Published in final edited form as:

Holist Nurs Pract. 2012 ; 26(5): 262–271. doi:10.1097/HNP.0b013e318263f2ed.

Yoga for Youth in Pain:

The UCLA Pediatric Pain Program Model

Subhadra Evans, PhD, Mona Moieni, BA, Beth Sternlieb, BFa, Jennie C.I Tsao, PhD, and Lonnie K. Zeltzer, MD

Pediatric Pain Program, Department of Pediatrics at the David Geffen School of Medicine, University of California, Los Angeles

Abstract

Children, adolescents, and young adults do not typically feature in clinics, studies, and mainstream notions of chronic pain. Yet many young people experience debilitating pain for extended periods of time. Chronic pain in these formative years may be especially important to treat in order for young patients to maintain life tasks and to prevent protracted disability. The Pediatric Pain Program at the University of California, Los Angeles, is a multidisciplinary treatment program designed for young people with chronic pain and their families. We offer both conventional and complementary medicine to treat the whole individual. This article describes the work undertaken in the clinic and our newly developed Yoga for Youth Research Program. The clinical and research programs fill a critical need to provide service to youth with chronic pain and to scientifically study one of the more popular complementary treatments we offer, Iyengar yoga.

Keywords

chronic pain; complementary medicine; pediatrics; yoga

CHRONIC PAIN IN CHILDREN, ADOLESCENTS, AND YOUNG ADULTS

Chronic pain is often considered a malady of the ageing. However, a significant minority of children and adolescents suffer from pain that can be considered chronic, that is, lasting 3 months or longer.¹ As many as 45% of children experience chronic pain, most typically in the form of headache, abdominal pain, limb pain, and back pain.² Many of these pain conditions are functional meaning that no apparent organic cause can be identified. Other pain conditions result from disease-related processes, such as postsurgical pain, cancer pain, and rheumatoid arthritis (RA). Under a biopsychosocial definition, all chronic pain is seen as resulting from a complex interplay of central nervous system functioning, psychological factors including motivation, past experience of pain, anxiety and depression, and the social environment, including social support. The social context of chronic pain can be particularly important to understand in pediatric settings given that parents and families play a large role in the lives of children and adolescents.³

Most children with chronic pain are treated at primary care facilities⁴ but some patients continue to experience recurrent or persistent pain and associated disability and such

Copyright © 2012 Lippincott Williams & Wilkins.

Correspondence: Subhadra Evans, PhD, Pediatric Pain Program, Department of Pediatrics, David Geffen School of Medicine at UCLA, MDCC 22-464, 10833 Le Conte Ave, Los Angeles, CA 90095, (suevans@mednet.ucla.edu).

The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

children present to tertiary clinics. Children with complex, protracted pain often deal with impairment and disability and a range of psychosocial comorbidities including school absence and associated social challenges, family stress, and psychological issues such as anxiety and depression.⁵ Sleep disturbances and fatigue are also commonplace and significantly impact quality of life.⁶ This article describes one tertiary clinic—the Pediatric Pain Program (PPP) at the University of California, Los Angeles—and the use of Iyengar yoga (IY) as a complementary treatment for pediatric chronic pain.

PEDIATRIC CHRONIC PAIN MANAGEMENT

Best practice management of pediatric chronic pain involves multiple treatment modalities in a multidisciplinary pain clinic. Current conventional treatments include pharmacologic therapy, psychotherapy, and physical therapy. Despite the widespread use of these strategies, management of pediatric chronic pain, like adult chronic pain, remains elusive. Chronic pain often involves a myriad of triggers and exacerbations. Management efforts may be most fruitful when the whole person's functioning is considered. To this end, complementary and alternative medicine (CAM) can be considered alongside conventional approaches. Complementary and alternative medicine interventions attempt to restore balance and harmony in the mind and body, whereas the goal of Western medicine is to restore homeostasis or balance to bodily functions. Under a biopsychosocial conceptualization of chronic pain, the integration of CAM with more traditional psychological and pharmacologic therapies may be the most effective way of dealing with chronic pain in young patients.

A more in-depth analysis of the various CAM modalities that may be therapeutic for children dealing with chronic pain is available in our previous work.^{7–9} Later in the text, we present a brief overview of some of the treatments currently being used in the UCLA PPP. We then turn to a detailed description of IY, a CAM modality we have been incorporating into the treatment plan of many children with chronic pain and for which we have recently embarked upon a research program to document feasibility, safety, and efficacy using a series of randomized controlled trials. It is worth noting that, to date, many of these interventions have been poorly studied in adults, and even less empirical work has been done with children experiencing chronic pain.

