

Peaceful Play Yoga: Serenity and Balance for Children With Cancer and Their Parents

Journal of Pediatric Oncology Nursing
27(5) 276–284
© 2010 by Association of Pediatric
Hematology/Oncology Nurses
Reprints and permission:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1043454210363478
<http://jopon.sagepub.com>



Megan V. Thygeson, BA,¹ Mary C. Hooke, PhD, RN, CNS, CPON,¹
Jeanine Clapsaddle, MA, LAMFT, CCLS,¹ Angela Robbins, MS, RN, CNP,¹
and Kristin Moquist, MA, RN, CNP, CPON¹

Abstract

Children with a cancer diagnosis experience symptom distress, including anxiety, because of the disease and its treatment. Parents experience stress and anxiety because of the uncertainty of the disease as well as the suffering of their children. Yoga is a complementary intervention that has physiological and psychological benefits in healthy children and healthy and chronically ill adults. On an inpatient hematology/oncology unit, 11 children aged 6 to 12 years, 5 adolescents aged 13 to 18 years, and 33 parents participated in a single yoga session tailored to the needs and abilities of the patients and parents. Sense of well-being pre- and postclass was measured with the Spielberger State Anxiety Scale. Children had normal anxiety scores preclass that did not change. Adolescents and parents experienced significant decreases in anxiety scores, and all cohorts gave positive feedback about the experience. The authors conclude that yoga is a feasible intervention for this population and is beneficial to adolescents and parents.

Keywords

yoga, children, parents, cancer, anxiety

Yoga, the Sanskrit word meaning “to unite or integrate,” is an ancient system of breathing practices intended to integrate the practitioner’s body, mind, and spirit. The disciplined practice of breathing (*pranayama*), postures (*asana*), and meditation (*dhanya*) creates an inner sense of balance with positive effects becoming visible over time. In terms of overall physical fitness, yoga improves posture, muscle tone, circulation, pulmonary function, coordination, and flexibility (Raub, 2002). As a stress management technique, yoga promotes relaxation, reduces anxiety, and improves sleep patterns.

Yoga lowers the heart rate and blood pressure and improves circulation and oxygenation, all of which lead to improved cardiovascular endurance. In a randomized controlled trial, subjects randomized to a yoga intervention were able to use their own strategies to voluntarily reduce heart rate (Telles et al., 2004). Healthy men have shown improved aerobic capacity through the practice of *Hatha* yoga (Ray et al., 2001). *Pranayama*, the foundation of yoga, helps improve lung function through deep breathing and improved posture, which in turn can increase oxygenation of tissues and lower the respiratory rate. A cohort of 287 college students who practiced yoga postures, breath control, and relaxation techniques for

15 weeks experienced a significant increase in vital capacity as measured by spirometry (Birkel & Edgren, 2000). In a randomized controlled trial of healthy men, Makwana, Khirwadkar, and Gupta (1988) found yoga to significantly decrease the respiratory rate and increase vital capacity.

Yoga can improve endocrine function by balancing hormone production and excretion. Evans, Sternlieb, Tsao, and Zeltzer (2009) found that cortisol levels are lowered following yoga and that nighttime plasma melatonin is increased, which may result in improved sleep quality. Yoga also decreases “fight or flight” physiological reactions to stress such as elevated heart rate and blood pressure. In a randomized controlled trial, Harinath et al. (2004) found that the increase in plasma melatonin had significant correlation to the rise in well-being scores in the yoga group. Yoga also strengthens upper and lower extremities as well as abdominal muscles. It contributes to balance, flexibility, posture, and the release of muscle

¹Children’s Hospitals and Clinics of Minnesota, Minneapolis, MN, USA

Corresponding Author:

Megan V. Thygeson, BA, 2525 Chicago Avenue South, Minneapolis, MN55404 USA

Email: megan.thygeson@childrensmn.org

tension. In a randomized controlled trial sponsored by the American Council on Exercise, researchers assigned healthy women to an 8-week yoga intervention group or a control group. The yoga group showed a 13% to 35% improvement in flexibility, muscular strength, endurance, and balance (Anders, 2005).

