

The Use of Yoga as a Group Intervention for Pediatric Chronic Pain Rehabilitation: Exploring Qualitative and Quantitative Outcomes

Abstract

Purpose: With the increase in opioid use over the last decade, mind–body approaches to pediatric pain management have been trending. To date, there is limited research regarding the use of yoga with pediatric chronic pain. This study aims to gauge the effectiveness of group yoga as part of chronic pain rehabilitation and one’s ability to continue practicing independently by exploring qualitative and quantitative information. **Methods:** A single therapist used yoga as a group physical therapy intervention once a week for 60 minutes. Yoga education, iyengar yoga components, relaxation, and stretching were incorporated into the therapeutic yoga session. Qualitative and quantitative information was collected. **Results:** Qualitative outcomes provided valuable data about distractions and benefits. Quantitative outcomes showed that there were significant improvements in areas such as mental tension, emotional tension, muscle tension, and pain (all $P < 0.001$ significant). **Conclusion:** Pediatric chronic pain patients can identify many benefits after a single group yoga session. It combines the physical and cognitive aspects of interdisciplinary pain rehabilitation for continued use after discharge. The use of yoga is an economical means of physical activity after discharge to promote long-term benefits.

Keywords: *Chronic pain, pediatric, physical therapy, qualitative, therapeutic yoga*

Introduction

Yoga is recognized as a form of mind–body medicine that integrates an individual’s physical, mental, and spiritual components to improve the aspects of health.^[1] Yoga is a low-impact physical activity that has been well researched and now considered by the American Physical Therapy Association as a skilled therapy intervention. Its use as a therapeutic technique in rehabilitation settings seems to be on the rise as many providers are looking at alternative therapies to opioids secondary to adverse effects, risk of addiction, and drug interactions.^[2] Mind–body approaches to pain management have been trending, especially with the recent increase in opioid prescriptions. Specific to the pediatric population, tolerance, withdrawal, and dependence are the causes for concern and other interventions should be pursued *in lieu* of opioids.^[3] Forty percent of children report experiencing pain at least one time per week, with 1.7 million considered to have chronic pain in the United States (US) alone.^[3] Chronic pain affects 40% of the adults^[2] and 25%–46% of children and young adults in the USA,^[4] with health-care costs for this population

being approximately 560 billion dollars in the USA alone.^[4]

A specific type of yoga, Iyengar yoga, is based on structural alignment of the physical body through poses with a focus on the use of mind and body components and the use of breathing to support the body and movements as it develops strength, stability, and stamina.^[5] In addition, yoga includes the practice of physical postures (asanas), breathing (pranayama), meditative awareness exercises, and mindfulness training to improve one’s awareness by paying attention to the present moment. It includes isometric exercises, body poses, and mindful breathing. Benefits can include improved body functioning and conditioning, skeletal realignment, and body awareness in order to relieve pain and limit functional limitations from physical, psychological, or psychosocial factors.^[1,6]

The literature base regarding yoga intervention for older children and adolescents^[7] with chronic noncancer pain is limited as most research is specific to a diagnosis,^[8–11] is not specifically to older children and/or adolescent care, or views yoga as only one part of complementary

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and alternative medicine.^[12-14] More recently, an article was published supporting the findings from therapeutic yoga in both pediatric and adult settings, with benefits such as lower pain reports, improved functioning, and decreased stress.^[2] This is important as chronic pain development in pediatrics often includes fear-avoidance response, emotional distress, functional disability secondary to the cycle of pain, and familial influence.^[3] The question has been raised, with chronic pain specifically, does therapeutic yoga improve chronic pain symptoms?^[2] which to date has been explored further in only a single study involving an adult pain management group.

Yoga typically requires a strong level of focus and concentration to fully benefit both physically and mentally. When performed properly, it has been found to improve pain and functioning and demonstrate both short- and long-term relief of low back pain specifically.^[4] A recent article^[15] showed that yoga practice is associated with superior motor imagery performance as well. Many families and adolescents also prefer yoga due to its noninvasive nature and ability to improve somatic control.^[Evans³] It has also been found to improve perception of pain through mindfulness training and use of cognitive components rather than through sensory properties of pain.^[3] Distractions during a group yoga session may impact the overall benefit received, but very little is known about the internal and external distractions that participants experience.

