help prevent dizziness in child’s pose or other restorative head-down positions.

Evaluation of the Yoga for Managing Fibromyalgia Program

Study Overview

A preliminary study was conducted to determine changes in participants’ self-reported symptoms after an 8-week workshop, Yoga for Managing Fibromyalgia. The workshop implemented the yoga strategies described in the first part of this article and outlined in Table 2.

Item	Measurement	Score Range	Normalization	Score Range After Normalization
2	Days felt good (scored inversely)	0–7	Score X 1.43	0–10
3	Days missed work	0–7	Score X 1.43	0–10
4	Pain interfered with work	0–10	None	0–10
5	How bad pain	0–10	None	0–10
6	How tired	0–10	None	0–10
7	How felt in the AM	0–10	None	0–10
8	How bad stiffness	0–10	None	0–10
9	How nervous, anxious	0–10	None	0–10
10	How depressed	0–10	None	0–10

Table 3. Scoring method for the subscale items of the FIQ used in the study.

Participant Recruitment

Persons diagnosed with fibromyalgia were recruited through physicians’ offices, a local fibromyalgia support organization, and a church, all in the greater Dallas, Texas, area. Eligible people were ages 18 years and older, able to attend a class that met weekly, and able to get to and from the floor without assistance. Twenty-four women and one man were recruited for the Managing Fibromyalgia with Yoga workshop. Fifteen individuals remained with the workshop until the end of its 8-week duration.

Measures

After providing informed consent and self-reported medical conditions, participants completed sections of

Centering breaths with meditation 10 min.	Learning and group sharing 15 min.	<i>Asanas</i> 35 min.	<i>Savasana</i> and meditation 15 min.
75 minutes			

Figure 2. Class agenda of the Managing Fibromyalgia with Yoga program.

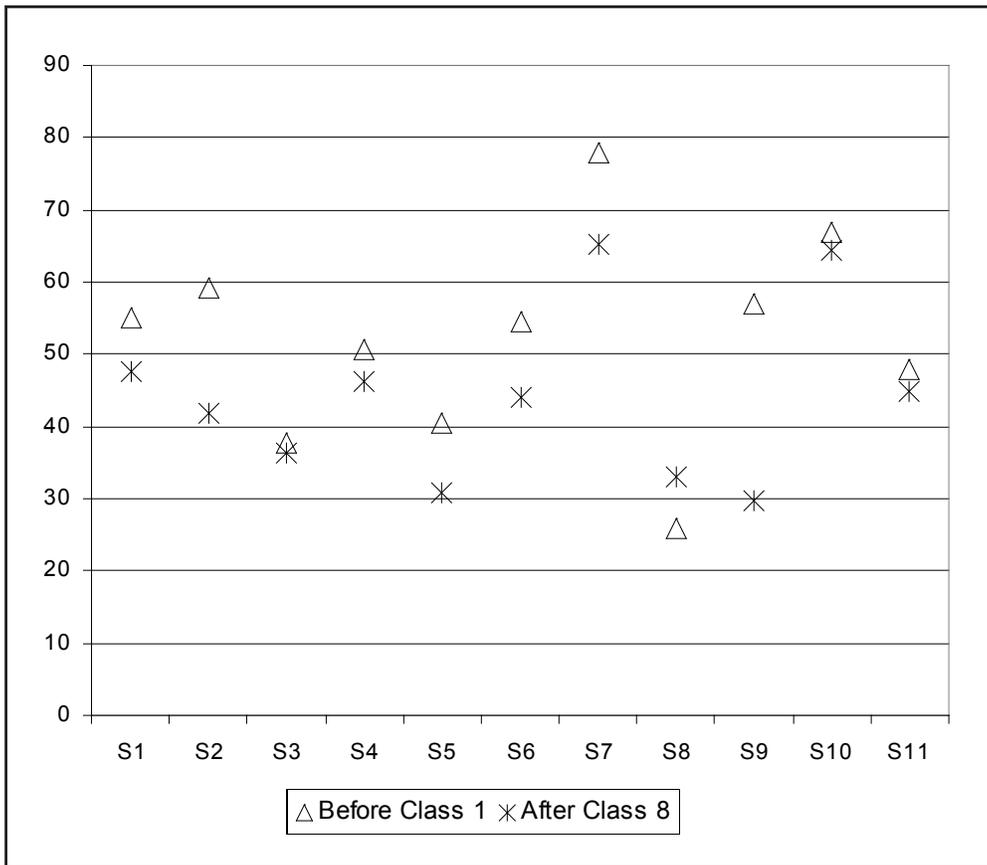


Figure 3. FIQ total scores (minimum = 0; maximum = 90) for each subject before and after the Managing Fibromyalgia with Yoga program. Improvements (lower scores) were seen in all but one subject.