Anxiety can lead to health problems such as obsessive thinking, insomnia, and migraine headaches (McCall, 2007). Breathing associated with anxiety tends to be short and choppy. Yoga encourages slow, deep, rhythmic abdominal breathing, which relaxes the nervous system and calms the mind. Meditation slows down anxious thinking and heightens awareness of what is contributing to anxiety (McCall, 2007). Smith, Hancock, Blake-Mortimer, and Eckert (2006) found *Hatha* yoga to be as effective as progressive muscle relaxation in reducing stress and anxiety and improving health status in subjects with mild to moderate stress (Smith et al., 2006). Yoga also contributes to feelings of well-being and improved body image. Woolery, Myers, Sternlieb, and Zeltzer (2004) assessed the effects of *Iyengar* yoga on women with mild depression. The yoga intervention group reported reduced depression and anxiety when compared with the waitlist controls. The practice of yoga can help foster spiritual growth and self-awareness. It is associated with being in the moment; experiencing feelings of forgiveness, empathy, and gratitude; and realizing that you are part of something bigger than yourself (McCall, 2007).

In a systematic review of yoga research in the pediatric population, Galantino, Galbavy, and Quinn (2008) critiqued 24 studies focused on healthy children with normal development. Yoga had a positive influence on motor performance, ability to concentrate, cardiopulmonary functioning, and musculoskeletal functioning. Randomized clinical trials are needed to evaluate quality-of-life outcomes, the use of yoga for pediatric rehabilitation, as well as the duration of yoga benefits (Galantino et al., 2008).

Yoga is emerging as an effective complementary therapy in adult oncology. In a review of current research on yoga for adults undergoing cancer treatment, DiStasio (2008) identified promising benefits for decreasing symptom distress including fatigue, insomnia, mood, and stress resulting in improved quality of life. Among the few randomized controlled trials conducted, it was found that lymphoma patients experienced significantly lower sleep disturbance after 7 weekly yoga sessions (Cohen, Warneke, Fouladi, Rodriguez, & Chaoul-Reich, 2004). In a randomized clinical trial of cancer survivors, subjects in the 7-week yoga group demonstrated significant changes in physical and psychosocial measures (Culos-Reed, Carlson, Daroux, & Hatley-Aldous, 2004). Other studies of yoga in adult oncology have used patients as their own controls

and have shown that yoga positively influences pain, fatigue, stress, and mood (DiStasio, 2008).

Children with cancer have reported distress related to multiple symptoms including pain, nausea/vomiting, fatigue, anxiety, sleep disturbance, muscle weakness, and lack of balance (Collins et al., 2000; Collins et al., 2002; Hedström, Haglund, Skolin, & Von Essen, 2003; Hockenberry, 2004; Hockenberry-Eaton & Hinds, 2000; Wright, Galea, & Barr, 2005). When patients and their parents were interviewed about their beliefs related to childhood cancer symptoms, they expressed an expectation that suffering was a normal part of the cancer treatment (Woodgate & Degner, 2003). Parental uncertainty about their child's future, combined with distress for their child's suffering, contributes to high levels of stress in parents of children with cancer. The level of anxiety in a parent of a child recently diagnosed with cancer is comparable with that of a person hospitalized for an anxiety disorder (Santacrose, 2002). Parents of children with sickle cell disease also report high levels of anxiety (Lemanek, Ranalli, & Luken, 2009).

Although results from adult studies have reported the advantages associated with the practice of yoga, and yoga has been shown to benefit healthy children, little is known about the potential benefit for the pediatric hematology/oncology patient facing long-term illness and hospitalization. The advantage of yoga for cancer patients is that it can be practiced anywhere and from any position—a hospital bed, chair, or wheelchair—if standing is not possible. Those new to yoga can limit the duration of their practice to a short period of time and increase as stamina builds. In this pilot study, we wanted to gain insight into approaches for yoga interventions in this population of children and parents to provide a foundation for future studies for specific hematology/oncology populations.

The aims of the Peaceful Play study were (a) to explore the feasibility of a single yoga session for children and adolescents hospitalized with cancer or other blood disorders and/or their parent(s) and (b) to determine if patients and parents experience a significant decrease in anxiety as measured at baseline and at the end of a single yoga class. Outcomes of this study will provide insight into approaches for designing yoga interventions in future studies for specific hematology/oncology populations.

Method

Participants

A convenience sample of study participants included 2 cohorts of patients (children aged 7-12 years and adolescents aged 13-18 years) and a cohort of parents recruited from 2 inpatient hematology/oncology units at

Children's Hospitals and Clinics of Minnesota. Eligible subjects included children (aged 7-12 years) and adolescents (aged 13-18 years) who (a) spoke English; (b) were hospitalized on an inpatient unit with a diagnosis of cancer or blood disorder; (c) had an activity level appropriate for yoga, were able to leave their room to attend the class, and had not previously attended an inpatient yoga class; (d) were able to give assent according to institutional guidelines; and (e) had parental consent to participate.