Yoga can be practiced at home or in the community with limited use of resources and can be cost-effective.^[16] More recently, research has been focused on yoga in the community^[17] and incorporated in school settings. Specific to use in the schools, studies have shown improvements in behavior/self-control, concentration, emotional balance/regulation, relaxation, and self-esteem.^[3,18] Integrating yoga as a therapeutic technique and integrative therapy shows promise in enhancing outcomes when combined with conventional interdisciplinary care.

There are many similarities between the principles of therapeutic yoga and that of chronic pain treatment including (1) the body is a holistic entity, (2) each individual has unique needs, (3) promotion of self-empowerment (the individual being his/her own healer) by playing an active role in your own health, and (4) the state of one's mind is part of health and functioning.^[1] To date, there is limited research on the use of yoga with chronic pain in pediatrics.^[7] Qualitative research, that can be used to enrich knowledge, is lacking as well.^[18] This study aims to gain both qualitative and quantitative information regarding the use of yoga as part of a pediatric pain rehabilitation program. The first hypothesis is that adolescents will identify physical and psychological benefits from a group yoga session. Second, adolescents will feel more able to participate with yoga at home (in community yoga programs or home based with digital versatile disc [DVD]

or app use) after completion of yoga as part of the program. Lastly, this study aims to further explore the self-reports of distractions while participating in yoga, as well as benefits from yoga.

Methods

Participants

All participants (referred to as adolescents) who participated in the study were enrolled in an intensive pediatric pain rehabilitation program for 3–4 weeks including 8 h of daily physical therapy, occupational therapy, recreation therapy, psychology, noninvasive medical management, and classroom education services.^[19,20] As part of program participation, therapeutic yoga intervention was included as a physical therapy group which occurred once per week. Exclusion criteria included if they did not participate in the full session (at times, leaving early for alternate appointments) or if they rated items incorrectly (i.e., providing a word instead of a number). Full data sets for mental, emotional, and muscle tension and pain ratings were collected from 106 adolescents. In addition, 98 provided answers to multiple-choice questions about prior yoga experience and expectations, 91 provided qualitative feedback regarding benefits they experienced, and 56 provided qualitative feedback regarding distractions that may have impacted participation and focus. Adolescents ranged from 8 to 20 years old and all had at least one chronic pain diagnosis (most commonly including headaches, migraines, amplified musculoskeletal pain syndrome, abdominal pain, complex regional pain syndrome, postural orthostatic tachycardia syndrome, Ehler–Danlos syndrome, and back pain) with 31% of males, 67% of females, and 1.8% of transgenders.

Procedure

The reported data were collected as part of clinical care for a calendar year and then retrospectively reviewed. Data collection has been approved by the Institutional Review Board and is on the clinical database registry.^[21]

Yoga group treatment session

Yoga was added to the program several years ago due to its low-impact nature; its ability for all skill levels to tolerate it well; and its nature of combining interdisciplinary cognitive, emotional, and physical skills. In addition, patients can directly access yoga at home or in the community after discharge, if they find it beneficial, and possibly limit their need for therapeutic intervention once home.

A single physical therapist assistant used yoga as part of a group physical therapy intervention on a once-a-week basis. The total session ran 60 min in length; however, the physical activity components only took about 30–40 min of the session to enhance tolerance and relaxation. This also ensured time for education regarding alignment,

breathing, appropriate challenge level, and modifications. The group was encouraged to be respectful and quiet during the session while quiet yoga music was played during physical components of each session. Yoga worksheets were filled out by adolescents at the start and end of each session.