the Fibromyalgia Impact Questionnaire (FIQ). The FIQ was also administered immediately following the last class of the 8-week program. The FIQ is a commonly used clinical and research questionnaire to assess the physical function and symptoms of fibromyalgia patients over the previous week. In various assessments, the FIQ has been shown to have a credible construct validity and reliable test-retest characteristics.⁴¹ A cited problem with the FIQ is its potential gender bias in the first question regarding physical functioning,^{41,42} in which about half of the listed tasks may be considered predominantly performed by women, such as vacuuming, shopping, making beds, doing laundry, washing dishes, and preparing meals. The question's listing of such tasks is understandable, because the FIQ was originally developed to assess the health of women with fibromyalgia.⁴³ However, since the Yoga for Fibromyalgia program was open to both men and women, this question was omitted, and the FIQ's remaining questions, which address symptom severity, were administered (see Figure 1).

Intervention

Participants met for 75 minutes each week to participate in brief discussions and to receive instruction in gentle yoga exercises and meditation. Two registered yoga teachers taught each class to ensure enough individual help with *asana* modifications and use of yoga props where necessary. Yoga instruction of *pranayama*, *asana*, relaxation, and meditation followed the considerations given in Table 2. Figure 2 provides a general agenda for each class.

The typical class began with 5 to 10 minutes of supine or seated guided *pranayama* and meditation to promote centering and calming. Following *pranayama* and meditation were 15 minutes of discussion about the latest research on fibromyalgia, how yoga may help with fibromyalgia symptoms, and sharing by participants of their experience with the yoga and

meditation techniques they practiced outside of the class. The discussion period allowed the instructors to gauge the effectiveness of specific *asanas*, *pranayama*, and meditation techniques, and provided opportunities for interaction and social connection. Instructors then led participants through slow-moving *asanas*, often including a gentle *surya namaskar* (sun salutation). Each class ended with guided relaxation in *savasana*, followed by guided meditation. All together, guided relaxation and meditation composed about one-third of each class.

Participants received handouts of each week's session that included illustrated instructions for the yoga *asanas* and meditation techniques used in each class. They were encouraged to practice these when away from the class.

Results

A previously published research review indicated that compliance is a significant problem in exercise studies with fibromyalgia patients, with attrition rates ranging from 13% to 44%.⁴⁴ A potential increase in pain and stiffness after the

initial exercise session may partly explain the high dropout rates. Additionally, fibromyalgia “flare-ups” may occur for unknown reasons, with intensified symptoms that may make a participant feel too disabled to attend a class.

In this study, the attrition rate was 36%, with 9 of the original 25 dropping out. Reasons cited in this study for dropping out included no childcare available, driving distance or traffic issues, and pain following the class. One participant stated she had to drop out because her physical situation required so many *asana* modifications that she did not feel she was “really doing yoga.”

Criteria for including participants in the analysis of evaluation data were (1) the participant must have attended at least six classes of the 8-week program, including the first class and the final class; (2) the participant must have completed the FIQ at the beginning of the program and immediately following the last class of the program. Ten women and one man satisfied these criteria. Their ages ranged from 27 to 70 years, with a mean age of 51 years. Of these 11 individuals, 8 reported in a pre-program questionnaire that they exercised by walking, swimming, lifting weights, or stretching. One person indicated practicing yoga for exercise.