Acupuncture is thought to harness and redirect “Qi” or energy throughout the body. It is believed that if blocked, this energy force can cause imbalance and sickness. Acupuncture is intended to restore Qi through the insertion of needles into points along energy pathways (meridians) in the body. The needles help stimulate the energy flow. Although the precise analgesic mechanisms have not been identified, it is likely that the body's nervous system, neurotransmitters, and endogenous substances are involved in needle stimulation.¹⁰ For an overview of acupuncture in pediatric populations see 2 of our recent reviews.^{11,12} Preliminary evidence supports the efficacy of acupuncture for migraine in children.¹³ We have also found initial evidence in our clinic for the utility of acupuncture combined with hypnotherapy (described below) in alleviating pediatric head pain, abdominal pain, fibromyalgia, and complex regional pain syndrome type I.¹⁴

Hypnotherapy used for chronic pain is based on a mind-body approach to healing. Hypnotherapy and guided imagery are thought to calm the nervous system and release stress and pain in the child. During hypnosis, modification or enhancement of sensation and perception often occurs, and children are especially susceptible to these effects. Neuroimaging research shows that hypnosis is associated with activation of brain areas consistent with decreased arousal, visual imagery, and the likely reinterpretation of perceptual experiences.¹⁵ A review of multiple studies testing the use of hypnosis for

pediatric headaches indicated relaxation/self-hypnosis to be a well-established and efficacious treatment.¹⁶ A recent clinical trial has shown benefits for children with recurrent abdominal pain and irritable bowel syndrome (IBS).¹⁷

Biofeedback uses a computer or other feedback device to assist children in managing symptoms by becoming aware of and learning to voluntarily control physiologic changes associated with the stress response. These monitored changes may include muscle tension, skin temperature, sweat gland response, brain wave activity, or breathing rate, with the goal of increasing relaxation in the body. Biofeedback teaches children to be aware of how their body reacts to experiences and to gain physiologic control of the branch of the nervous system that is activated by pain or stress. Studies have reported significant reductions in children's symptoms of headache and migraine¹⁸ and recurrent abdominal pain.¹⁹

Massage therapy is based on the belief that when muscles are overworked, waste products can accumulate in the muscle, causing soreness and stiffness. The therapy aims to improve circulation in the muscle, increase flow of nutrients, and eliminate waste products. Although the underlying mechanisms are unknown, it is likely that massage involves increased parasympathetic activity and a relaxed physiologic state.²⁰ Studies have shown massage to alleviate juvenile RA pain²¹ and to reduce pain, tension, and distress in a group of children with a range of chronic pain conditions presenting to a pediatric pain clinic.²²

Mindfulness meditation involves the conscious monitoring of one's attention and focusing on the present moment to promote stabilizing the mind and a sense of calm. By adjusting practices to the child's development, mindfulness meditation can be taught to children of almost all ages. It is likely that mindfulness meditation minimizes pain through the individual's acceptance of pain and a reduction in stress. Meditation has shown beneficial effects on blood pressure and heart rate in adolescents,²³ although trials expressly studying children with chronic pain are wanting.

Iyengar yoga is a traditional form of yoga taught by B.K.S. Iyengar who uses props such as blankets, bolster, blocks, to allow even those individuals with limiting disabilities to practice yoga. Other hallmarks of the Iyengar tradition include extensive training for teachers, modifications to adjust for the individual's particular needs, and the use of therapeutic sequences that are condition specific. Yoga poses are intended to correct health-related problems, both in body structure and in internal organ function, and to develop a sense of mastery. The poses allow children to look at the underlying causes and habits that may contribute to their pain problems and to learn how to change them. A number of positive effects have been reported for yoga in young people. Practice of IY appears to be associated with improvements in mood and function.²⁴ One randomized trial also demonstrated that regular home practice of yoga assisted with pain and disability related to IBS in adolescents.²⁵ Our recent pilot study found positive effects in young patients with RA.²⁶ To illustrate the use of CAM within the PPP clinic and research program we follow with a more in-depth overview of IY.