Eligible parent subjects included parents who (a) had a child of any age who was hospitalized on an inpatient unit with a diagnosis of cancer or blood disorder, (b) spoke English, (c) had not previously attended the inpatient yoga class, and (d) consented to participate in the study. The parents could participate in the study with or without their child. Some hospitalized children were younger than the eligibility age for the study and others chose not to participate.

There are currently no published studies available that evaluate yoga in children with cancer and blood disorders. Because there are no studies on which to base a sample size estimation, we were unable to estimate the power needed to detect a change in anxiety. Therefore, our sample size was determined by the number of subjects that enrolled during the 9-month study period. This pilot study will provide a foundation for developing future power estimations for yoga intervention studies.

The study was approved by Children's Hospitals and Clinics of Minnesota Institutional Review Board. Study details were explained to each participant by one of the researchers, and eligible subjects were invited to participate during their hospitalization. Potential subjects could choose to attend the yoga session without participating in the study. However, once they attended the class, they became ineligible for study participation in the future. Researchers recruiting patients and families for the study made every effort to minimize the distress associated with an unknown hospital experience. Developmentally appropriate language was used to explain the study intervention and measures.

Design and Procedures

Using a mixed-methods, within-subject, repeated-measures design, pre- and poststudy measures were performed immediately before and after an inpatient, standardized 45-minute yoga class. Anxiety and general sense of well-being were assessed using the Spielberger State Trait Anxiety Inventory (STAI). Assent and consent were obtained within 48 hours before the class. Qualitative data were collected using an open-ended survey question administered after the class. In this mixed-methods study, the qualitative data provide clarification

and elaboration of the quantitative outcomes (Wilkins & Woodgate, 2008).

Yoga Intervention

The yoga class, held in the inpatient unit playroom, was administered by one of the researchers, a registered yoga teacher. The center of the room was cleared of furniture, and yoga mats were provided for each participant. The lights were dimmed and relaxing instrumental music played in the background. The structure of the 45-minute class was modeled after a standardized yoga class consisting of an opening seated meditation, warm-up and centering poses, standing poses, balance poses, cool down/spinal twists, and final resting pose. Modifications were recommended as needed. For example, where leg strength was compromised, poses were executed in a supine position or seated in a wheelchair. Language used to describe poses, relaxation imagery, and music was consistent. The poses were presented in English, not Sanskrit. The class was noncompetitive, according to the underlying principles of yoga, and the instructor encouraged students to participate according to their individual ability. Inner peace was stressed.

A yoga curriculum was created that was developmentally appropriate for the targeted population and consisted of safe and easily executed yoga poses. To develop the curriculum and core concepts of the program, the researcher/instructor consulted with the hematology/oncology physical therapist and child life specialists as well as outside yoga instructors with experience in teaching the oncology population. The yoga intervention designed specifically for this class blended active and restorative (restful) poses. Though the program did not adhere to one particular yoga philosophy, postures were based on basic principles of *Hatha* (physical) yoga.

Study Measures

The STAI was used to measure anxiety and the general sense of well-being. The adult version of the STAI was used for the adolescent cohort, aged 13 to 18 years, and the parent cohort (Spielberger, Gorsch, Lushene, Vagg, & Jacobs, 1983). The Spielberger State Trait Anxiety Inventory for Children (STAIC) was used for the child cohort, aged 7 to 12 years (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1973). The STAI and STAIC comprise 2 separate report scales that measure state and trait anxiety. State anxiety refers to how the subject is feeling "right now," whereas trait anxiety refers to how the person generally feels. In this study, only the State (S-Anxiety) scale was used as a measure of the participants' feelings "in the moment" both before and after the yoga intervention. The

questionnaires are of low impact and have been found to be a sensitive indicator of changes in transitory anxiety. One of the researchers administered the study instruments prior to the onset of the yoga class and again within 15 minutes after the completion of the class.

