

THE USE OF YOGA FOR CHRONIC PAIN MANAGEMENT  
IN THE PEDIATRIC POPULATION

by

ANNABETH HUFF

A thesis submitted in partial fulfillment of the requirements  
for the Honors in the Major Program in Nursing  
in the College of Nursing  
and in The Burnett Honors College  
at the University of Central Florida  
Orlando, Florida

Spring Term 2015

Thesis Chair: Joyce Burr, PhD, RN, AHN-BC

## **ABSTRACT**

Chronic pain has an adverse impact on the quality of life in children and adolescents. It can impair a child's physical, psychological, and social functioning, leading to lower satisfaction with life and poor self-image related to health status. Forty-five percent of children experience chronic pain related to either disease processes or idiopathic causes. Not all children who suffer from chronic pain respond to traditional therapies. The purpose of this literature review was evaluation of current research on the use of yoga as an integrative therapy for chronic pain management in the pediatric population. A database search of CINAHL, MEDLINE, and PsycINFO was conducted. Yoga has few side effects, is inexpensive, and can be practiced almost anywhere, regardless of physical ability or age. There is limited research on the use of yoga as an intervention within the pediatric population. Existing research supports the efficacy of yoga for chronic pain management.

*Keywords: yoga, chronic pain, complementary therapy, alternative therapy, child\*, and pediatrics.*

## **DEDICATIONS**

To my parents for always believing in my dreams, and telling me to “be fearless.”

To Emily, my best friend and inspiration for conducting this review.

To all the children who will benefit from yoga.

To all my friends and family for always supporting me and providing me with love and encouragement.

## **ACKNOWLEDGMENTS**

Dr. Burr, you have been an incredible guide and mentor throughout this entire process. Thank you for saying yes to a last minute e-mail from a random student desperate for a thesis chair.

Without you, I would have given up at the start. Thank you for your support, guidance, and constant motivation throughout this process. I am so grateful for this experience, and even more thankful to have you as my chair for this past year.

To my incredible committee members, Dr. Kelly Allred and Dr. Raheleh Ahangari, thank you for your invaluable input, recommendations, and support throughout this process.

Dr. Ladores, thank you for passing down your love for pediatrics and research to me. Without you, I would have never applied for the Honors in the Major Program. Thank you for helping me find something I am passionate about, and make something of it.

## TABLE OF CONTENTS

<b>INTRODUCTION</b> .....	6
Problem.....	8
Significance.....	8
Purpose.....	9
Method.....	9
<b>BACKGROUND</b> .....	9
Chronic Pain.....	9
Quality of Life.....	11
Yoga.....	11
<b>FINDINGS/RESULTS</b> .....	12
Chronic Headaches.....	13
Irritable Bowel Syndrome.....	14
Psychosomatic Pain.....	14
Musculoskeletal Pain.....	15
Current Research.....	16
<b>DISCUSSION</b> .....	17
Recruitment and Retention.....	17
Research.....	18
<b>LIMITATIONS</b> .....	19
<b>NURSING IMPLICATIONS</b> .....	20
Practice.....	20
Education.....	21
Research.....	22
<b>REFERENCES</b> .....	23

## INTRODUCTION

Chronic, persistent, and recurrent pain is a common problem among the pediatric population. Chronic pain has an adverse impact on the quality of life in children and adolescents. According to Vetter (2011), chronic pain can impair a child's physical, psychological, and social functioning, leading to lower satisfaction with life and poor self-image related to health status. Physicians may be more concerned about an underlying disease process causing the pain, and fail to provide appropriate attention to the pain itself; leaving the child with little pain management (Eccleston, 2008). As time goes on, chronic pain can cause physical disability, anxiety, depression, sleep disturbances, school absences, social withdrawal, family and social adversity (Eccleston, 2008). As evidenced by the above statements, poorly treated, undertreated, or untreated chronic pain may have adverse consequences.