THE UCLA PEDIATRIC PAIN PROGRAM

The clinic

Dr Lonnie Zeltzer is the medical director of the PPP, seeing patients for an initial evaluation and overseeing the treatment plan. Dr Zeltzer formed the PPP in 1991 after noting the dearth of medical clinics for children with chronic pain conditions. At present as many as 120 patients are seen in the PPP each year. Approximately 70% of patients are female. The race/ethnicity breakdown is as follows: 82.1% white, 10.4% African American, 4.1% Asian, 1.7% American Indian/Alaska Native, and 1.7% Native Hawaiian/other Pacific Islander;

ethnically, 13% are Hispanic or Latino and 87% are non-Hispanic or Latino. The most common diagnoses are headaches, abdominal pain, fibromyalgia, complex regional pain syndrome, and other myofascial pain disorders besides headaches. For further information regarding the sociodemographic makeup of the population, see our recent article.²⁷ Subspecialists refer approximately 80% of patients to the PPP, and the remainder are referred by primary care providers or self-referred.

Along with traditional medical treatment, patients receive treatment from an integrative clinical team that includes specialists trained in clinical psychology, physical therapy, hypnotherapy, art therapy, music therapy, psychiatry, family therapy, biofeedback, craniosacral therapy, IY, acupuncture, and massage therapy. Patients typically see an average of 2 specialists from the clinical team in addition to medical staff. Patients are encouraged to seek one type of treatment where they will actively learn new skills (eg, biofeedback, hypnotherapy), along with an additional “passive” treatment (eg, craniosacral, massage therapy). The clinical team meets weekly to ensure communication, coherence, and efficiency when treating patients.

Patients and their families are often, but not always, interested in pursuing the CAM treatments offered to them. We recently conducted a survey of patient preferences for the therapies.^{27,28} Participants were 129 children and adolescents (94 girls; age 8–18 years, mean 14.5 years) presenting to the clinic. We found that children with chronic pain, irrespective of pain diagnosis, preferred noninvasive approaches that enhanced relaxation and increased somatic control (such as biofeedback, yoga, and hypnosis). Longer duration of pain and greater impairment in functioning, particularly during family activities, increased the likelihood that such patients agreed to engage in CAM treatments, especially those that were categorized as mind-body modalities. Mind-body modalities involve the practitioner using the mind to influence physical functioning and enhance health.

The yoga for youth in pain research program

After incorporating IY into the PPP for more than 12 years and noting the relief it has brought to many children and adolescents with a range of chronic pain conditions, we recently embarked upon a research program to scientifically examine the feasibility, safety, and efficacy of IY as a complementary treatment for young people with chronic pain. Our goal is to systematically test the potential benefits of IY for a range of pediatric chronic pain conditions using randomized controlled trials, using appropriate control groups, and by targeting interventions at an age group that is most likely to benefit, that is, older adolescents and young adults. It is likely that teaching yoga to a younger age group is associated with specific challenges, such as reliance upon family members for support, permission, and transportation and the possibility that the attention and endurance that an IY practice requires may exceed the capacity of many younger children. Given these concerns, it is likely that the transition to independence and self-directed management of health that occurs increasingly across puberty as a normative developmental process²⁹ presents the optimal time to begin yoga practice for health. Pediatric pain clinics often continue to follow-up patients into their young adult years, hence the inclusion of young adults in our research program.

Ideally we will systematically test the use of IY for the major chronic pain problems affecting youth. We have begun our program with 2 serious health concerns associated with recurrent pain affecting young people. Our first clinical trial examines IY for young people with RA, and the second for IBS. Each of these conditions presents unique challenges to patients and to yoga teachers. Although RA impacts musculoskeletal functioning, IBS is not typically associated with structural or organic limitations. Indeed, some young people with IBS may be as physically capable of yoga as their nonaffected peers. As discussed further in

the following text, the yoga practice for each of these groups varies as a function of patient needs. Despite the disparities between RA and IBS, it is possible that youth with both these conditions have psychological comorbidities such as anxiety and depression that are common within the spectrum of chronic pain problems.³⁰ By including 2 conditions involving very distinct processes—one a systemic, organic disease (RA) and the other a functional disorder (IBS)—our approach is likely to yield not only valuable information about each individual condition but also together to delineate the extent of yoga's impact on different bodily and psychological systems.