Outline of session

Yoga education (approximately 10 min)

Prior to starting each yoga session, a brief summary of the potential benefits and areas of focus was reviewed with the group. This included the benefits of low-impact activities, facilitation of alignment, how to improve mindfulness and body awareness, how to combine physical skills with relaxation skills, and how to ensure appropriate level of strength training. In addition, specific diaphragmatic breathing techniques were reviewed in order to use musculature more efficiently, prevent orthostatic changes due to holding breath or abnormal breathing, and promote relaxation throughout activities. The therapist then demonstrated poses with focus on smooth transitions, mindfulness of positioning, and how to adjust/modify positioning to facilitate flexibility. There was additional focus on appropriate modifications to adjust poses to each individual's needs and abilities. Adolescents were encouraged to use coping skill training and mindfulness strategies that work for them, or had been recommended for trial by psychology, to facilitate improved outcomes. And lastly, each participant was encouraged to think about how muscles, joints, mindset, and feelings might be affecting their own participation and abilities.

Warm up (2–3 min)

As outlined in Table 1, a simple warm up including the use of mountain pose for a posture check and stress check (with step-by-step instructions) and warm up diaphragmatic breathing. Basic dynamic, controlled range of motion (ROM) through all joints was completed (neck circles, thoracic rotation, hip circles, pelvic tilts, knee circles, and forward bend) with modifications as needed based on ability.

Yoga flow (approximately 20–25 min)

Therapeutic yoga activities were based on the use of Iyengar yoga poses^[5] as this type of yoga emphasizes alignment and modification, along with smooth transitions and incorporation of relaxation components (breath training, imagery, distraction, and coping thoughts). Poses were held for 30–45 s with return to mountain pose between each task with encouragement to recheck posture and alignment. Standing poses were completed before floor poses, with attempts to alternate primary upper body, abdominal/core, and lower body poses. As some adolescents had limited functional mobility (i.e., were using assistive equipment for standing or walking), they would modify session using necessary support and/or floor poses.

Table 1: General outline of yoga group including positions, poses, and time spent on each to be used for reference or replication of group

Positioning/activity	Description of yoga poses/postures	Length of time/reps
Warm up	Mountain pose posture check	2 min posture check
	Diaphragmatic breathing	5-10 breath cycles
	Dynamic ROM	5-10 reps of all ROM activities
	Neck circles	
	Thoracic rotation	
	Hip circles	
	Knee circles	
	Forward fold/bend	
	Overhead reach with arms	
	Standing	Mountain pose
Warrior I		
Warrior II		
Triangle		
Chair pose		
Floor poses	Tree pose	All 30-45 s hold, taking a total of 10-15 min
	Cat-cow transitions	
	Downward facing dog	
	Child's pose	
	Dolphin pose	
	Half-seated twist	
	Cobra	
	Bridge	
	Boat pose	
	Cobra or upward facing dog	
Relaxation	Roll up	7-8 min
	Corpse pose	
Supine stretching	Modifications: Prone or side lying	Hold each for 30 s
	Full extension body stretch	
	Hip flexor	
	Hamstring	
	Calf w/hamstring	
Seated stretching	Supine back	Hold each for 30 s
	Double knee to chest	
	Trunk rotation	
	Butterfly	
	Seated pectoral stretch	
	Lateral trunk flexion	
Seated stretching	Cervical stretching/rotation	Hold each for 30 s
	Forward fold	

Contd...

Table 1: Contd...

Positioning/activity	Description of yoga poses/postures	Length of time/reps
Cool down	Three closing breaths and positive thoughts Hydration Optional meditation	1-2 min

ROM=Range of motion

Relaxation (approximately 12–15 min)

After completion of yoga poses, adolescents were cued to lay down in a “relaxed but lengthened position.” Most often, adolescents would assume corpse pose or hook-lying position; however, alternate positions (i.e., prone or side lying) could be chosen based on comfort and physical abilities. Guided relaxation with background music was completed for the first 1–2 min focused on breathing, alignment, and release of muscle tension. Specific verbal cuing included phrases such as: “relax your whole body,” “focus on your breathing,” and “let your muscles unwind.” After 7–8 min of relaxation, the group progressed to active ROM, static and dynamic stretching: first supine stretching (hip flexor, hamstring, supine back, double knees to chest), then seated stretching (trunk rotation, pec stretch, lateral trunk flexion, neck circles), and followed by three closing breaths. Music was played quietly as the adolescents were encouraged to complete any remaining stretches they would like to do, clean up their area, and fill out their yoga worksheets.