Chronic pain management is traditionally approached with both pharmacological and non-pharmacological strategies. Non-pharmacological therapies include integrative practices, such as mind-body medicine, biologically based practices, manipulative and body-based practices, and energy therapies. (National Center for Complementary and Alternative Medicine [NCCAM], 2013). Yoga is a mind-body practice and one of the top ten complementary health approaches used by adults in the United States. (NCCAM, 2014). The ancient practice of yoga has been in use for thousands of years; originating in India at least 2,000 years ago (Birdee, et al. 2009). It is often depicted as a "tree" with eight "limbs," *yama* (universal ethics), *niyama* (individual ethics), *asana* (physical postures), *pranayama* (breath control), *pratyahara* (control of the senses), *dharana* (concentration), *dyana* (meditation), and *samadhi* (bliss) (Ross & Thomas, 2010). Hatha yoga, which emphasizes postures and breathing, includes Iyengar, Ashtanga, Vini, Kundalini, and Bikram yoga (NCCAM, 2013). The original "yogis" developed

this practice to transcend suffering through the power inherent in mind and body (Reiss, 2013). The American Osteopathic Association (2012) cites Nevins, a board certified Osteopathic family physician and Kundalini yoga instructor, who describes yoga as “a healing system of theory and practice. The purpose of yoga is to create strength, awareness, and harmony in both the mind and body” (para. 2).

Yoga has become increasingly popular in recent years among the adult population and it is commonly taught in gyms, spas, colleges, and can be found on YouTube and in various magazines. In addition, there is a growing interest in researching the benefits, and the healing applications of yoga to prevent or treat various medical conditions. According to the American Osteopathic Association (2012), the benefits of yoga include increased flexibility, increased muscle strength and tone, improved respiration, energy, and vitality, balanced metabolism, weight reduction, cardio and circulatory health, improved athletic performance, and protection from injury. The relaxation techniques incorporated in yoga can lessen chronic pain, such as lower back pain, arthritis, headaches, and carpal tunnel syndrome (American Osteopathic Association, 2012). According to Lipton (2008), a recent study revealed positive effects of yoga on blood glucose and blood lipid levels, salivary cortisol, and oxidative stress. Yoga has also shown improvements in subjective measures of fatigue, pain, and sleep in both healthy and ill individuals (Lipton, 2008). Hyatt (2001) found that those who suffer from chronic pain are likely to experience depression or anxiety, therefore, the body and mind must be treated at the same time. In a qualitative study, Hayes and Chase (2010) found that yoga decreased stress and anxiety, improved functional status and symptoms in low back pain, improved subjective and objective outcomes in asthma, improved physical and quality of life measures in older people,

shortened duration of labor, improved birth outcomes, and benefited the management of eating disorders. Diamond (2012) found that yoga not only improves the perception of stress, but has a positive impact on the autonomic nervous system, endocrine system, and the immune system. The long-term practice of yoga has been shown to improve pain tolerance by providing different ways to deal with sensory inputs and the potential emotional reactions related to those inputs (Villemure, Ceko, Cotton, & Bushnell, 2013).

Yoga has few side effects, is inexpensive, and can be practiced almost anywhere by anyone, regardless of physical ability or age. According to NCCAM (2013), pain and certain types of nerve damage may be possible side effects of yoga. Research supports overall efficacy for pain management in the adult population, however, little research has been done on the use of yoga for chronic pain management in the pediatric population. This is important because there are thousands of children who suffer from chronic pain and do not respond to traditional therapies. (Evans, Moieni, Sternlieb, Tsao, & Zeltzer, 2012). The purpose of this review is to determine efficacy of yoga as an effective adjunct therapy for chronic pain in the pediatric population.

## **Problem**

### Significance

Up to forty-five percent of children experience chronic pain (headache, abdominal pain, limb pain, back pain) related to either disease processes or idiopathic causes (Evans, et al., 2012). Most children with chronic pain, undergoing traditional treatment, continue to experience frequent and/or persistent pain. Recurring/persistent pain can lead to psychosocial impairments, such as social challenges, family stress, anxiety, and depression (Evans, et al., 2012).



**Purpose**

Integrative therapies have received more attention by the allopathic medical and healthcare community in recent years. Chronic pain is not only uncomfortable, but can lead to psychosocial impairments, fatigue, sleep disturbances, and impact quality of life and self-image (Eccleston, 2008). Treatment for chronic pain may be ineffective, resulting in reoccurring or persistent pain. Though many studies have shown yoga as effective in relieving chronic pain among adults, there is limited research available for the pediatric population.