FIQ total scores were computed to assess the impact of the Yoga for Managing Fibromyalgia program on the overall symptomatology of fibromyalgia. Each of the 10 items of the FIQ has a maximum possible score of 10, resulting in a maximum composite score of 100, with a higher score indicating higher symptom severity. As discussed earlier, the first item of the FIQ was not tested. Therefore, the maximum possible score for each subject in our study is 90. Using the algorithm set forth by Bennett,⁴¹ the items were scored as summarized in Table 3. The effect size (*ES*) was calculated

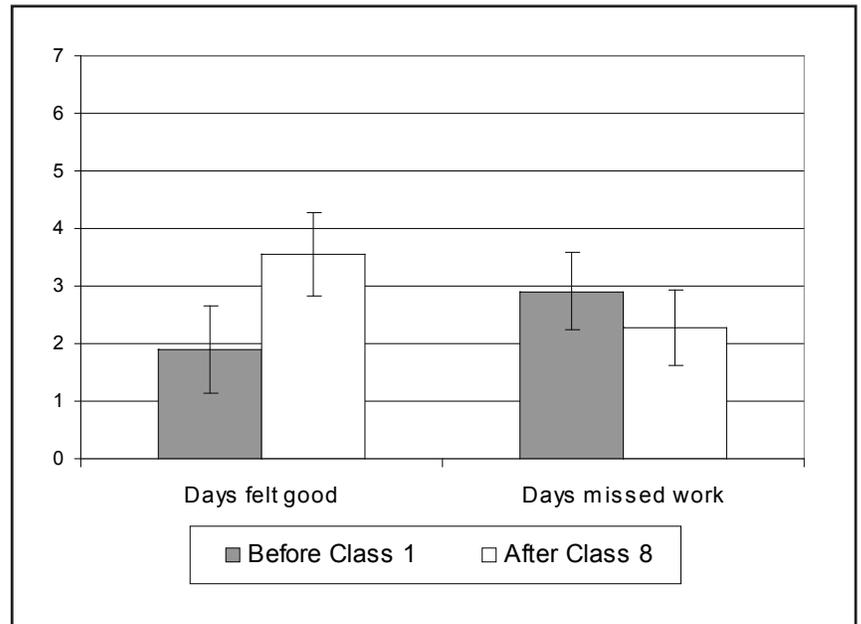


Figure 4. Average response value for FIQ subscale questions. (See Figure 1, Q2, and Q3.) Error bars are standard errors of the mean (SEM). “Days felt good” and “days missed work” showed significant improvement, with respective *p*-values of *<.01* and *.01*. Overlapping SEM bars for “days missed work” are a function of the small sample size (see Discussion).

according to Cohen’s formula, using a pooled standard deviation. The FIQ total improved significantly (*p* = .01) during the course of the intervention, decreasing by a mean of 8.14 (*SD* = 5.11), and having an effect size of .62. Improvements were seen in FIQ total scores for all but one of the subjects (see Table 4 and Figure 3).

In addition to the FIQ total analysis, pre- and post-intervention analyses of significance and effect size were performed on the nine tested FIQ subscale items. Consistent with the health status improvement seen for the total FIQ, mean score improvements were seen in all tested subscale items of the FIQ over the course of the intervention. Significant differences were seen in the pre- and post-intervention measurements of the number of days that one felt good (*p* < .01, *ES* = .69) and

Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Change in FIQ Total Score	-7.4	-17.6	-1.4	-4.4	-9.7	-10.5	-12.7	+7	-27.4	-2.4	-3.1

Table 4. Post-intervention change in each subject’s FIQ total score. Negative values indicate improvement, observed in all but one subject.

in the number of days missed work because of fibromyalgia ($p = .01$, $ES = .28$). Significant improvements were also seen in measures of stiffness ($p = .01$, $ES = .93$), anxiety ($p < .05$, $ES = .55$), and depression ($p < .05$, $ES = .53$). Nonsignificant improvements were seen in the degree that pain interfered with work ($ES = .16$), pain severity ($ES = .37$), fatigue ($ES = .48$), and how one felt in the morning ($ES = .57$). Details of FIQ total and subscale measurements are given in Table 5. The average response values for pre- and post-intervention FIQ subscale items are given in Figures 4 and 5.

Discussion

The findings of this study demonstrate that a short program in yoga and meditation has positive effects on the overall health status of fibromyalgia sufferers and on specific fibromyalgia symptoms. Results indicate significant improvement in the overall severity of fibromyalgia, with moderate-to-large effect sizes for the total FIQ, days felt good, pain severity, fatigue, how one felt in the morning, stiffness, anxiety, and depression.