Measures

Before and after each session, the adolescents were given a “yoga worksheet” to fill out, providing both quantitative and qualitative information for each session [Figure 1].

Quantitative outcomes

Adolescents provided numerical ratings for benefits/outcomes in several areas, with each rating using a 0–10 scale, with 0 being the lowest/none and 10 being the highest/most. Categories rated included mental tension, emotional tension, muscle tension, and pain, with examples for each [Figure 1]. In addition, before each session, the adolescents were asked (1) do you think you will like yoga (yes, no, unsure) and (2) have you done yoga before (yes, no). After each session, the adolescents rated the following additional items: Did you find anything distracting? (yes, no), Did you find the music helpful? (yes, no, unsure), In general, were you satisfied with the yoga session? (yes, no), and Do you think you could now participate in yoga at home (in community or at home)? (yes, no, unsure, I don’t like yoga). All items were designed by the team with focus on what may be most important to capture for clinical adjustments to programming. Specifically, distractions were of interest because part of the benefit of yoga is working

Name: _____

Please rate these items BEFORE starting yoga group:
Rate the following 0-10 (0 being lowest, 10 being highest/extreme)

- Mental Tension (occupied thoughts, stress, worry): _____
- Emotional Tension (frustration, depression, angry, upset, sadness): _____
- Muscle Tension (feeling tight, sore, can't relax) : _____
- Pain : _____

Have you ever done yoga before this program? _____, If yes when or how often _____

Do you think you will like Yoga? Yes _____ No _____

Please rate these items AFTER yoga group:

- 1) How much effort were you able to put into yoga (100% effort= working into muscle fatigue and focus on alignment), please rate 0-10 (0 being lowest (0% effort) 10 being highest(100%) _____
- 2) Did anything distract you during yoga? Yes _____ No _____
If Yes, what? _____
- 2) Did you find the music helpful? Yes _____ Neutral/Unsure _____ No _____
- 3) What was one benefit you noticed from the yoga session? _____
- 4) In general, were you satisfied with this yoga session? Yes _____ No _____
- 5) Do you feel like you **COULD** now participate in a yoga class in your community or at home?
Yes _____ No _____ Unsure/Neutral _____ No, I don't like yoga _____

Rate the following 0-10 (0 being lowest, 10 being highest/extreme)

- Mental Tension (occupied thoughts, stress, worry): _____
- Emotional Tension (frustration, depression, angry, upset, sadness): _____
- Muscle Tension (feeling tight, sore, can't relax) : _____
- Pain : _____

Additional Comments: _____

Figure 1: A copy of the yoga worksheet that adolescents filled out for this study's data

on mindfulness training to improve one’s awareness by paying attention to the present moment. At the same time, it is often observed that adolescents seem to be distracted, therefore not being mindful or fully present in the current moment.

Qualitative outcomes

After each session, additional qualitative data were collected as adolescents had the opportunity to elaborate on certain answers. The first is a subcategory to “did you find anything distracting”? If the participant stated “yes,” they were encouraged to free text a response providing detail about what was distracting. The second was simply an area where the participant could free text any benefits they noticed from the yoga session.

Results

Quantitative outcomes

Mental, emotional, muscle tension, and pain decreased significantly in each of the three sessions (all $P < 0.001$) as shown in Table 2. There was no difference between those who participated in a single yoga group session compared to all three opportunities (only the first session is reported for this study because of this).

Multiple-choice response (yes, no, neutral/unsure) questions [Table 3] found that 82 adolescents (77.4%) thought they would like yoga and 98 (93.3%) were satisfied with their first yoga session. Of those that reported they liked yoga after a single session, 49.5% reported that

they felt they could perform yoga in a community setting, 33% were unsure, 9 (8.6%) reported they did not feel prepared (with a “no” response), and 9 (8.6%) stated they would not simply because they don’t like yoga enough to participate after discharge. Of those that reported they did not think they would like yoga (12%), 9 (8.6%) continued to report they did not like yoga, therefore would not trial in the community or at home. Of those that had never done yoga before, 32% felt they could complete yoga at home and 35% were unsure. Over half, 56 (53%) reported experiencing distraction (s) of some type (internal or external).