Case studies support using yoga in individual pediatric patients with disorders characterized by chronic/persistent pain, such as irritable bowel syndrome, and juvenile rheumatoid arthritis (Evans, et al., 2011). Few studies have been conducted to determine the overall effectiveness of integrating yoga for treatment of chronic pain in the pediatric population. A literature review was completed to examine and evaluate overall effectiveness of yoga as an integrative therapy for chronic pain in the pediatric population.

**Method**

A literature review was conducted of current peer reviewed journal articles to explore research on yoga for chronic pain management in the pediatric populations (ages 1-21). Inclusion criteria required: research published in 2009 or after; keywords of yoga, chronic pain, complementary therapy, alternative therapy, child\*, and pediatrics; and written in the English language.

**BACKGROUND****Chronic Pain**

Merskey and Bugduk (1994) define pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such

damage” (p. 210). Chronic pain extends past the normal healing stage, can be disabling, and is frequently associated with anxiety and depression (Ersek, & Polomano, 2011).

Chronic pain amplifies and prolongs pain by sensitization of the central and peripheral nervous system, which leads to hyper-excitability, recruitment, and disinhibition of pathways. Chronic pain leads to anxiety and depression by creating a constant state of stress through hyper-arousal of the sympathetic system, and sustained deep muscle tension (Vallath, 2010). Some people who suffer from chronic pain may feel as if they have lost control which can lead to irritability, hostility, and aggression or feelings of helplessness, hopelessness, guilt, and disturbed faith (Vallath, 2010).

Chronic pain is often undertreated due to providers’ inadequate knowledge and skills to assess and treat pain, unwillingness to believe reports of pain, lack of time and expertise, poor perception of the importance of regular pain assessments, and inaccurate/inadequate information about pain medications, addiction, tolerance, and side effects (Ersek & Polomano, 2011).

Pediatric patients do not typically present to clinics with chronic pain, however, many children experience debilitating pain over long periods of time, and it is imperative to treat chronic pain of the child to maintain life and protect against disability (Evans, et al., 2012). The most common complaints of chronic pain among children are tension type headaches, migraines, functional abdominal pain, musculoskeletal pain disease, and idiopathic pain (Boris, et al., 2012). The degree of impairment from chronic pain is related to age, location of pain, prior hospital stay, and depression (Boris, et al., 2012). Many children who suffer from chronic pain do not respond well to traditional, pharmacological therapies. Evans, et al. (2012), found that even with

pharmacological treatment for chronic pain, many children still experience reoccurring or persistent pain.

### **Quality of Life**

Pain is a complex, multidimensional experience that can lead to suffering and decreased quality of life (Ersek & Polomano, 2011). Children with chronic discomfort experience alterations in activities of daily living, such as decreased sleep, change in eating habits, decreased social activities participation and hobbies, and increased school absences. Both pain and fatigue contribute to a decrease in overall sense of well-being (Gold, Mahrer, Yee, & Palermo, 2009).

According to a five year study in Germany, nearly a quarter of the children with chronic pain ( $N = 2249$ ) missed 25% or more of regular school days due to pain. Children were no longer participating in normal every day activities, and depression was 24% higher overall, anxiety was 19% higher overall, and 40% of children were hospitalized for pain prior to seeking treatment at a pain clinic (Boris, et al., 2012).

### **Yoga**

Exercise has been identified as a critical part of chronic pain management. Exercise enhances circulation, improves cardiovascular function, reduces edema, increases muscle strength and flexibility, and enhances physical and psychosocial functioning (Ersek & Polomano, 2011). Deep muscle tension associated with chronic pain negatively affects microcirculation within muscles and surrounding viscera, which is aggravated by lack of exercise (Vallath, 2010). Yoga poses (*Asanas*) use a combination of isometric exercises and relaxation to provide the body with steadiness and lightness that optimizes tissue functioning, body reconditioning, realignment of the skeleton, and improving blood and lymph flow through underlying tissues (Vallath, 2010).