Significant improvements were seen in the participants' perception of how often they feel good and how often they had to miss work because of fibromyalgia. Although the purpose of the study was not to analyze cost savings, these results suggest such a possible benefit. Improvements in "feel good" and "miss work" alone might result in a decrease of the previously noted \$13 billion of direct and indirect costs of fibromyalgia in the United States.

The significant improvement in participants' bodily stiffness ($p = .01$), along with the large effect size (.93), is especially encouraging since, in a pre-program questionnaire, the majority of measured participants (8 of 11) indicated they already engaged in some form of exercise. Therefore, the overall improvement in stiffness was not likely simply the result of sedentary people starting to move again.

Significant improvements were also seen in measures of anxiety ($p < .05$, $ES = .55$) and depression ($p < .05$, $ES = .53$). It is possible that these scores improved partly as an

effect of the social support that naturally occurs when people with the same illness come together. Merely practicing in an open and supportive environment with individuals having the same symptoms could have improved anxiety and depression measurements. Nonetheless, this study's results are consistent with those of this article's previously cited studies showing improvement in mood with yoga and meditation.

Although pain improvements in this study were promising, these measures did not reach significance, and the effect sizes were small. This may be partly due to the chronic nature of pain in fibromyalgia and the need to design

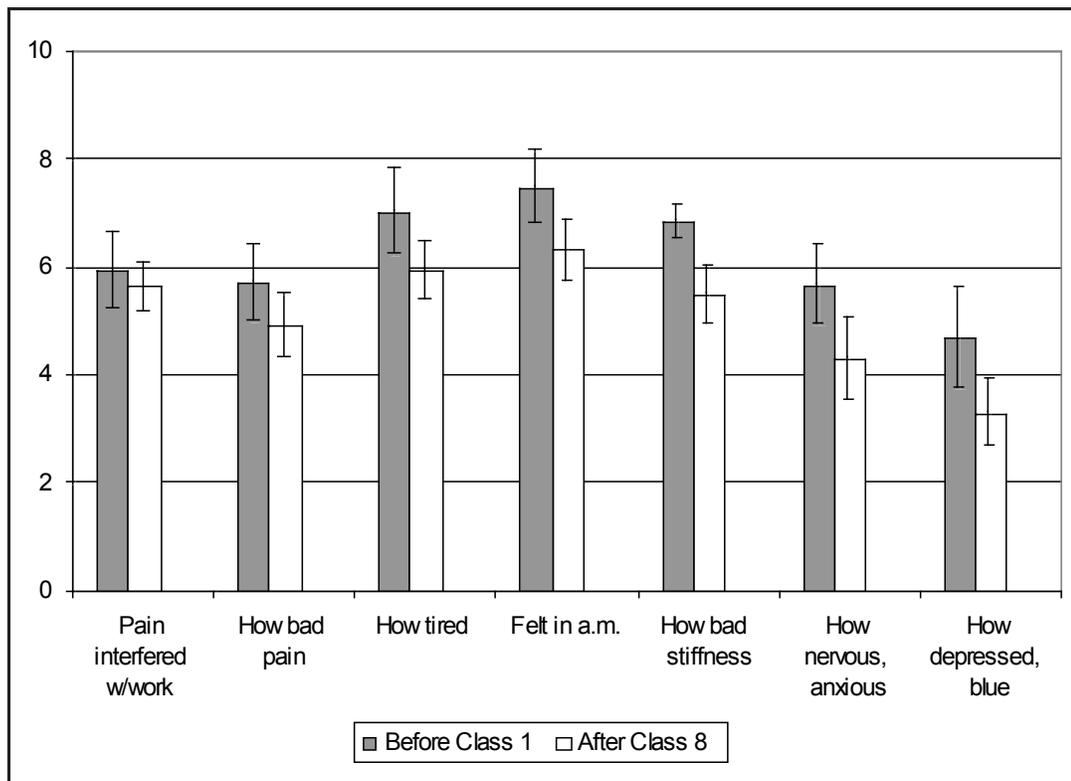


Figure 5. Average response value for FIQ subscale questions. (See Figure 1, Q4-Q10.) Higher values indicate higher symptom severity. Error bars are standard errors of the mean (SEM). Significant results were found for "how bad stiffness" ($p = .01$), "how nervous, anxious" ($p < .05$), and "how depressed, blue" ($p < .05$). Overlapping SEM bars in measures of significant results are a function of the small sample size.