Post hoc analyses looked at data to see if gender and/or prior experience with yoga had significant impact or findings. Gender had a mild significance; however, it is skewed due to the fact that there were many more female than male participants. For all other *post hoc* analyses, nothing of significance was found.

Qualitative outcomes

Most adolescents provided open-ended feedback regarding the benefit(s) of their yoga session regardless of if they stated they were “satisfied” with the session. Benefits ranged including feeling general relaxation, less tension, calmer, and more focused [Table 4]. A total of 91 adolescents (86%) provided helpful open-ended feedback regarding benefits [Table 4]. Of those that reported distractions, all (100%) provided additional feedback as well [Table 5]. There was a split between reports of external (48%) and internal (52%) distractions. Some of the external distractions included people coming in/out of the room, peers, external noise/music, lighting, and silence. Some internal distractions included pain, thoughts, symptoms, temperature, and feeling overwhelmed.

Discussion

Pediatric patients with chronic pain can benefit from a single, yoga group session in many ways including identification of reduced mental, emotional, and/or muscle tension, and decreased pain. This supports the first hypothesis that adolescents would identify physical and psychological benefits from a yoga group session. Adolescents were able to identify and differentiate the various types of tension without excessive cuing or education. They seemed to learn how to be more mindful and aware of their body as noted by their ability to complete the questionnaire regardless of age or prior experience. This highlights the earlier point that there are common principles between yoga and chronic pain rehabilitation, specifically the importance of recognizing the body as a holistic entity and that the state of one’s mind can impact health and functioning.

The second hypothesis, that adolescents will feel more able to participate with yoga at home (in community yoga programs or home based with us of a DVD or yoga app) after completion of yoga as part of the program, was supported by the results. Of those who had previously trialed yoga elsewhere, 49.5% felt they could continue practicing yoga after discharge. Of those who had not previously trialed yoga, 32% felt they were ready to continue practicing yoga after discharge. This leads to an area for potential research as looking at a yoga group longitudinally may better support confidence and use of yoga at home.

The aim of the study to further explore self-reports of distractions and benefits while participating in yoga was reported. Nearly 86% of the adolescents reported either an internal or external distraction while participating in the yoga group. All adolescents further elaborated and provided more detail regarding distractions. The most

Table 2: Paired t-test for mental tension, emotional tension, muscle tension, and pain before and after each session (n=106)

	Before mean score (SD)	After mean score (SD)	Correlation	Paired t-test
Mental tension	5.2 (2.5)	3.7 (2.4)	0.691 (0.000)***	7.67 (0.000)***
Emotional tension	4.5 (2.8)	3.1 (2.6)	0.804 (0.000)***	8.54 (0.000)***
Muscle tension	5.9 (2.2)	4.3 (2.5)	0.598 (0.000)***	7.75 (0.000)***
Pain	6.3 (2.3)	5.9 (2.4)	0.888 (0.000)***	4.51 (0.000)***

***P<.001. SD=Standard deviation

Table 3: Multiple-choice responses before and after session (n=98)

	Yes (%)	No (%)	Unsure (%)	I don’t like yoga (%)
Do you think you will like yoga?	77.4	12.3	10.4	
Have you ever done yoga before?	56.6	43.4		
Did you find anything distracting?	53.3	46.7		
Did you find the music helpful?	61.9	5.7	32.4	
In general, were you satisfied with the yoga session?	93.3	5.7		
Do you think you could now participate in a yoga session at home or in your community?	49.5	8.6	33.3	8.6

Table 4: Qualitative report of benefits from a single yoga session

Benefits	Time 1 (n=98), n (%)
General relaxation	40 (40.1)
Loose muscles/less tense	22 (22.4)
Calming	14 (14.3)
Muscle/body relaxation	6 (6.1)
Clear mind	4 (4.1)
Mind relaxation	2 (2)
Fun	2 (2)
Peaceful	2 (2)
Stress relief	2 (2)
Energy boost	1 (1)

Table 5: Qualitative report of external and internal distractions during yoga sessions

	Time 1, n (%)
External distractions	n=26
People entering/exiting room	11 (21.2)
Peers	4 (76.9)
Silence	1 (1.9)
Music	2 (3.8)
Noise	8 (15.4)
Internal distractions	n=28
Pain	13 (25)
Thoughts	10 (19.2)
Other symptoms	2 (3.8)
Temperature	1 (1.9)
Overwhelmed/everything	2 (3.8)

common external distraction was other people entering or exiting the area and the most common internal distraction was chronic pain. They also provided information about the benefits from the group, most commonly adolescents reported general relaxation or less muscle tension.