Poses are said to open up the flow of energy through the body that helps strengthen muscles and correct posture (Vallath, 2010). Studies have shown that yoga postures also decrease cortisol and cholinesterase levels, which leads to a decreased stress and anti-inflammatory response (Vallath, 2010). A recent study found that yoga may improve pain tolerance and alter brain anatomy. The study suggests there is a relationship between insular gray matter (related to pain tolerance) size and long-term yoga practice (Villemure, Ceko, Cotton, & Bushnell, 2013). During yoga, abdominal stretching leads to regeneration of pancreatic cells, which may lead to an increase in utilization and metabolism of glucose in peripheral tissues, liver, and adipose tissues (Balaji, Varne, & Ali, 2012).

Current literature indicates there is an increase in applications of integrative therapies for the pediatric population with chronic pain. Yoga was found to be a popular integrative therapy for the treatment of pain in the pediatric population (Moody, Daswani, Abrahams, & Santizo, 2010). Tsao (2007) found that out of 129 patients presenting at a pediatric pain clinic, over 60% of children elected to try at least one integrative for pain, the most common being yoga and biofeedback. The study found that when children were given a choice of pain management, they preferred non-invasive approaches that enhanced relaxation and increased somatic control.

## **FINDINGS/RESULTS**

According to the National Center for Complementary and Integrative Health (NCCIH, 2015), approximately 429,000 more American children used yoga in general in 2012 than in 2007. This is the greatest growth sector of a trend in the use of “movement therapies” and integrative healthcare by American children. Young and Kemper (2013) conducted a study to gain insight about pediatric patients who seek integrative care. They examined 110 new patients

with complaints of headaches, abdominal pain, and musculoskeletal pain. Most complaints were accompanied by fatigue, mood changes or anxiety, constipation and/or diarrhea, and sleeping problems. The study concluded that 8% were recommended to try yoga.

### **Chronic Headaches**

Hainsworth, et al. (2013) conducted a preliminary study to determine the feasibility, acceptability, and safety of alignment-based yoga for the pediatric population with complaints of chronic headaches. This same study also aimed to determine effectiveness of yoga's ability to improve headaches, daily functioning, quality of life, and anxiety. The study included 11-18 year olds with a history of headaches for three months or more, with medical clearance to participate in yoga. Classes were held once a week for 75 minutes for eight weeks. Out of 237 patients, 57 were eligible to participate, 19 agreed to participate, and approximately 7 completed the study. The study utilized the Holistic Health Questionnaire to examine previous experience with yoga, the Pediatric Quality of Life Inventory 4.0, the Spielberger State-Trait Anxiety Scale, the Child Activity Limitations Questionnaire, and participants recorded in a daily headache diary (which included numerical rating for head pain and duration). The study found that many participant families reported the facility was "too far" or families were "too busy." Participants stated that yoga helped and was pleasant; parents reported they would recommend yoga to another family dealing with chronic pain. The study concluded that the outcomes are promising and further studies using "alignment-based yoga" for youth with chronic headaches recommended. Challenges related to recruitment and retention, not the exercise itself may be anticipated (Hainsworth, et al., 2013).

### **Irritable Bowel Syndrome**

Brands, Purperhart, and Deckers-Kocken (2011) evaluated the effect of yoga on pain frequency and intensity, and quality of life in children with irritable bowel syndrome (IBS) or functional abdominal pain (FAP). The study included 20 participants, age 8-18 with IBS or FAP to participate in 10 hatha yoga sessions of 1.5 hours each. Participants were not eligible if they previously participated in yoga therapy, hypnotherapy, psychotherapy, or any other form of relaxation therapy for IBS or FAP. The sessions implemented poses and breathing techniques to relax the abdomen, and focus thoughts on a good experience. Pain intensity and pain frequency were scored in a pain diary, and quality of life was measured with the Kidscreen quality of life questionnaire (KQoL). Patients reported a significant decrease in pain frequency and intensity at the end of therapy; parents reported an increase in quality of life.