Measurement	N	Before Class 1		After Class 8		Effect Size	p-value
		Mean (SD)	SEM	Mean (SD)	SEM		
<i>Total FIQ</i>	11	52.149 (14.21)	4.284	44.01 (12.06)	3.636	.62*	.01
FIQ Subscale Items:							
<i>Days felt good</i>	11	1.91 (2.51)	.760	3.55 (2.21)	.670	.69*	<.01
<i>Days missed work</i>	11	2.91 (2.43)	.730	2.27 (2.20)	.660	.28	.01
<i>Pain interfered with work</i>	11	5.955 (2.318)	.699	5.636 (1.518)	.458	.16	NS
<i>How bad pain</i>	11	5.727 (2.402)	.724	4.909 (1.973)	.595	.37	NS
<i>How tired</i>	11	7.045 (2.641)	.796	5.955 (1.823)	.550	.48	NS
<i>How felt in the a.m.</i>	11	7.5 (2.191)	.661	6.318 (1.927)	.581	.57*	NS
<i>How bad stiffness</i>	11	6.864 (1.074)	.324	5.5 (1.775)	.535	.93**	.01
<i>How nervous, anxious</i>	11	5.682 (2.462)	.742	4.318 (2.513)	.758	.55*	<.05
<i>How depressed</i>	11	4.682 (3.076)	.928	3.318 (1.978)	.596	.53*	<.05

Table 5. Mean, standard deviation (SD), standard error of the mean (SEM), effect size and p-values for the pre- and post-intervention total FIQ score consisting of nine items (mean minimum = 0; maximum = 90) and individual FIQ subscale items (mean minimum = 0; maximum = 10). Higher mean values indicate higher symptom severity. Effect size* = medium; effect size** = large.

studies that test the long-term effects of practicing yoga and meditation. Additional studies, perhaps with programs of longer duration and follow-up, are needed to examine the effects of yoga and meditation on pain in individuals with fibromyalgia.

Several effect-size values of this study were about the same size as, or exceeded, the mean effect size of .49 for pharmacological and nonpharmacological treatment interventions for fibromyalgia.⁴⁵ In this study, the effect size of post-intervention compared to pre-intervention was .62 for the total FIQ, a measure of the overall severity of fibromyalgia. Effect sizes for number of days felt good (.69), fatigue (.48), how one felt in the morning (.57), stiffness (.93), anxiety (.55), and depression (.53) are encouraging and highlight the importance of additional studies to explore results of similar measures.

Limitations and Future Research

Because this research was a preliminary study, there are several limitations to consider. First, the small number of subjects may have limited the statistical power of the results. With our small sample size (N = 11), it is not surprising to see a large standard error of the mean (SEM) in almost all of the study's measurements. A larger sample size would have likely reduced SEMs, thereby decreasing overlaps of error bars where the pre- and post-intervention measurements are nonetheless statistically significant. Further studies with larger sample sizes could also better determine both the statistical and clinical significance of the symptom improvements that failed to reach statistical significance in this small sample. Also, the study did not include a control group and did not include follow-up after the 8-week program. Since fibromyalgia is a chronic syndrome, further research is important to determine

if subjects would continue to practice yoga and meditation and if their symptoms improved over a longer period.

With the measurements collected for this study, it is difficult to know which improvements were specific to practicing yoga and meditation, compared to improvements brought about by social interaction and sharing. Also unknown is the contribution of the psychological effect of doing *something* as opposed to feeling helpless about the illness. Future research on the effects of yoga and meditation on fibromyalgia symptoms should include studies with long-term follow-up to test the duration of fibromyalgia symptom relief and control groups to verify whether positive outcomes are indeed due to the yoga and meditation practices.

Conclusion

Despite the small sample, this study found mean score improvements in all tested symptoms, as well as a significant gain and medium effect size for the overall health status of the subjects. Significant improvements and medium-to-large effect sizes were also found in symptoms of stiffness, anxiety, depression, days that one felt good, and days that fibromyalgia caused one to miss work. Nonsignificant improvements were found in pain measurements, fatigue, and how one felt in the morning. This study provides additional evidence of the positive effects of yoga and meditation for fibromyalgia patients and encourages further research to explore the use of these tools as adjunctive therapies for fibromyalgia.

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