After reviewing all data, it seems that neither one's participation in yoga prior to the group session nor the amount of sessions completed impacted recognition of the benefits of yoga. Both those who had no prior yoga experience and those who had experience were able to identify similar outcomes, distractions, and benefits. These factors are important to discuss because it demonstrates that yoga can be utilized therapeutically regardless of prior experience or knowledge of yoga, or specific physical ability, and that similar results may be anticipated.

As seen in previous research,^[3,18] this study supports the idea that individuals can find benefit (i.e., improved mental relaxation, improved physical relaxation, looser muscles, improved concentration, etc.) regardless of prior yoga experience. This also supports previous findings that using yoga as part of pediatric rehabilitation can result in benefits such as lower pain reports, improved functioning, and decreased stress.^[2]

Limitations

The first limitation of this study is that specific diagnoses were not analyzed separately to see if there was variability regarding participation and outcomes. Clinically, one's chronic pain specific diagnosis did not seem to specifically impact participation, i.e., a child with mobility issues using appropriate modifications could participate just as well as a more independent child. Second, it seems that psychological diagnoses (i.e., anxiety or depression) and comorbidities (i.e., attention-deficit hyperactivity disorder or developmental coordination disorder) may have impacted participation to a greater extent; however, these diagnoses were not categorized for potential use. The second limitation was program scheduling as it was common that some program participants were only able to attend and complete one of three possible yoga group session(s). This limited the ability to collect and analyze data longitudinally, therefore. A third limitation is that there was no control or comparison group for this study. All program participants were scheduled with the yoga group as frequently as possible as it is naturally part of the full program.

A possible limitation was the use of yoga as a group therapy. Although this could be considered a limitation, it could also be a benefit in that less individualized attention and one-on-one instruction was able to be provided. This allowed adolescents to be more mindful of their impact on others around them, generally allowing for less opportunity for the individual to focus on what was difficult, what they felt they couldn't do, and their overall pain level, while reinforcing the focus on the individual on themselves and their body and mind.

Lastly, of the adolescents who reported external distractors, 20% specified that it was distracting due to people entering or exiting the room. This was unavoidable secondary to room availability and location near staff offices. However, people were encouraged to enter/exit quietly and were aware that a yoga group was running in the room to avoid other noises. Despite the reports of the distractor, they still largely found benefit from the session in various ways. This seems to highlight the impact of the therapeutic yoga intervention alone.

Conclusion

Iyengar yoga can be an effective treatment for pediatric chronic pain. It can promote short-term physical improvements (muscle tension and pain) and psychological improvements (mental tension and emotional tension). The use of therapeutic yoga teaches individuals how to combine physical and cognitive strategies to improve functioning in a low-impact environment and become more aware of how to be mindful to listen to their bodies. Individuals reported that they also can feel more independent and capable of completing yoga at home or in the community

for continued physical activity and exercise. Yoga is a cost-effective intervention as it can be accessed in many forms by many individuals.^[16] In response to the previously raised question “does therapeutic yoga improve chronic pain symptoms,” this study implicates that adolescents can identify improvement in many areas after participation in a yoga group session that includes, but is not limited to, decreased mental, emotional, or muscle tension, pain, and insight of benefits.

This study leads to several areas for further research that include: (1) long-term effect of yoga on pediatric chronic pain, (2) comparisons between yoga utilized during individual and group settings, (3) observing differences between those that think they will like yoga and those that predetermine they will not like/benefit from yoga, and (4) look at how effort or motivation may impact outcomes.

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Conflicts of interest

There are no conflicts of interest.