The STAI used for the adolescent and parent cohort has 20 items. For each item, the subject rates the feeling on a 4-point scale with response choices being “not at all,” “somewhat,” “moderately so,” or “very much so.” Possible scores range from 20 to 80. The internal consistency estimate for the STAI ranges from .90 to .94 (Cronbach’s α). The mean score for working adults aged 19 to 39 years is 36.54 (SD = 10.40) for males and 36.17 (SD = 10.61) for females. The mean score for high school students is 39.45 (SD = 9.74) for males and 40.54 (SD = 12.86) for females (Spielberger et al., 1983).

The STAIC administered to the child cohort is a 20-item instrument that gives children the opportunity to describe how they feel at a given moment in time. The questionnaire takes approximately 5 to 8 minutes to complete when it is read to the child and has been previously used in the pediatric oncology population. Each question begins with the words “I feel” followed by a 3-point rating scale. For example, possible answers to question one are “very calm,” “calm,” or “not calm.” The researcher read the questions to the child and recorded the child’s response. Possible scores range from 20 to 60. The internal consistency estimate for the STAIC is .82 to .87 (Cronbach’s α). The mean score on the STAIC for healthy children is 31 (SD = 5.71) for males and 30.7 (SD = 6.01) for females (Spielberger et al., 1973).

After completing the postintervention questionnaire, subjects were asked an open-ended question, “What would you tell another parent or child about what it is like to take a yoga class?” Children were asked the question verbally by a researcher who recorded their answer, whereas adolescents and parents read the question and responded in writing.

Analysis

Descriptive statistics were used to assess the feasibility of the study, which included the percentage of patients and parents who consented to study participation, percentage of patients and parents who completed the study intervention, and percentage of patients and parents who completed the study measurements. Descriptive statistics were also used to describe patients’ demographic data, types of cancer, reason for hospitalization, number of months in treatment, and number of total days of hospitalization during treatment.

SPSS software version 14.0 was used for data analysis. Each anxiety variable (patient, parent) was examined

for parametric assumptions, and they were found to have nonnormal distributions. The nonparametric Wilcoxon’s signed ranks test for nonnormal distributions was used to evaluate the change in anxiety in each patient group (child and adolescent) and in the parent group. For the qualitative analysis, the researchers identified and agreed on themes and used them to independently code the responses (O’Cathain & Thomas, 2004). Child, adolescent, and parent responses were analyzed separately.

Results

Sample

During the 9-month enrollment period, 20 children, 12 adolescents, and 45 parents were invited to participate in the yoga intervention study. Eleven children, 5 adolescents, and 33 parents chose to participate in the study for an enrollment rate of 55%, 42%, and 73%, respectively. All but 1 child and 1 parent were able to complete the yoga session and the study measurements, for a completion rate of 90% for children, 100% for adolescents, and 96% for parents. The child withdrew from the study during the yoga class because of dizziness, and the parent was unable to complete the class because of emotional distress related to her child’s diagnosis. All subjects who completed the intervention successfully completed the anxiety measurements.

Sample characteristics of the child and adolescent cohorts are provided in Table 1, and the characteristics of the parent cohort are provided in Table 2. Sixty-four percent of the child cohort was male and 60% of the adolescent cohort was male, whereas 70% of the parent cohort was female. Patients and parents in the study were predominantly Caucasian (73% of children, 80% of adolescents, and 70% of parents), which is characteristic of the pediatric hematology/oncology inpatient population in the state of Minnesota. Ten of the 31 (32%) parents of children with cancer had learned of their child’s diagnosis within a month of participating in the study. Forty-two percent of the parents ($n = 14$) participated in the study and yoga session with their child. Of the remaining 19 parents, 13 (68%) had children who were less than 6 years and thus ineligible for the study, and 6 (32%) had children who were unable to participate because of their clinical condition or because they chose not to participate.

Change in Anxiety in Children, Adolescents, and Parents

Children ($n = 11$) reported no change in their anxiety/sense of well-being from their pre- to postclass measure (Table 3). Their median score on the STAIC was

Table 1. Patient Demographic Characteristics

Characteristic	Child Cohort (N = 11)		Adolescent Cohort (N = 5)	
	n	Percentage	n	Percentage
Gender				
Male	7	64	3	60
Female	4	36	2	40
Race or origin				
Caucasian	8	73	4	80
Black	1	9		
Hispanic Latino	1	9		
Asian			1	20
Multiracial	1	9		
Reason for admission				
Chemotherapy	2	18	1	20
New diagnosis/ relapse	2	18	3	60
Side effects	7	64	1	20
Diagnostic group				
ALL	2	18	2	40
Relapsed ALL	2	18		
AML			1	20
Solid tumor	3	27	1	20
CNS tumor	3	27	1	20
Sickle cell disease	1	9		
	Mean	SD	Mean	SD
Age	8.55	1.75	15.40	1.82
Time since diagnosis ^{ab} (months)	8.25	7.02	3.37	5.09
Number of total days inpatient since diagnosis	33.09	18.85	15.60	11.41