### **Psychosomatic Pain**

Spinazzola, et al. (2011) conducted a study to examine the use of yoga with traumatized youth demonstrating chronic somatic dysregulation and associated behavioral, functioning, and health complaints. The study included 12-21 year olds in residential treatment with post-traumatic stress disorder (PTSD). Post-traumatic stress disorder is characterized by re-experience of the trauma, chronic experience of hyperarousal, and constriction. Exposure to extreme stress has also been shown to alter the hypothalamic– pituitary–adrenal axis and affect trauma survivors' ability to modulate behavioral and cognitive responses to subsequent stress. In turn, heightened vulnerability to stressors can lead to gastrointestinal problems, disturbed sleep, decreased sexuality, and a heightened fear response. The study implemented a “trauma-sensitive yoga” intervention which aims to cultivate a positive relationship with one’s body and ease

symptoms of PTSD through gentle breath and movements. The study concluded that yoga is a promising approach for youth with PTSD, and further research is warranted.

Hoffart, Anderson, and Wallace (2014) examined the functional, psychological, and pain-related outcomes of an intensive interdisciplinary pain rehabilitation among 30 children, ages 11-18, with chronic musculoskeletal pain due to amplified pain syndromes. The rehabilitation program included 5-6 hours of yoga, physical and occupational therapy daily for 3.7 weeks. At the end of each week, pain, anxiety, depression, and function were evaluated. Follow-ups were completed after one and six months. Patients reported pain did not consistently change during the program, but there was a decrease in pain between the program and follow-ups, and depression and anxiety decreased significantly. The study concluded that children with amplified pain syndromes improved pain and restored function without pharmacology therapy, and benefitted from yoga therapy.

### **Musculoskeletal Pain**

Evans et al. (2012) conducted a pilot study examining the use of yoga for rheumatoid arthritis management in the pediatric population. Rheumatoid arthritis is characterized by inflammation of joints, chronic pain, associated fatigue, deteriorated range of motion, and impaired psychosocial functioning. Iyengar yoga is designed to increase strength and mobility of joints and muscles, it is individualized based on individual needs and abilities, and addresses psychosocial functioning. The study included eight individuals with RA, who were interviewed before and after participating in a six week long, biweekly Iyengar yoga program of 1.5 hour sessions. Findings indicate that Iyengar yoga improved range of motion, energy, relaxation, sleep and mood. Participants also expressed increased strength and flexibility, and release of “feel good” hormones. Evans et al. (2012), concluded that preliminary evidence has shown that

Iyengar yoga offers much promise in alleviating symptoms of pain and disability and improving quality of life in young people with chronic pain.

### **Current Research**

Duke University initiated a study to examine psychosomatic pain in youth. The purpose is to determine if integrative group-based interventions will help children (ages 10 to 12) experiencing psychological and physical distress. The study initiated a 12 week program of coping skills group that implements yoga and cognitive-behavioral therapy. It is hypothesized that the yoga-based intervention will be acceptable and feasible for children, and there will be a significant reduction in somatic and anxiety symptoms following the 12-week intervention (Mauro, 2014).

The University of California, Los Angeles (UCLA) initiated a study to examine the use of Iyengar yoga in young people with IBS. The study aims to test the potential benefits of Iyengar yoga on clinical symptoms, psychospiritual functioning and visceral sensitivity. 64 IBS patients ages 14-26 will be randomly chosen to participate in a 6 week, biweekly, 1.5 hour yoga sessions. They will compare the primary clinical outcomes of IBS symptoms, quality of life and global improvement at post-treatment and 2 month follow-up. They hypothesize that Iyengar yoga will be safe, feasible, and demonstrate significantly improved outcomes compared to controls (Evans, 2010).



## **DISCUSSION**

Overall, research supports efficacy of yoga as an integrative therapy for pediatric chronic pain. According to Evans et al. (2012), preliminary evidence provides support for reducing symptoms of pain and disability and improving quality of life (Evans, et. al., 2012). Yoga has both a body and mind connection, helping relieve physical pain and improving quality of life. Children develop a sense of accomplishment, because they are doing something to relieve their pain, and not just taking a medication. However, the implementation of yoga therapy is ineffective due to scarcity of documented application. Current research challenges include poor recruitment and low retention, small sample sizes, and limited research related to safety, feasibility, and efficacy of teaching yoga to the pediatric population.