References

1. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. *Int J Yoga* 2011;4:49-54.
2. Achilefu A, Joshi K, Meier M, McCarthy LH. Yoga and other meditative movement therapies to reduce chronic pain. *J Okla State Med Assoc* 2017;110:14-6.
3. Brown ML, Rojas E, Gouda S. A mind-body approach to pediatric pain management. *Children (Basel)* 2017;4. pii: E50.
4. Bonakdar RA. Integrative pain management. *Med Clin North Am* 2017;101:987-1004.
5. Williams K, Steinberg L, Petronis J. Therapeutic application of Iyengar yoga for healing chronic low back pain. *Int J Yoga Ther* 2003;13:55-67.
6. Ward L, Stebbings S, Cherkin D, Baxter GD. Yoga for functional ability, pain and psychosocial outcomes in musculoskeletal conditions: A systematic review and meta-analysis. *Musculoskeletal Care* 2013;11:203-17.
7. Hoffart CM, Wallace DP. Amplified pain syndromes in children: Treatment and new insights into disease pathogenesis. *Curr Opin Rheumatol* 2014;26:592-603.
8. Evans S, Lung KC, Seidman LC, Sternlieb B, Zeltzer LK, Tsao JC. Iyengar yoga for adolescents and young adults with irritable bowel syndrome. *J Pediatr Gastroenterol Nutr* 2014;59:244-53.
9. Evans S, Moieni M, Taub R, Subramanian SK, Tsao JC, Sternlieb B, *et al.* Iyengar yoga for young adults with rheumatoid arthritis: Results from a mixed-methods pilot study. *J Pain Symptom Manage* 2010;39:904-13.
10. Hainsworth KR, Salamon KS, Khan KA, Mascarenhas B, Davies WH, Weisman SJ. A pilot study of yoga for chronic headaches in youth: Promise amidst challenges. *Pain Manag Nurs* 2014;15:490-8.
11. McNamara C, Johnson M, Read L, Vander Velden H, Thygeson M, Liu M, *et al.* Yoga therapy in children with cystic fibrosis decreases immediate anxiety and joint pain. *Evid Based Complement Alternat Med* 2016:Article ID# 9429504:1-10.
12. 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;2:521-7.
13. Prabhakar A, Kaiser JM, Novitch MB, Cornett EM, Urman RD, Kaye AD. The role of complementary and alternative medicine treatments in fibromyalgia: A comprehensive review. *Curr Rheumatol Rep* 2019;21:14.
14. Evans S, Moieni M, Sternlieb B, Tsao JC, Zeltzer LK. Yoga for youth in pain: The UCLA pediatric pain program model. *Holist Nurs Pract* 2012;26:262-71.
15. Gray C, McCormack S. Yoga for Chronic Non-Malignant Pain Management: A Review of Clinical Effectiveness, Cost-Effectiveness and Guidelines. Canadian Agency for Drugs and Technologies in Health; 2019.
16. Schmid AA, Fruhauf CA, Sharp JL, Van Puymbroeck M, Bair MJ, Portz JD, *et al.* Yoga for people with chronic pain in a community-based setting: A feasibility and pilot RCT. *J Evid Based Integr Med* 2019; 24: 1-11
17. Butzer B, LoRusso AM, Windsor R, Riley F, Frame K, Khalsa SB, *et al.* A qualitative examination of yoga for middle school adolescents. *Adv Sch Ment Health Promot* 2017;10:195-219.
18. Hartnoll S, Punt D. Yoga practice is associated with superior motor imagery performance. *Int J Yoga Ther* 2017;27:81-6.
19. Evans JR, Benore E, Banez GA. The cost-effectiveness of intensive interdisciplinary pediatric chronic pain rehabilitation. *J Pediatr Psychol* 2016;41:849-56.
20. Banez GA, Frazier TW, Wojtowicz AA, Buchanan K, Henry DE, Benore E. Chronic pain in children and adolescents: 24-42 month outcomes of an inpatient/day hospital interdisciplinary pain rehabilitation program. *J Pediatr Rehabil Med* 2014;7:197-206.
21. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377-81.