Note: AML = acute myeloid leukemia; ALL = acute lymphocytic leukemia; CNS = central nervous system.

a. For subjects who were in treatment for relapsed ALL, time since diagnosis and total days of hospitalization are measured from date of relapse.

b. Time for child with sickle cell disease (n = 1) was omitted from this statistic because of their longer period of time since diagnosis (infancy to 12

31 preclass and 30 postclass ($P = .21$). Adolescents (n = 5) experienced a significant decrease in anxiety with an improved sense of well-being with their median score on the STAI decreasing from 41 to 28 ($P = .04$). Parents (n = 33) also experienced a significant decrease in anxiety and an increased sense of well-being with the median score decreasing from 45 preclass to 30 postclass ($P < .01$; see Table 3).

Responses to Open-Ended Question

In response to the open-ended question, "What would you tell another parent or child about what it is like to take a yoga class?" children, adolescents, and parents all reported positive feelings. The parent reactions were more detailed, provided deeper insight into their experience, and supported the quantitative findings.

Children. After administering the anxiety questionnaire to the child subjects (n = 11), the researcher read them the open-ended question. Responses were brief but all were

positive. Four themes emerged from this group. Yoga was fun (n = 6), relaxing (n = 4), helped them feel calm (n = 4), and helped them feel good (n = 3). One child stated, "Very fun and really relaxing and like it calms you down and stuff."

Adolescents. Adolescents (n = 5) answered the open-ended questions on a separate page attached to the STAI instrument. Adolescent themes mirrored those from the child group with an additional theme of yoga as a self-care strategy. Teens reported that they felt relaxed (n = 4) and calmer (n = 3) and that it was fun (n = 2). Three responded that it was helpful (self-care) in "managing stress more effectively," "it was helpful to me," and it "calmed all my worries and helped strengthen some of my muscles."

Parents. Parent responses (n = 33) were consistent with the patient experiences but provided in-depth insight into the experience. The 7 themes identified affirmed the quantitative results that yoga helped them feel better. The theme of *relaxation* was very strong with 19 parents using the words, "very relaxing," to describe the experience.

Table 2. Parent Demographic Characteristics

Characteristic	Parent Cohort (N = 33)	
	n	Percentage
Gender		
Male	10	30
Female	23	70
Parent race or origin		
Caucasian	23	70
Black	3	9
Hispanic Latino	2	6
Asian	4	12
Mideastern	1	3
Reason for child's admission		
Chemotherapy	9	27
New diagnosis/relapse	6	18
Side effects	18	55
Child's diagnostic group		
ALL	9	27
Relapsed ALL	3	9
AML	6	18
Lymphoma	1	3
Solid tumor	9	27
CNS tumor	3	9
Sickle cell disease	2	6
Child attended yoga class with parent	14	42
	Mean	SD
Parent's age	37.42	7.26
Child's age	7.21	4.30
Time (months) since child's diagnosis ^{a,b}	5.38	5.49
Number of total days child has been inpatient since diagnosis ^a	28.48	19.62

Note: AML = acute myeloid leukemia; ALL = acute lymphocytic leukemia; CNS = central nervous system.

a. For children who were in treatment for relapsed ALL, time since diagnosis and total days of hospitalization are measured from date of relapse.

b. Time for children with sickle cell disease (n = 2) was omitted from this statistic because of their longer period of time since diagnosis (infancy to age 12-14 years).

Table 3. Change in Median Scores on STAI Before and After Yoga Class

Cohort	N	Preclass	Postclass	Z	P
Child (STAIC)	11	31	30	-1.26	.21
Adolescent (STAI)	5	41	28	-2.03	.04*
Parent (STAI)	33	45	30	-5.00	<.001*

Note: STAI = Spielberger State Trait Anxiety Inventory; STAIC = Spielberger State Trait Anxiety Inventory for Children.

*Significant difference.

