Feasibility of Yoga Intervention among Cancer Survivors: Pilot results indicate contemplative yoga improves emotional and spiritual well-being

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Abstract

To assess the feasibility of offering standardized yoga protocols as a complementary approach to improve post-treatment side-effects in cancer patients, and obtain pilot results of association between their practice and cancer-related quality of life.

Seventeen survivors (88% women, age=55 years, 34% breast cancer, 66% others, months post-treatment=39) participated in eight weekly, 90-minute sessions using the Healing Yoga for Cancer Survivorship (HYCS) protocol comprised of active (reclining, seated, kneeling, standing, restorative postures) and contemplative practices (intention setting, chanting, mudra, pranayama, body scan, guided relaxation). Participants reported daily on which HYCS protocols were practiced and quality of life domains (physical, functional, emotional, spiritual) using online tool based on validated FACT-G and FACT-Sp questionnaires. Association between yoga practice and QoL analyzed using the generalized estimated equation model (GEE).

Participants used intention setting (29 days), breathing (25 days), reclining asana (24 days), and mudra (21 days) most frequently (attendance=67.6%, daily reporting rate=72.4%) Participation in active HYCS showed a 60% increase in emotional well-being [RR=1.60, 95% CI (1.06-2.40), p=0.02], specifically reclining asana [RR=6.24, 95% CI (1.44-27.10), p=0.01], standing asana [RR=6.06, 95% CI (1.08-33.85), p=0.04], and restorative asana [RR=5.07, 95% CI (1.15-22.42), p=0.03]. Participation in contemplative HYCS showed an 87% increase in spiritual well-being [RR=1.87, 95% CI

(1.12-3.11), p=0.02], specifically body scan [RR=4.78, 95% CI (1.31-17.43), p=0.02], and final relaxation [RR=3.62, 95% CI (1.10-11.87), p=0.03].

This study demonstrates the feasibility of offering a comprehensive therapeutic yoga protocol for cancer survivors including contemplative practices that may help improve participant's emotional and spiritual quality of life.

Introduction

The word *yoga* is from the Sanskrit root *yuj,* which means to join or yoke together in union, philosophically referring to the union of the individual self with the universal self that can occur through the practice of yoga. There are a variety of forms of yoga, each with their own practices and ideals. Hatha yoga is the root of many other physical forms of the practice such as Iyengar, Restorative, and Anusara. The word hatha is a combination of *ha*, or sun, and *tha*, or moon; when joined these words are translated as 'forceful'. It is believed that through the physical yoga practice, the practitioner balances these two complementary energies that imbue all life, and through this balance, the body is made strong and steady.

It is commonly believed that the Yoga Sutra, one of earliest texts describing the practices of Hatha yoga, was authored by Patanjali and compiled around 400 C.E. In this treatise of aphorisms, Patanjali outlines the method and benefits of practicing the eight-limbed path of Hatha yoga. These eight limbs are *yama,* moral observances of how to best interact with others; *niyama,* self-restraints to reduce inner suffering; *asana*, the physical postures; *pranayama*, control of the breath; *pratyahara*, drawing awareness inward; *dharana*, or one-pointed concentration; *dhyana*, or absorption with the object of meditation; and *samadhi,* or awareness of oneness[1]. As a whole, this system of physical and contemplative practices enhances body awareness, encourages the distribution of vital energy, and promotes wellness[2].

According to the Taittiriya Upanishad, there are five sheaths or layers that make up the *Atman*, or Self. From the gross to the subtle, the five sheaths are *anamaya kosha*, the food sheath or physical body; *pranamaya kosha*, the energy sheath or pranic body; *manomaya kosha*, the mental/emotional sheath or our everyday thoughts and

reactions; *vjnanamaya kosha*, the wisdom sheath or witness consciousness; and *anandamaya kosha*, the bliss sheath or soul. The different practices of the eight–limbed path of Hatha yoga enable the practitioner to positively affect the koshas. For example, the practice of asana strengthens anamaya kosha; the practice of pranayama strengthens pranamaya kosha; and practicing pratyahara, dharana, and dhyana create calm within manomaya kosha, providing greater access to vijnanamaya and annandamaya koshas. Therefore, depending on which limbs of yoga are practiced, changes may be made within different domains of well-being.