Why Iyengar yoga? A prescription for every condition

Iyengar yoga is distinct from other traditions of yoga in its emphasis on anatomic alignment, use of props to support and modify poses, sequences of postures that are tailored for medical conditions, and systematized teacher training that includes knowledge of physiology, anatomy, and yoga philosophy.³¹ Not all styles of yoga demonstrate an extensive teacher training system, and this is a serious issue when dealing with patients who may have musculoskeletal or other health concerns. Teachers in the IY system study for at least 7 years before being certified to work with students who have therapeutic needs, including children with chronic pain. Training includes the modification of poses for individuals with physical limitations and the use of props to prevent straining and injuries.

Our use of the Iyengar tradition in the clinic and research program is based on a number of considerations. The philosophy of IY, which tailors the yoga sequence taught for a specific condition and individualizes the practice through props to meet a particular patient's needs, is in accord with the medical need to provide prescriptions of treatment that are specific, targeted, and appropriate for the individual. The rigorous teacher training also provides some surety that teachers will be familiar with the conditions and limitations they are working with and can call upon a vast knowledge base of modifications to poses to support the safety of patients. The systematized teacher training system also ensures the reliability of the intervention, which is a particular concern of the research program.

Sequencing and modifications should take a lifespan development approach. Thus, the selection of poses is guided by the developmental stage of the patient, as well as their health condition. For children, classes take a fun, playful tone and stories may be used to illustrate the essence of poses. Adolescents and young adults often require active, challenging poses to increase their confidence and self-efficacy, which are balanced with relaxing, restorative poses to counter the effects of stress that may be experienced in work, home, and school. Older patients may require yet a different focus with more emphasis on concentration and holding postures for longer lengths of time as well as restorative poses. For this reason, we generally limit the age range of participants in our research studies to ensure that the practice is relevant to everyone in the class.

To illustrate how sequencing and modifications to poses work within the IY tradition, we briefly describe the interventions for each of the conditions we have been studying in the PPP. A given yoga sequence is designed to have specific therapeutic benefits for the condition being treated. The structural, physiologic, psychological, and spiritual bodies are all targeted in the sequences, although the nature of the disease or condition drives which poses are selected to achieve maximum benefits upon each aspect of functioning. Underlying the use of props in modifying poses is the assumption that adjusting a pose is not designed to make yoga easier, but rather to increase the accuracy of the pose to achieve the structural, physiologic, and psychospiritual benefits being sought. The photographs below depict the traditional pose, *adha mukha svanasana* (down dog) using props such as wall ropes and a chair to support the patient in holding the pose with the correct action (Figure 1).

Iyengar yoga for rheumatoid arthritis

We recently conducted a small, single-arm feasibility pilot for young adults with RA and found medium to large effect sizes for a range of outcomes including disability, pain, vitality, psychological functioning, self-efficacy, and mindfulness.²⁶ No adverse events were reported. Rheumatoid arthritis is a chronic, disabling disease that can greatly compromise the health-related quality of life and daily functioning of patients. Conventional treatment, typically involving medication, has brought relief to many patients but can pose medical risks such as gastrointestinal problems and kidney or liver damage.³² Long-term use in young patients is of concern and there is a need for complementary treatments that target quality of life and functioning that enable young patients to achieve an active family, work, and social life. To this end, IY may be a beneficial adjunct therapy. Indeed, the qualitative findings from our recent pilot suggest that yoga supports functioning through a myriad of benefits including energy, sleep, psychological resilience, and physical stamina.²⁶ On the basis of these promising findings from the single arm trial, our first randomized controlled clinical IY trial focuses on adolescents and young adults aged 16 to 35 years with RA. Sixteen is the youngest age that RA can be diagnosed, and the upper age range was chosen because of the often similar work/school-home challenges that young adults in their 20s and early 30s experience in present-day living. The study is a waitlist-controlled design where participants are randomized to receive a 6-week twice weekly IY intervention or to the waitlist group involving usual care for 6 weeks, followed by the IY intervention. The protocol of this study has been detailed previously.³³

The rheumatoid arthritis trial

Props are extremely important for individuals with musculoskeletal limitations such as those seen in many patients with RA. Props are used to protect and support joints and to allow patients to correctly hold the poses without strain or tension despite their limitations. The RA sequence is designed to affect the structural body, through correct alignment and extension of the joints and the release of tension that impacts pain; the physiologic body by promoting circulation of lymph, strengthening the immune system, increasing breath circulation, and balancing hormonal systems; and psychospiritual functioning by promoting confidence, skills-based coping, mindfulness, and concentration. Confidence building is particularly important in this group, as many patients never imagined being able to attempt, much less hold, yoga poses such as inversions and backbends. Through confidence, patients can develop the intention to increase the action of the pose and their sustained attention to sensations within the pose increases mindfulness and concentration. Modifications within the sequence are made for individual concerns and limitations. Thus, if a patient presents with wrist pain, props are added to ensure that the patient continues to work with their joints but in a non-weight-bearing way. Figure 2 illustrates how a handstand can be achieved with the use of a slant board to support the wrist joints of affected RA patients.