### **Recruitment and Retention**

Pharmacological treatments are seemingly more convenient for both children and parents for the management of chronic pain. Yoga requires transportation, time, and participation in order to be effective. Hainsworth (2013), reported out of 237 patients, 57 were eligible to participate, and 19 agreed to participate. Parents said the facility was too far or families were too busy. In order to increase convenience, studies should implemented to assess convenient times for yoga classes to be held, parking and transportation, barriers to attending, and alternative forms of class such as video instruction. Brands, Purperhart, and Deckers-Kocken (2011) noted larger sample sizes are needed to confirm the positive effects of yoga on irritable bowel syndrome and functional abdominal pain. The small samples sizes can be attributed to the lack of convenience. In order to increase recruitment and retention, studies should be relatively short and offer incentives, such as gas vouchers. It is also important to select a yoga instructor that is

familiar with the pediatric population (ages 1 to 21) to keep participants safe, engaged, and motivated.

### **Research**

The current research supports the efficacy of yoga as an integrative therapy for the management of chronic pain in the pediatric population. Larger studies are needed to confirm these findings. Further research plans have been initiated by Evans, S (2012) at UCLA to address the gaps in literature, such as safety, feasibility, and efficacy in children. They are undertaking various clinical trials of Iyengar yoga for chronic pain in youth.

## **LIMITATIONS**

There were several limitations to the review of literature. Original research addressing therapeutic applications of yoga for chronic pain management in the pediatric population is limited (n=5). Many scholarly articles identified in the literature were published prior to 2009. Additionally, many pediatric research samples included participants over the age of 21. These were excluded from this thesis.

Many studies are limited to specific types of chronic pain, such as chronic headaches, IBS, and psychosomatic pain. These findings apply to the sample and cannot be generalized to the broader pediatric population.

Several studies included additional therapies and/or variables addition to pain, such as anxiety, depression, and quality of life. Additionally, the studies overall have small sample sizes, and must be duplicated with large samples to confirm the findings.

## NURSING IMPLICATIONS

### Practice

Though research is limited, many pediatric hospitals are implementing inpatient, outpatient, and bedside pediatric yoga programs for pain management. St. Jude Children's Research Hospital provides information and infographics titled "Yoga for Kids" on their website, stating that "All ages benefit from yoga. Postures incorporated in yoga are derived from movements that children naturally do," and advertise the benefits of yoga. Children's Hospital Colorado provides a "Creative Arts Yoga" program, and providers can include yoga therapists in a patient's care. They implemented yoga for treatment of anxiety, chronic headaches, general pain management, grief/depression, post-traumatic disorder, sleep issues, and sports injuries in children. Other hospitals with yoga programs include Boston Children's Hospital, Children's Hospital at Montefiore, Children's Hospitals and Clinics of Minnesota, and Seattle Children's Hospital.

Pharmacological management alone may not be effective in managing pain in the pediatric population. However, due to the consequences of poorly treated chronic pain, it is imperative to better manage children's discomfort. Though further research is warranted, based on preliminary studies yoga is found to be effective in chronic pain management in the pediatric population. Children's hospitals are implementing yoga programs, and pediatric providers may consider yoga as part of an integrative program for the management of chronic pain. In addition, yoga research outcomes support improvement for quality of life and mood which may be part of the chronic pain sequela.

## **Education**

Integrative therapy, such as yoga, is increasingly used by children. The research demonstrates that education on the use of yoga for chronic pain management is needed. Nurses and providers should be educated on safety measures related to yoga, different types of yoga to recommend, and classes available. Nurses and providers then should educate families about yoga as an option to better manage pediatric chronic pain. There should be an increase the number of programs available for certification and education on pediatric yoga. Pediatric providers and nurses should take continuing education or certification courses on pediatric yoga to implement yoga at the bedside and in inpatient settings. Nursing programs should incorporate education on complementary and integrative medicine into the curriculum, with specific education on yoga for chronic.