According to a survey published by Yoga Alliance in 2016, more than 36 million Americans have practiced yoga in the past six months, and over 70% of those who practice regularly are women. It is also reported that 10% of practitioners began practicing because of a medical condition, but only 6% say they received recommendations from a traditional doctor/nurse/physical therapist. Practitioners' motivation to continue practicing yoga reportedly varies from flexibility (59%), to stress reduction (53%), to general fitness (47%), to improving overall health (48%), to mental health (35%), to spiritual development (23%), among others. The vast majority, 67% of practitioners report that they do yoga in their homes[3]. Additionally, it was reported in study of over 34,500 American adults surveyed in 2012 that 13% were lifetime yoga practitioners. Of those, 90% used breathing exercises and 55% used meditation[4].

In 2016, an estimated 1.65 million new cancer cases are expected to be diagnosed, with cancers of the digestive system, breast, prostate, and lung comprising the most common types. As of January 1, 2014, there were an estimated 14.5 million cancer survivors in the United States, with a 5-year relative survival rate of 69% for all

cancers diagnosed during 2005-2011. This was an improvement from the 1975 survival rate of less than 50%[5,6].

Despite greater survival, cancer and its allopathic treatments are often associated with a reduction in quality of life (QoL) across physical, functional, emotional, and spiritual domains that may include pain, insomnia, fatigue, digestive disturbance, inability to work, anxiety, and hopelessness[7,8]. These side-effects range from acute, which occur during treatment and last for a short period of time, to chronic, which occur during treatment and may last months or years, to late, which occur months or years after treatment has ended. Meta-analysis shows that exercise interventions may have variable beneficial effects on function within physical, role, and social domains, including cancer-related fatigue, cognitive impairment, sleep problems, depression, pain, anxiety, and physical dysfunction among cancer survivors[9,10].

When comparing yoga to other forms of exercise (e.g., walking, running, dancing, bicycling), yoga proves to be as effective as, or better than other exercise in improving many health-related outcomes including fatigue, mood, pain, sleep disturbance, and stress[11]. Research also suggests that yoga is a well-tolerated form of exercise for cancer survivors, and beneficial for managing fatigue, insomnia, stress, mood disturbances, and distress[12-21]. Approximately 21% of cancer survivors in the United States engaged in complementary and alternative (CAM) practices to help manage the effects of their illness. The third most common CAM practice used among cancer survivors was yoga[22].

There are many different types of yoga (e.g., Hatha, Iyengar, Ashtanga, Vinyasa, Yin), and all types of yoga may not be appropriate for all cancer survivors[23]. The survivor's previous exposure to yoga, their overall health, previous injuries, and other

factors may preclude them from practicing a more vigorous style of yoga (e.g., Ashtanga, Bikram, Power Vinyasa), as these styles may be too challenging to be considered therapeutic for post-treatment care. Research suggests that Hatha yoga and restorative yoga are quickly gaining acceptance in Western medicine for therapeutic use[24]. Research also suggests that meditative movement therapies, such as the more contemplative forms of yoga and mindfulness, may be helpful for improving health-related QoL in certain conditions, including cancer[10,12-23,25-28]. Therefore, it is important that yoga protocols be tested for their safety and effectiveness in managing survivors' QoL.

However, what the previous research lacks is data collected on how individual yoga practices impact survivor's QoL. Merely using the word 'yoga' to describe an intervention fails to provide enough detail as the practices included in 'yoga' can vary widely between active and restorative asanas or various calming and energizing breathing techniques, even within the same tradition. When a yoga intervention includes many different practices, how can we determine whether an increase in well-being was due to the active asana practice or a guided final relaxation? This point was key when developing the Healing Yoga for Cancer Survivorship (HYCS) protocol, and this study addresses the following questions: (1) Can a standardized protocol that includes a wide array of physical and contemplative yoga techniques significantly affect QoL and reduce reported residual side-effects in the post-treatment results of a variety of types of cancer patients? (2) Does more consistent practice of a standardized protocol correlate with stronger improvements in measured outcomes and greater reduction of residual treatment side-effects? (3) Which yoga practices (physical or contemplative) have the greatest effect on QoL across physical, functional, emotional, and spiritual domains?