The RA sequence begins with restful poses, such as *supta baddha konasana* (Figure 3) to begin quieting the nervous system. Once the relaxation response is initiated, it is thought that patients are able to tolerate more sensation and progress through the sequence of more challenging poses. Other poses that follow include rope-down dog (as shown in Figure 1), rope headstand, backbend over 2 chairs, chair shoulder stand, and *setu bandha* on a bench (Figure 4). Later standing poses are introduced, and often rely heavily upon the use of props to ensure that patients are able to hold the poses with the correct anatomic alignment. Figure 5 shows the use of a wooden horse and blocks to support the patient in *trikonasana*, or “triangle” pose. Structural limitations are commonly experienced in RA and present unique safety concerns. To prevent injuries or strain in the RA study, yoga is practiced under the strict supervision of a qualified teacher.

Iyengar yoga for irritable bowel syndrome

Irritable bowel syndrome is a serious public health issue. Symptoms include discomfort in the abdomen, along with diarrhea and/or constipation. Moderate to severe symptoms can lead to disruptions in school, work, and home life. With as many as 15% of adolescents and young adults experiencing symptoms of IBS,^{34,35} a significant minority of youth may have their social, school, and work lives impacted. The pathophysiology of IBS and its best course of treatment remain unclear. Mind-body approaches that reduce arousal and provide skill-based coping strategies are promising, but as yet, are largely unstudied. Given the wide prevalence of IBS, the impact upon multiple areas of patients' lives, the often protracted course of the illness beginning early in life, and the possibility of an active mind-body approach such as yoga providing a means of control over bodily and mental systems, we considered IBS an ideal chronic pain problem to address in our yoga research program. The intervention involves a similar design as the RA study, including a randomized waitlist-control condition and a 6-week twice weekly intervention. The targeted age range is 14 to 26 years as this reflects an adolescent and young adult group that are likely to experience similar impact of symptoms upon life tasks and also similar levels of strength, flexibility, and symptoms to warrant being in the same yoga class without age-related modifications. Further information regarding the study protocol is available.³⁶

The irritable bowel syndrome trial

The IY sequence used in the classes for IBS patients targets the structural body through lengthening of the abdomen and lower extremities. Many young people with IBS tend to grip the abdomen and contract their knees in adopting a hunched position to compensate for discomfort (Figure 6). The first poses in the IBS sequence are designed to relax and lengthen the abdomen and include, among other poses, *supta baddha konasana* (see Figure 3) and as depicted in Figure 7, a backbend using a specially designed prop to hold the patient in traction.

Poses that internally massage the abdomen are then taught, and include chair twists and supported shoulder stand as demonstrated in Figures 8 and 9, respectively. The psychospiritual functioning of young people with IBS is also important to address and we include poses that allow for both confidence building and relaxation.

One innovation of our research program is the use of take-home sheets to facilitate home practice. After their second week of classes, participants in the IBS study are given a handout showing the restorative poses they have been learning in class as a visual guide to home practice, should participants wish to do so. Props are also loaned out for the duration of the study. Restorative poses are encouraged to alleviate stress during the week.

LESSONS

Recruitment

Although both studies are still underway, we have learnt a number of valuable lessons regarding the conduct of yoga interventions. Thus far, recruitment and adherence to the studies has been vastly different for the IBS and RA populations. The prevalence of IBS is more than double that of arthritis in young people. Despite the notably higher estimated prevalence of IBS, we have had more success recruiting patients for the RA yoga study. Since recruitment began for the studies, almost 2 times as many people have expressed interest in the RA study, compared with the IBS study.