Nurses can provide information resources such as: the National Center for Complementary and Integrative Medicine (NCCIM) for current research on pediatric yoga and yoga basics, American Academy of Pediatrics (AAP) provides safety information about yoga for children, and the American Yoga Association (AYA) provides information on yoga and local classes. These organizations can provide education materials to providers, patients and their families on pediatric yoga, safety measures, and yoga classes for children in their area. Pediatric nurses should also familiarize themselves with information about pediatric yoga and safety recommendations so they can educate families and answer questions.

Pediatric providers and nurses can take continuing education courses or certification courses on pediatric yoga. Information on these education courses can be easily found online. This allows providers to utilize yoga at the bedside and in inpatient settings. Pediatric hospitals can implement yoga programs, like Children's Hospital Colorado.

**Research**

This literature review has established that there are barriers to conducting research on the use of yoga for chronic pain management, and further research is warranted. The next step is to create interventions to overcome these barriers. Research is needed to directly examine the safety, feasibility, and efficacy of teaching yoga to children. Additional research should examine implementation strategies for pediatrics, such as games. Future research may also examine the influence of various cultural and religious barriers to yoga. Additionally, pediatric providers may consider preliminary research and recommend yoga a plan of integrative management for pediatric chronic pain.

## REFERENCES

- American Osteopathic Association (2012). *The benefits of yoga*. Retrieved from <http://www.osteopathic.org/osteopathic-health/about-your-health/health-conditions-library/general-health/Pages/yoga.aspx>
- Balaji, P., Varne, S., & Ali, S. (2012). Physiological effects of yogic practices and transcendental meditation in health and disease. *North American Journal Of Medical Sciences*, (10).
- Birdee, G., Yeh, G., Wayne, P., Phillips, R., Davis, R., & Gardiner, P. (2009). Clinical applications of yoga for the pediatric population: A Systematic Review. *Academic Pediatrics*, 9(4), 212-220.
- Boris, Z., Wager, J., Hechler, T., Hasan, C., Rhor, U., Dobe, M., Meyer, A., Hubner-Mohler, B., Wamsler, C., & Blankenburg, M. (2012). Characteristics of highly impaired children with severe chronic pain: a 5-year retrospective study on 2249 pediatric pain patients. *BMC Pediatrics*. 12(54).
- Brands, M., Purperhart, H., & Deckers-Kocken, J. (2011). A pilot study of yoga treatment in children with functional abdominal pain and irritable bowel syndrome. *Complementary Therapies In Medicine*, 19(3), 109-114.
- Diamond, L. (2012). The benefits of yoga in improving health. *Primary Health Care*, 22(2), 16-19.
- Mauro, C. (2014). Treatment of psychosomatic pain in youth (ToPSY): A Pilot Study. Retrieved from <https://clinicaltrials.gov/ct2/show/record/NCT01813669?term=yoga%2C+pediatric&rank=2>

- Eccleston, C. (2008). Managing chronic pain in children and adolescents. *BMJ*, 326, 1408-1409.  
Retrieved June 20, 2014, from <http://www.bmj.com/content/326/7404/1408>.
- Ersek, M., & Polomano, R. (2011). Pain. In S. L. Lewis, S. R. Dirksen, M. M. Heitkemper, L. Bucher, & I. M. Camera (Eds.), *Medical surgical nursing: Assessment and management of clinical problems* (8th ed.). St. Louis, MO: Mosby Elsevier
- Ersek, M., & Polomano, R.C. (2011). Nursing management of pain. In Lewis, S.M., Heitkemper, M.M., Dirksen, S.R., O'Brien, P., Giddens, J., & Bucher, L. (Eds.), *Medical-surgical nursing: Assessment and management of clinical problems*. 8, 127-152.
- Evans, S., Moieni, M., Sternlieb, B., Tsao, J., & Zeltzer, L. (2012). Yoga for youth in pain: the UCLA pediatric pain program model. *Holistic Nursing Practice*, 26(5), 262-271.
- Evans, S., Moieni, M., Subramanian, S., Tsao, J. I., Sternlieb, B., & Zeltzer, L. K. (2011). "Now I see a brighter day": expectations and perceived benefits of an Iyengar yoga intervention for young patients with rheumatoid arthritis. *Journal Of Yoga & Physical Therapy*, 1(101).
- Hainsworth, K., Salamon, K., Khan, K., Mascarenhas, B., Davies, W., & Weisman, S. (2013). A pilot study of yoga for chronic headaches in youth: Promise amidst challenges. *Pain Management Nursing: Official Journal Of The American Society Of Pain Management Nurses*.
- Hayes, M., & Chase, S. (2010). Prescribing yoga. *Primary Care: Clinics In Office Practice*, 3731-47. doi:10.1016/j.pop.2009.09.009
- Hoffart, C., Anderson, R., & Wallace, D. (2014). A155: Development of an intensive interdisciplinary pediatric pain rehabilitation program: improving pain, functioning, and