Objectives

There were two main objectives of the study: (1) To assess the feasibility of offering the standardized HYCS protocol as a CAM practice to improve post-treatment side effects and overall QoL of cancer survivors. The HYCS protocol contains physical practices (reclining, seated, kneeling, standing, and restorative asana) and contemplative practices (intention setting, chanting, mudra, pranayama, body scan, and final relaxation). (2) To obtain pilot data on the relationship between the yoga practice and four QoL domains (physical, functional, emotional, and spiritual) based on which parts of the yoga protocol were practiced at home by study participants. Much of the previous research does not address whether the benefits to QOL are a result of physical yoga practice (i.e., asana), or the more contemplative and meditative aspects of the yoga practice, especially taking into consideration the positive effect these contemplative practices have on emotional and spiritual well-being[2,12].

Materials and Methods

Population: Participants were recruited from members of the Cancer Support Community of the San Francisco Bay Area in Walnut Creek, CA, via flier distribution and e-mail contact, as well as via social media and e-mail distribution channels to other local cancer support group and yoga interest lists. The selection criteria included adult men and women with cancer, at least six months post active treatment, who score greater than 40/90 on a baseline symptom severity questionnaire.

Intervention Method: The yoga intervention consisted of a once-per-week, 90-minute, in-person yoga session over eight consecutive weeks (50 days from September 5, 2014 to October 24, 2014) plus voluntary home practice using the provided HYCS protocol DVD and a booklet. The protocol included short sections on setting an

intention, chanting, mudra, reclining asana, seated asana, kneeling asana, standing asana, breathing practices, restorative asana, body scan, and final relaxation. Practices included in the HYCS protocol had an intended therapeutic effect of bringing awareness to and strengthening the body, assisting with lymphatic drainage, easing muscle tension, improving balance, increasing immunity, reducing constipation, reducing edema, facilitating deep breathing, reducing anxiety, balancing the sympathetic and para-sympathetic nervous systems, and inducing relaxation.

Specifically, the protocol was made up of both physical postures and contemplative practices. The physical postures included reclining poses incorporating gentle pelvic mobilization as well as lymphatic drainage; seated poses incorporating spinal mobilization and lymphatic drainage; kneeling poses for deeper flexion and extension of the spine and hip, and lymphatic drainage; standing poses for balance, strength and stamina; and restorative poses including passive supported inversions to initiate the relaxation response (Figure 1). Alternate positions were offered to those who had difficulty putting pressure on the knees in the kneeling asana section (Figure 2). The contemplative practices included stating an intention, or *sankalpa*, such as “I am calm,” to plant a transformative thought deep in the mind; chanting vowel sounds to increase awareness of the body and breath; mudras, which direct vital energy into the body and mind to elicit a specific response; pranayama to elicit relaxation and distribute vital energy throughout the body; body scanning, or a systematic relaxation of the body and the mind; and final relaxation, either silent or guided, for integration (Figure 3).

[Figure 1, 2 & 3 about here]

Classes were held at the Cancer Support Community of the San Francisco Bay Area in Walnut Creek, CA, and were taught by a certified integrative yoga therapist, who

also designed the standardized HYCS protocol. Two certified yoga teacher assistants provided hands-on adjustments and prop modifications as needed during the classes. A DVD and booklet with pictures and descriptions for each step of the protocol were provided to participants during the first class for voluntary home use. Participants were encouraged to do at least a portion of the protocol daily on their own.

Data Collection Method: Participants were asked to report daily on which HYCS protocols were practiced, any medication changes, and 31 QoL factors (physical, functional, emotional, and spiritual well-being) using an online assessment form. Questions were extracted from the validated Functional Assessment of Cancer Therapy-General (FACT-G). Physical well-being is comprised of questions GP1 and GP3 to GP6; functional well-being is comprised of questions GF1 and GF3 to GF7; emotional well-being is comprised of questions GE1 and GE3 to GE6. [29] Spiritual well-being was extracted from the validated Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being questionnaire (FACIT-Sp), specifically the questions on 'peace' (Sp1, Sp6 and Sp7).[30] Responses were reversed when necessary, according to the instruction on how to calculate these validated instruments. The final scores were prorated to the number of questions used in each QoL section.