In general, recruitment for both studies has been challenging. Dozens of rheumatologists, gastroenterologists, pediatricians, and other primary care providers have been mailed fliers,

contacted via e-mail, and visited by research assistants for the 2 studies. The studies have been advertised using online resources, such as Craigslist and Clinical Trials, and in print media. Fliers have been posted in physicians' offices, public bulletin boards in the community, and online. Online support groups for the conditions have also been targeted as sources of potential subjects. For the RA study, the most effective form of recruitment has been through the local chapter of the Arthritis Foundation. Approximately 30% of interested participants heard about the study from an e-mail, contact, or event related to the Arthritis Foundation. A similar large, local support group for young adults with IBS is not available. The most effective source of recruitment for the IBS study (36% of interested participants), and the second most effective method for the RA study (27% of interested participants), was the participant or an acquaintance of the participant seeing a study flier (eg, in the community, physician's office, on UCLA's campus). Perhaps because of the lack of a large, organized support group for IBS patients, other forms of recruitment tended to result in a bigger proportion of interested participants for the IBS study than the RA study. Online sources, such as Craigslist, resulted in about 23% of interested IBS patients compared with 15% of interested RA patients. Physician referrals accounted for roughly 23% of interested IBS patients and approximately 14% of RA patients.

Attendance and scheduling

Once recruited, screened, and enrolled in the study, participants in both studies have been committed to attending the pre- and poststudy assessments and attendance at yoga classes has been impressive. Both groups have thus far attended approximately 90% of classes. Yoga classes are offered at times when participants would likely not be at work or in school; a typical pattern has been 1 weeknight class and 1 weekend class per week. One difference that has been noted between the 2 groups has been the completion rate of the 2-month follow-up questionnaires. All (100%) of the RA participants who completed the yoga intervention in the first 2 cohorts have completed their 2-month follow-up; of the IBS participants in the first 2 cohorts that completed the yoga intervention, approximately 70% completed their 2-month follow-up questionnaires.

Overall, it appears that both patient groups are similarly motivated to continue with yoga, once they have passed the barriers to entering the study. There are interesting group differences in terms of the number of initially interested patients. Rheumatoid arthritis affects less young people, yet they appear to be easier to attract to a yoga intervention than IBS, which is a very common and widespread condition. The primary lesson for other investigators interested in undertaking yoga research is to target populations for which large-scale support networks are available for recruitment. Without adequate locations to attract interest from potential patients, clinical trials of yoga will not be sufficiently powered.

CONCLUSIONS

Preliminary evidence in the UCLA PPP has shown that IY offers much promise in alleviating symptoms of pain and disability and improving quality of life in young people with chronic pain. Scientific research documenting the safety, feasibility, and efficacy of teaching yoga to young people is scant, and to address these gaps in the literature we are currently undertaking a series of clinical trials of IY for chronic pain in youth. Our present focus is on RA and IBS, although we intend to expand our research program to include other common conditions affecting children, adolescents and young adults.

Young people have the potential to respond exceedingly well to a yoga practice. Adolescents and young adults, perhaps more so than younger or older individuals, are likely to possess a combination of independence, motivation, and receptiveness that support the feasibility of a clinical trial of yoga practice. In fact, we have found that participants who do

enroll in the study have excellent adherence rates. We endeavor to ensure that classes are held at convenient times, parking needs are addressed, and barriers to attending are minimized. For example, we offer gas vouchers for participants who live outside a certain radius, and for those participants either too young or unable to drive, we offer vouchers for parents or friends willing to drive participants to wait at a nearby coffee store. The intervention is relatively short, which may also keep motivation high across the trial. Part of our analysis will be to determine whether 6 weeks is sufficiently long to achieve benefits, although we suspect that individuals experiencing chronic illnesses may need a long-term practice to reap the full spectrum of benefits. We also select teachers with sufficient experience working with the targeted conditions and who have experience working with younger populations. Our teachers are trained to understand physical or psychological comorbidities that participants may present with, and to adapt the poses to each individual's needs accordingly. We believe that all of these factors are important for retention of participants in a clinical yoga trial.

The clinical and research programs within the UCLA PPP address the needs of an often-overlooked population—young people with chronic pain. When experienced in youth, chronic pain is likely to take a particular toll on a range of life tasks including healthful sleeping, eating, and day-to-day living. The expectation of youth is to enjoy a full social, academic, and work life, and chronic pain and its associated disability often present barriers to such normative developmental processes. The assumption is that if left untreated, difficulties associated with chronic pain may persist or even compound across adulthood. Management of chronic pain in youth is best approached from a holistic, biopsychosocial model. We have adopted such a model in the UCLA PPP and have noted success for many years using a combination of conventional and complementary medicine to treat the whole individual. Our yoga research program brings the scientific spotlight to IY as one piece of the treatment model. If found to be safe, attractive, and efficacious, Iyengar yoga may serve as an important adjunct in pain clinics across the globe.