The benefits of *exercise and movement* were acknowledged by 9 parents. "It was nice to stretch out and work some muscles," wrote one parent. Others noted, "I used muscles I never thought about," "it will increase your stamina," "the body becomes stronger and more balanced," and the experience was "strengthening emotionally and physically."

Stress relief was identified by 7 parents. They said that yoga was "a way to let go, stress reliever," "it is like going on a mini vacation from everything else going on," "all the anxieties you feel in the hospital melt away," and "it was a nice break from a long day in the hospital."

Parents (n = 7) shared that the single yoga session helped them feel *calm and centered*. They shared that "Yoga is a union of your body and your mind," "I felt calm after class, calmer than I can remember ever feeling," "yoga helped me focus on the good and center my energy on the positive," and "now I feel more peaceful."

Self-care was a theme identified by the researchers in comments from 5 parents. Parents wrote, "I felt I had more to offer after this class," "one hour to concentrate on your well-being will benefit your child in so many ways," "it is ok to take time for yourself to feel, relax, learn, enjoy, move," "it helps you take some much-needed deep breaths," and "you have a sense of confidence also."

Parents who participated in the yoga class with their child (n = 14) recognized that the yoga experience provided an opportunity for *bonding with their child*. Three parents shared that the class was "an excellent time spent with my child" and that "it was a great way to further bond with my child."

Six parents advised other parents to try yoga because it is *easy and better than expected*. They stated that yoga "is not difficult, can do at your own pace," and others should "take the change and try it," "class is a lot of fun," and "it is not as scary as it sounds."

Discussion

The study demonstrated that participation in a yoga class was feasible for children and adolescents with cancer or blood disorders and their parents. All the participants responded to an open-ended question with positive comments about the class. Parents and adolescents experienced significant decreases in anxiety, whereas anxiety levels in children remained stable.

Although the STAIC scores in children did not decrease, their baseline scores were within norms for healthy children. Fifty-five percent of children invited to participate in the study provided assent with parental consent. It may be that only those children who felt well or children with lower levels of anxiety chose to participate

and that children with higher anxiety and/or symptom distress chose not to participate. Additionally, fatigue and/or fear of an unknown hospital experience may have interfered with motivation to try something new. Thus, the child sample may not be representative of a typical, inpatient hematology/oncology patient in this age-group.

The median baseline STAI anxiety score in the adolescent cohort was 41. This score is similar to the mean scores for healthy high school adolescents (39.45 for males and 40.54 for females; Spielberger et al., 1983). Even though the sample was quite small ($n = 5$), there was a significant change ($P = .04$) in anxiety levels demonstrating that yoga was helpful to the subjects in this age-group. Although adolescents may have more life experience and knowledge about what yoga is, the assent/consent rate among adolescents was still low (42%), which was similar to the child cohort. Symptom distress and fatigue in the inpatient adolescent may have prevented participation or perhaps they said “no” because they had the choice to do so.

Parents were eager participants with a 73% consent rate. Eighteen percent of the 33 parents were on the inpatient unit because their child was newly diagnosed or had experienced a relapse, a time of crisis that did not prevent them from participating in the yoga class. Fathers were eager participants and comprised 30% of the parent cohort. Only 2 of the 22 parents had children with sickle cell disease, and so results for this population of parents are inconclusive. At baseline, the median parent anxiety score on the STAI was 45. This score is higher than the mean scores for working adults (36.54 for males and 36.17 for females; Spielberger et al., 1983) but lower than the mean STAI score (51.73) in Santacrose's (2002) study of 16 parents whose children had been diagnosed with cancer during the previous 4- to 8-week period. Parents experienced a significant decrease in anxiety scores ($P < .001$), and their responses to the open-ended question provided rich detail about the emotional distress experienced by parents of children with cancer, as well as the psychological and physical relief that yoga provided.

Parents and adolescents showed a decrease in anxiety and increase in sense of well-being in response to the yoga session. It is not known how long the benefits from a single yoga class were sustained in these groups. It was more difficult to recruit the adolescents and children for the study. Although patients could participate in the study with their parent and parents with their child, when a parent was not present to provide consent for a child's participation patient enrollment was challenging. For future studies, photos or a short DVD demonstrating yoga in children with cancer might be helpful in recruiting patients who have limited experience with yoga.