Data Analysis: Data were analyzed using SAS statistical software version 9.3 (SAS Institute, Cary, NC). To estimate the association between practicing HYCS protocols and QoL (physical, functional, emotional and spiritual well-being), we used the Generalized Estimating Equation (GEE) method, which takes into account correlations among intra-individual outcomes in repeated measures, in this case, repeat assessments of QoL over the eight weeks of follow up. The model was adjusted for

time, so that it accounted for the chronological timing of the practice and data assessment.

Results

Recruitment: Out of 27 participants interviewed, 19 were enrolled in the yoga treatment group (8 were ineligible due to low symptom severity scores), one person dropped-out before the first class with no reason given, and one person dropped out after the second class citing transportation difficulties (Figure 4). Of those 17 (88% women, 12% men), the median age was 55 years, with an initial diagnosis of 34% breast, 12% each for lymphoma, melanoma and ovarian, 6% each for brain, endometrial, kidney, leukemia, neuroendocrine, and rectal cancers. Staging ranged from 6% for Stage I, to 23.5% each for Stages II, III, IV, and unknown. Participants received various treatments, including 82% surgery, 71% chemotherapy, 35% hormone therapy, 29% radiation, 12% stem cell transplant, and 6% no treatment). The mean time since treatment was 39 months. There was a very high incidence of previous yoga experience (94%), however, only 53% of participants were currently practicing yoga in public classes or at home (Table 1).

[Figure 4 and Table 1 about here]

Attendance: Attendance in the eight, in-person sessions was 67.6% (range 8-14 participants), and daily reporting was 72.4% (range 7-17). There were no major changes to cancer-related medication usage during the study, and no adverse events were reported. Frequency of voluntary practice varied, as did the practices participants chose to use at home. The mean number of days (out of 50) the HYCS protocols were used during the eight-week study: intention setting=29, breathing=25, reclining

poses=24, mudra=21, seated poses=18, final relaxation=16, restorative poses=16, standing poses=15, kneeling poses=12, chanting=12, and body scan=12.

Adherence to Yoga Intervention: Participants used the contemplative practices on average 38% of days, and the physical practices 34% of days. The reasons for this preference towards the contemplative practices may derive from high levels of cancer-related fatigue, and a greater level of confidence in practicing something easier at home. With relation to the practices used less often, participants mentioned that they found chanting "a bit uncomfortable," they "found it difficult," or that they "can't hold a note." When asked about the kneeling asana, several participants stated similar issues; the kneeling was "hard to do at times because of my knees." Alternate positions were given for these participants (Figure 2). When asked about the body scan, one participant stated, "I am impatient with this at home but enjoy it in class."

[Figure 2 about here]

Association between Yoga and QoL: Tables 2 and 3 demonstrate the association between active (Table 2) and contemplative (Table 3) HYCS protocol and different domains of QoL. Participation in the active HYCS protocol showed a 60% increase in emotional well-being [Risk Ratio (RR)=1.60, 95% Confidence Interval (CI) (1.06-2.40), p=0.02], while participation in the contemplative HYCS protocol showed a 87% increase in spiritual well-being [RR=1.87, 95% CI (1.12-3.11), p=0.02].

Within the active HYCS protocol, participants who practiced reclining asana experienced a 6-fold increase in emotional well-being [RR=6.24, 95% CI (1.44-27.10), p=0.01]. Participants who engaged in seated asana showed over a 6-fold increase in spiritual well-being [RR=6.36, 95% CI (1.27-31.87), p=0.02]. Participants who practiced standing asana showed a 6-fold increase in emotional well-being [RR=6.06, 95% CI

(1.08-33.85), p=0.04]. Participants who practiced restorative asana showed a 5-fold increase in emotional well-being [RR=5.07, 95% CI (1.15-22.42), p=0.03] and over a 10-fold increase in spiritual well-being [RR=14.42, 95% CI (2.63-79.25), p=0.002]. (Table 2)

Within the contemplative HYCS protocol, participants who used body scan experienced an approximately 5-fold increase in spiritual well-being [RR=4.78, 95% CI (1.31-17.43), p=0.02], and those who used final relaxation experienced a 3.5-fold increase in spiritual well-being [RR=3.62, 95% CI (1.10-11.87), p=0.03]. (Table 3)

[Table 2 and Table 3 about here]

Qualitative Results: Follow-up questionnaires were sent out seven days after the last session with a response rate of 42%. When asked how the specific practices affected them, participants had this to say: On setting an intention, “[It is] very helpful, as I have found it to become a center that helps me stay grounded/calm in times of doubt or ‘what if’ thinking”; on mudras, “[Mudras] are calming and energizing, and most useful in a number of situations. They're fairly easy to use, and I feel their effects.” On breathing exercises, “[They are] helpful, especially alternative [nostril breath,] as it is calming in times of anxiety.” On final relaxation, one participant stated that it “helped me get a good night’s sleep. I usually can get to sleep easily but wake up frequently with anxiety. [It] helped avoid the anxiety.”