REFERENCES

1. Classification of chronic pain. Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. Pain Suppl. 1986; 3:S1–S226. [PubMed: 3461421]
2. Roth-Isigkeit A, Thyen U, Raspe HH, Stöooven H, Schmucker P. Reports of pain among German children and adolescents: an epidemiological study. Acta Paediatr. 2004; 93(2):258–263. [PubMed: 15046285]
3. Vowles KE, Cohen LL, McCracken LM, Eccleston C. Disentangling the complex relations among caregiver and adolescent responses to adolescent chronic pain. Pain. 2010; 151(3):680–686. [PubMed: 20833472]
4. Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, et al. Pain in children and adolescents: a common experience. Pain. 2000; 87(1):51–58. [PubMed: 10863045]
5. Eccleston C, Jordan A, McCracken LM, Slead M, Connell H, Clinch J. The Bath Adolescent Pain Questionnaire (BAPQ): development and preliminary psychometric evaluation of an instrument to assess the impact of chronic pain on adolescents. Pain. 2005; 118(1–2):263–270. [PubMed: 16202524]
6. Gold JI, Mahrer NE, Yee J, Palermo TM. Pain, fatigue, and health-related quality of life in children and adolescents with chronic pain. Clin J Pain. 2009; 25(5):407–412. [PubMed: 19454874]
7. Evans S, Tsao JC, Zeltzer L. Pediatric pain management: using complementary and alternative medicine. Rev Pain. 2009; 2(1):14–20.
8. Evans S, Tsao JC, Zeltzer LK. Iyengar yoga for pediatric chronic pain. Pediatr Pain Lett. 2009; 11(2):12–16.

9. Evans, S.; Zeltzer, L. Complementary and alternative approaches for chronic pain. In: Walco, G.; Goldschneider, K., editors. *Pain in Children: A Practical Guide for Primary Care*. Totowa, NJ: Humana Press; 2008.
10. Ma SX. Neurobiology of acupuncture: toward CAM. *Evid Based Complement Alternat Med*. 2004; 1(1):41–47. [PubMed: 15257325]
11. Libonate J, Evans S, Tsao JC. Efficacy of acupuncture for health conditions in children: a review. *Scientific World Journal*. 2008; 8:670–682. [PubMed: 18661055]
12. Waterhouse M, Tsao JC, Zeltzer LK. Commentary on the use of acupuncture in chronic pediatric pain. *J Dev Behav Pediatr*. 2009; 30(1):69–71. [PubMed: 19218847]
13. Pintov S, Lahat E, Alstein M, Vogel Z, Barg J. Acupuncture and the opioid system: implications in management of migraine. *PediatrNeurol*. 1997; 17(2):129–133.
14. Zeltzer LK, Tsao JC, Stelling C, Powers M, Levy S. A phase I study on the feasibility and acceptability of an acupuncture/hypnosis intervention for chronic pediatric pain. *J Pain Symptom Manage*. 2002; 24(4):437–446. [PubMed: 12505213]
15. Rainville P, Hofbauer RK, Bushnell MC, Duncan GH, Price DD. Hypnosis modulates activity in brain structures involved in the regulation of consciousness. *J Cogn Neurosci*. 2002; 14(6):887–901. [PubMed: 12191456]
16. Holden EW, Deichmann MM, Levy JD. Empirically supported treatments in pediatric psychology: recurrent pediatric headache. *J Pediatr Psychol*. 1999; 24(2):91–109. [PubMed: 10361386]
17. Vlieger AM, Menko-Frankenhuis C, Wolfkamp SC, Tromp E, Benninga MA. Hypnotherapy for children with functional abdominal pain or irritable bowel syndrome: a randomized controlled trial. *Gastroenterology*. 2007; 133(5):1430–1436. [PubMed: 17919634]
18. Tsao JC, Zeltzer LK. Complementary and alternative medicine approaches for pediatric pain: a review of the state-of-the-science. *Evid Based Complement Alternat Med*. 2005; 2(2):149–159. [PubMed: 15937555]
19. Sowder E, Gevirtz R, Shapiro W, Ebert C. Restoration of vagal tone: a possible mechanism for functional abdominal pain. *Appl Psychophysiol Biofeedback*. 2010; 35(3):199–206. [PubMed: 20229150]
20. Ireland M, Olson M. Massage therapy and therapeutic touch in children: state of the science. *Altern Ther Health Med*. 2000; 6(5):54–63. [PubMed: 10979162]
21. Field T, Hernandez-Reif M, Seligman S, et al. Juvenile rheumatoid arthritis: benefits from massage therapy. *J Pediatr Psychol*. 1997; 22(5):607–617. [PubMed: 9383925]
22. Suresh S, Wang S, Porfyrus S, Kamasinski-Sol R, Steinhorn DM. Massage therapy in outpatient pediatric chronic pain patients: do they facilitate significant reductions in levels of distress, pain, tension, discomfort, and mood alterations? *Paediatr Anaesth*. 2008; 18(9):884–887. [PubMed: 18768049]
23. Barnes VA, Davis HC, Murzynowski JB, Treiber FA. Impact of meditation on resting and ambulatory blood pressure and heart rate in youth. *Psychosom Med*. 2004; 66(6):909–914. [PubMed: 15564357]
24. Woolery A, Myers H, Sternlieb B, Zeltzer L. A yoga intervention for young adults with elevated symptoms of depression. *Altern Ther Health Med*. 2004; 10(2):60–63. [PubMed: 15055096]
25. Kuttner L, Chambers CT, Hardial J, Israel DM, Jacobson K, Evans K. A randomized trial of yoga for adolescents with irritable bowel syndrome. *Pain Res Manag*. 2006; 11(4):217–223. [PubMed: 17149454]
26. Evans S, Moieni M, Taub R, et al. Iyengar yoga for young adults with rheumatoid arthritis: results from a mixed-methods pilot study. *J Pain Symptom Manage*. 2010; 39(5):904–913. [PubMed: 20471550]
27. Tsao JC, Meldrum M, Kim SC, Jacob MC, Zeltzer LK. Treatment Preferences for CAM in children with chronic pain. *Evid Based Complement Alternat Med*. 2007; 4(3):367–374. [PubMed: 17965769]
28. Tsao JC, Meldrum M, Bursch B, Jacob MC, Kim SC, Zeltzer LK. Treatment expectations for CAM interventions in pediatric chronic pain patients and their parents. *Evid Based Complement Alternat Med*. 2005; 2(4):521–527. [PubMed: 16322810]