Conclusion

This preliminary study used a single yoga session and a short anxiety measurement, which was used as a proxy for sense of well-being. It provided insight into the feasibility and benefits of an inpatient yoga class for patients and parents. Parents readily participated in the study, although recruitment strategies for patients need to be explored. Larger studies are needed to evaluate the influence of yoga on other distressing patient symptoms such as fatigue, sleep disturbance, pain, and nausea. Additionally, in the pediatric oncology population, it is challenging to design a single-site study with a multisession intervention when the patient population has diverse oncology and hematology diagnoses, treatment protocols and schedules, and a range of developmental age-groups. Future multi-site research studies are needed to evaluate the influence of multiple yoga sessions delivered over the trajectory of treatment in specific populations of pediatric oncology and hematology patients.

Acknowledgments

We are grateful to the patients and parents who participated in the study and tried a new intervention at a stressful time in their lives. We are appreciative of the inpatient oncology nurses at Children's Hospitals and Clinics of Minnesota who supported patients and parents in attending the yoga sessions by arranging cares around the class schedule and responding to patients' needs during the class. Thank you to the Children's Cancer Kids Fund for their support of the yoga program.

Declaration of Conflicting Interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this.

Funding

The authors received no financial support for the research and/or authorship of this article.

References

- Anders, M. (2005). Does yoga really do the body good? *ACE Fitness Matters*, September/October, 7-9.
- Birkel, D. A., & Edgren, L. (2000). Hatha yoga: Improved vital capacity of college students. *Therapies in Health and Medicine*, 6, 55-63.
- Cohen, L., Warneke, C., Fouladi, R., Rodriguez, M., & Chaoul-Reich, A. (2004). Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer*, 100, 2253-2260.
- Collins, J. J., Byrnes, M. E., Dunkel, I. J., Lapin, J., Nadel, T., Thaler, H. T., et al. (2000). The measurement of symptoms

- in children with cancer. *Journal of Pain and Symptom Management*, 19, 363-373.
- Collins, J. J., Devine, T. D., Dick, G. S., Johnson, E. Z., Kilham, H. A., Pinkerton, C. R., et al. (2002). The measurement of symptoms in young children with cancer: The validation of the Memorial Symptom Assessment Scale in children aged 7-12. *Journal of Pain and Symptom Management*, 23, 10-16.
- Culos-Reed, S., Carlson, L., Daroux, L., & Hatley-Aldous, S. (2004). Discovering the physical and psychological benefits of yoga for cancer survivors. *International Journal of Yoga Therapy*, 14, 45-52.
- Distasio, S. A. (2008). Integrating yoga into cancer care. *Clinical Journal of Oncology Nursing*, 12, 125-130.
- Evans, S., Sternlieb, B., Tsao, J., & Zeltzer, L. (2009). Using the bio-psychosocial model to understand the health benefits of yoga. *Journal of Complementary and Integrative Medicine*, 6, 1-22.
- Galantino, M., Galbavy, R., & Quinn, L. (2008). Therapeutic effects of yoga for children: A systematic review of the literature. *Pediatric Physical Therapy*, 20, 66-80.
- Harinath, K., Malhotra, A. S., Pal, K., Prasad, R., Kumar, R., Kain, T. C., et al. (2004). Effects of Hatha yoga and Omkar meditation on cardiorespiratory performance, psychologic profile, and melatonin secretion. *Journal of Alternative and Complementary Medicine*, 10, 261-268.
- Hedström, M., Haglund, K., Skolin, I., & Von Essen, L. (2003). Distressing events for children and adolescents with cancer: Child, parent, and nurse perceptions. *Journal of Pediatric Oncology Nursing*, 20, 120-132.
- Hockenberry, M. (2004). Symptom management research in children with cancer. *Journal of Pediatric Oncology Nursing*, 21, 132-136.
- Hockenberry-Eaton, M., & Hinds, P. S. (2000). Fatigue in children and adolescents with cancer: Evolution of a program of study. *Seminars in Oncology Nursing*, 16, 261-271.
- Lemanek, K. L., Ranalli, M., & Lukens, C. (2009). A randomized controlled trial of massage therapy in children with sickle cell disease. *Journal of Pediatric Psychology*, 34, 1091-1096.
- Makwana, K., Khirwadkar, N., & Gupta, H. C. (1988). Effect of short term yoga practice on ventilatory function tests. *Indian Journal of Physiology and Pharmacology*, 32, 202-208.
- McCall, T. (2007). *Yoga as medicine, the yogic prescription for health and healing*. New York: Bantam Dell.
- O'Cathain, A., & Thomas, K. J. (2004, November 8). "Any other comments?" Open question on questionnaire: A bane or a bonus to research? *BioMed Central Medical Research*, 4.
- Raub, J. (2002). Psycho-physiological effects of Hatha yoga on musculoskeletal and cardiopulmonary function: A literature review. *Journal of Alternative and Complementary Medicine*, 8, 797-812.
- Ray, U. S., Sinha, B., Tomer, O. S., Pathak, A., Dasgupta, T., & Selvamurthy, W. (2001). Aerobic capacity & perceived exertion after practice of Hatha yogic exercises. *Indian Journal of Medical Research*, 114, 215-221.
- Santacroce, S. (2002) Uncertainty, anxiety, and symptoms of posttraumatic stress in parents of children recently diagnosed with cancer. *Journal of Pediatric Oncology Nursing*, 19, 104-111.
- Smith, C., Hancock, H., Blake-Mortimer, J., & Eckert, K. (2007). A randomized comparative trial of yoga and relaxation to reduce stress and anxiety. *Complimentary Therapies in Alternative Medicine*, 15, 77-83.
- Spielberger, C. D., Gorsch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1973). *State-Trait Anxiety Inventory for Children manual*. Menlo Park, CA: Mindgarden.
- Spielberger, C. D., Gorsch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1983). *State-Trait Anxiety Inventory for Adults*. Menlo Park, CA: Mindgarden.
- Telles, S., Joshi, M., Dash, M., Raghuraj, P., Naveen, K. V., & Nagendra, H. R. (2004). An evaluation of the ability to voluntarily reduce the heart rate after a month of yoga practice. *Integrative Physiological and Behavioral Science*, 39, 119-25.
- Wilkins, K., & Woodgate, R. (2008). Designing a mixed methods study in pediatric oncology nursing research. *Journal of Pediatric Oncology Nursing*, 25, 24-33.
- Woolery, A., Myers, H., Sternlieb, B., & Zeltzer, L. (2004). A yoga intervention for young adult with elevated symptoms of depression. *Alternative Therapy in Health and Medicine*, 10, 60-63.
- Woodgate, R. L., & Degner, L. F. (2003). Expectations and beliefs about children's cancer symptoms: Perspectives of children with cancer and their families. *Oncology Nursing Forum*, 30, 479-491.
- Wright, M. J., Galea, V., & Barr, R. D. (2005). Proficiency of balance in children and youth who have had acute lymphoblastic leukemia. *Physical Therapy*, 85, 782-790.