- psychological outcomes. Pediatric Rheumatology Symposium, April 3-6, 2014, Orlando, Florida. *Arthritis & Rheumatology*, 66S201. doi:10.1002/art.38581
- Hyatt, V. T. (2001). Well-being: Minding your pain. *Yoga Journal*, 162, 35.
- Lipton, L. (2008). Using yoga to treat disease: An evidence-based review. *JAAPA-Journal of the American Academy of Physicians Assistants*, 2, 34.
- Medical College of Wisconsin. (2010). Evaluation of yoga for the treatment of pediatric headaches. Retrieved from [https://clinicaltrials.gov/ct2/show/record/NCT00726843?term=yoga%2C+pediatric%2C+child\\*&rank=2](https://clinicaltrials.gov/ct2/show/record/NCT00726843?term=yoga%2C+pediatric%2C+child*&rank=2)
- Merskey H, & Bogduk N. (1994) *Classification of Chronic Pain*. 2, 210.
- Moody, K., Daswani, D., Abrahams, B., & Santizo, R. (2010). Yoga for pain and anxiety in pediatric hematology: Case series and review of the literature. *Journal Of The Society For Integrative Oncology*, 8(3), 95-105.
- National Center for Complementary and Integrative (NCCIH). (2014). *Yoga*. Retrieved from <http://nccam.nih.gov/health/yoga>
- National Center for Complementary and Integrative Health (NCCIH). (2013) *Yoga for health*. Retrieved from <http://nccam.nih.gov/health/yoga/introduction.htm#hed3>
- National Center for Complementary and Integrative Health (NCCIH). (2015). *Most used mind & body practices*. Retrieved from <https://nccih.nih.gov/research/statistics/NHIS/2012/mind-body/yoga#child-data>
- Reiss, V. (2013). The art of yoga. *Yoga Journal*, (259), 34-113

- Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative & Complementary Medicine*, 16(1), 3-12.  
doi:10.1089/acm.2009.0044
- Spinazzola, J., Rhodes, A. M., Emerson, D., Earle, E., & Monroe, K. (2011). Application of yoga in residential treatment of traumatized youth. *Journal of The American Psychiatric Nurses Association*, 17(6), 431-444. doi:10.1177/1078390311418359
- Tsao, J. K. (2007). Treatment preferences for CAM in children with chronic pain. *Evidence-Based Complementary & Alternative Medicine (Ecam)*, 4(3), 367-374.
- Evans, S. (2010). Iyengar yoga for young people with irritable bowel syndrome. Retrieved from [https://clinicaltrials.gov/ct2/show/NCT01107977?term=yoga%2C+pediatric%2C+child\\*&rank=8](https://clinicaltrials.gov/ct2/show/NCT01107977?term=yoga%2C+pediatric%2C+child*&rank=8)
- Vallath, N. (2010). Perspectives on yoga inputs in the management of chronic pain. *Indian Journal of Palliative Care*. 16(1).
- Vetter, T. (2011). *The epidemiology of pediatric chronic pain*. Chicago: Springer Science+Business Media.
- Villemure, C., Ceko, M., Cotton, V., & Bushnell, M. (2013). Insular cortex mediates increased pain tolerance in yoga practitioners. *Cerebral Cortex* (New York, N.Y.: 1991).
- Young, L., & Kemper, K. (2013). Integrative care for pediatric patients with pain. *Journal of Alternative and Complementary Medicine*. 19(7): 627-32.