29. Remschmidt H. Psychosocial milestones in normal puberty and adolescence. *Horm Res.* 1994; 41(suppl 2):19–29. [PubMed: 8088699]
30. Gatchel R. Comorbidity of chronic pain and mental health disorders: the biopsychosocial perspective. *Am Psychol.* 2004; 59(8):795–805. [PubMed: 15554853]
31. Yoga: the Path to Holistic Health. London: Dorley Kindersley Ltd; 2008. Iyengar BKS.
32. Wolfe F, Michaud K. Biologic treatment of rheumatoid arthritis and the risk of malignancy: analyses from a large US observational study. *Arthritis Rheum.* 2007; 56(9):2886–2895. [PubMed: 17729297]
33. Evans S, Cousins L, Tsao JC, Subramanian S, Sternlieb B, Zeltzer LK. A randomized controlled trial examining Iyengar yoga for young adults with rheumatoid arthritis: a study protocol. *Trials.* 2011; 12:19. [PubMed: 21255431]
34. Drossman DA, Camilleri M, Mayer EA, Whitehead WE. AGA technical review on irritable bowel syndrome. *Gastroenterology.* 2002; 123(6):2108–2131. [PubMed: 12454866]
35. Russo MW, Gaynes BN, Drossman DA. A national survey of practice patterns of gastroenterologists with comparison to the past two decades. *J Clin Gastroenterol.* 1999; 29(4): 339–343. [PubMed: 10599638]
36. Evans S, Cousins L, Tsao JC, Sternlieb B, Zeltzer LK. Protocol for a randomized controlled study of Iyengar yoga for youth with irritable bowel syndrome. *Trials.* 2011; 12:15. [PubMed: 21244698]

FIGURE 1.
Down dog on ropes.

FIGURE 2.
Handstand with slant board.

FIGURE 3.
Supta baddha konasana.

FIGURE 4.
Setu bandha on bench.

FIGURE 5.
Horse triangle.

FIGURE 6.
Common posture seen in irritable bowel syndrome patients.

FIGURE 7.
Backbend.

FIGURE 8.
Chair twist.

FIGURE 9.
Supported shoulder stand.