Bios

Megan V. Thygeson, BA, is a scientific and technical writer in the research department at Children's Hospitals and Clinics of Minnesota. She is a registered yoga teacher with an interest in the use of yoga as a therapeutic tool in the hospital environment.

Mary C. Hooke, PhD, RN, CNS, CPON, is an advanced practice nurse in hematology/oncology at Children's Hospitals and Clinics of Minnesota. Her research focus is on symptom distress in children with cancer.

Jeanine Clapsaddle, MA, LAMFT, CCLS, a child life specialist in the hematology/oncology program at Children's Hospitals

and Clinics of Minnesota, facilitates opportunities for patients and families to develop coping skills and adjustment to the complexities of the diagnosis.

Angela Robbins, MS, RN, CNP, is a pediatric nurse practitioner in hematology/oncology at Children's Hospitals and Clinics of Minnesota. Her special interests include adolescent health as

well as caring for patients and families from diverse cultural backgrounds.

Kristin Moquist, MA, RN, CNP, CPON, is a pediatric nurse practitioner in hematology/oncology at Children's Hospitals and Clinics of Minnesota. Her special interests include care of child and adolescents with sickle cell disease and bleeding disorders.



Continuing Education Credit

The *Journal of Pediatric Oncology Nursing* is pleased to offer the opportunity to earn pediatric hematology/oncology nursing continuing education credit for this article online. Go to www.aphon.org and select "Continuing Education." There you can read the article again or go directly to the posttest assessment. The cost is \$15 for each article. You will be asked for a credit card or online payment service number.

The posttest consists of 11 questions based on the article, plus several assessment questions (e.g. how long did it take you to read the article and complete the posttest?). A passing score is 8 out of 11 questions correct on the posttest and completion of the assessment questions yields one hour of continuing education in pediatric hematology/oncology nursing for each article.

The Association of Pediatric Hematology/Oncology Nurses is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.