Conclusion

We believe that the standardized HYCS protocol is confirmed as a safe and effective CAM practice to improve post-treatment side effects and overall QoL of cancer survivors. The protocol was tolerated extremely well by the group and was easy to administer by the teachers. It could be practiced by adults with a wide variety of cancer types, treatment histories, and general levels of mobility. There were a few participants

who required alternate positions to the kneeling postures (Figure 4). The combination of physical practices and contemplative practices met a variety of participants' needs for home practice.

We found that the change in QoL was dependent on which practices were used, and how often participants practiced at home. The greatest increase was found among emotional (60% increase) and spiritual well-being (87% increase), with participants using contemplative practices (38% of days) more often than active practices (34% of days) at home. Within the active practices, participants gained the greatest increase in emotional and spiritual well-being from the gentler asana practices in the protocol including reclining asana (6-fold increase in emotional well-being, used 48% of days), seated asana (6-fold increase in spiritual well-being, used 36% of days), and restorative asana (5-fold increase in emotional well-being and over 10-fold increase in spiritual well-being, used 32% of days). Standing asana practice also showed a 6-fold increase in emotional well-being but it was practiced infrequently (30% of days). Within the contemplative practices, participants gained the greatest increase in spiritual well-being from setting an intention (approximately 5-fold increase in spiritual well-being, used 58% of days) and final relaxation (3.5 fold increase in spiritual well-being, used 32% of days).

These results follow the general understanding of how the various yoga practices affect the koshas. The active practices would more directly affect the physical and energetic bodies (anamaya and pranamaya koshas), which relate to functional and physical domains. The contemplative practices would more directly affect the mental/emotional and wisdom bodies (manomaya and vijnanamaya koshas), which relate to the emotional and spiritual domains.

There are obvious limitations in the analysis due to selection bias, the lack of a control group, and small sample size. A longer study (a minimum of 12 weeks) may more accurately represent yoga's benefits over time. Future larger scale studies would need to use an active control group in order to adjust for the level of mild exercise, social factors, attention received by study personnel, etc. to isolate the effect of the yoga intervention.

Our findings support the need for continued investigation into how increased practice of contemplative yoga may further increase emotional and spiritual well-being in cancer survivors. Yoga Nidra, which is a technique including intention setting, pranayama, and relaxation, is one such contemplative practice that might effectively be used in such an investigation.

References

1) Stiles, M. (2002). *Yoga Sutras of Patanjali.* San Francisco, CA: Reed Wheel/Weisser, LLC.

2) Iyengar, B. K. S. (1966). *Light on Yoga.* New York: Schocken Books.

3) Yoga in America Study. (2016). Retrieved from https://www.yogaalliance.org/2016YogaInAmericaStudy

4) Cramer, H., Ward, L., Steel, A., Lauche, R., Dobos, G., & Zhang, Y. (2016). Prevalence, Patterns, and Predictors of Yoga Use: Results of a U.S. Nationally Representative Survey. *American Journal of Preventative Medicine*, *50*(2), 230-235. doi:10.1016/j.amepre.2015.07.037

5) Cancer Treatment & Survivorship Facts & Figures. (2015). Retrieved from http://www.cancer.org/Research/CancerFactsStatistics/cancerfactsfigures2015/cancer-facts-and-figures-2015

6) Cancer Facts & Figures. (2016). Retrieved from http://www.cancer.org/Research/CancerFactsStatistics/cancerfactsfigures2016/cancerfactsandfigures2016

7) Montazeri, A., Vahdaninia, M., Harirchi, I., Ebrahimi, M., Khaleghi, F., & Jarvandi, S. (2008, Nov 11). Quality of life in patients with breast cancer before and after diagnosis an eighteen months follow-up study. *BMC Cancer*, *8,* 330. doi:10.1186/1471-2407-8-330

8) Zabora, J., Brintzenhofeszoc, K., Curbow, B., Hooker, C., & Piantadosi, S. (2001, Jan-Feb). The prevalence of psychological distress by cancer site. *Psychoncol, 10*(1), 19-28.

9) Mishra, S. I., Scherer, R. W., Snyder, C., Geigle, P., & Gotay, C. (2014, Nov 1). Are exercise programs effective for improving health-related quality of life among cancer survivors? A systematic review and meta-analysis. *Oncol Nurs Forum, 41*(6), E326-E342. doi:10.1188/14.ONF.E326-E342

10) Mustain, K. M., Sprod, L. K., Janelsins, M., Peppone, L. J., & Mohile, S. (2013, May 8). Exercise Recommendations for Cancer-Related Fatigue, Cognitive Impairment, Sleep problems, Depression, Pain, Anxiety, and Physical Dysfunction: A Review. *Oncol Hematol Rev*, *8*(2), 81-88.

11) Ross, A., & Thomas, S. (2010). The Health Benefits of Yoga and Exercise: A Review of Comparison Studies. *The Journal of Alternative and Complementary Medicine*, *16*(1), 3-12. doi:10.1089/acm.2009.0044

12) Buffart, L. M., van Uffelen, J. G., Riphagen, I. I., Brug, J., van Mechelen, W., Brown, W. J., & Chinapay, M. M. (2012, Nov 27). Physical and psychosocial benefits of yoga in cancer patients and survivors, a systematic review and meta-analysis of randomized controlled trials. *BMC Cancer, 12*, 559, 2-15. doi:10.1186/1471-2407-12-559

13) Cramer, H., Lange, S., Klose, P., Paul, A., & Dobos, G. (2012, Nov 27). Yoga for breast cancer patients and survivors: a systematic review and meta-analysis. *BMC Cancer, 12,* 412. doi:10.1186/1471-2407-12-412

14) Kelly, G. A., & Kelly, K. S. (2015, Jun 8). Meditative Movement Therapies and Health Related Quality-of-Life in Adults: A Systematic Review of Meta Analyses. *PLoS ONE, 10*(6). doi:10.1371/journal.pone.0129181

15) Kiecolt-Glaser, J., Bennett, J., Andridge, R., Peng, J., & Shapiro, C. (2014, April 1). Yoga's Impact on Inflammation, Mood, and Fatigue in Breast Cancer Survivors: A Randomized Controlled Trial. *Journal of Clinical Oncology, 32*(10), 1040-1052.

16) Mustain, K. (2013, November 1). Yoga as Treatment for Insomnia Among Cancer Patients and Survivors: A Systematic Review. *Eur Med J Oncol*, *1*, 106-115.

17) Mustain, K. M., Sprod, L. K., Palesh, O. G., Peppone, L. J., Janelsins, M. C., & Mohile, S. G. (2009). Exercise for the Management of Side Effects and Quality of Life among Cancer Survivors. *Curr Sports Med Rep*, *8*(6), 325-330. doi:10.1249/JSR.0b013e3181c22324

18) Pan, Y., Yang, K., Wang, Y., Zhang, L., & Liang, H. (2015, Jan 6). Could yoga practice improve treatment-related side effects and quality of life for women with breast cancer? A systematic review and meta-analysis. *Asia Pac l J Clin Onco*. doi:10.1111/ajco.12329

19) DiStasio, S. A. (2008, Feb 12). Integrating yoga into cancer care. *Clin J Oncol Nurs, 12*(1), 125-30. doi:10.1188/08.CJON.125.130

20) Smith, K. B., & Pukall, C. F. (2009, May). An evidence based review of yoga as a complementary intervention for patients with cancer. *Psychooncol, 18*(5), 465-475. doi:10.1002/pon.1411

21) Taso, C. J., Lin, H. S., Lin, W. L., Chen, S. M., Huang, W. T., & Chen, S. W. (2014, Sept 1). The effect of yoga exercise on improving depression, anxiety, and fatigue in women with breast cancer: a randomized controlled trial. *J Nurs Res, 22*(3), 155-64. doi:10.1097/jnr.0000000000000044

22) Lin, K. Y., Hu, Y. T., Chang, K. J., Lin, H. F., & Tsauo, J. Y. (2011, Mar). Effects of Yoga on Psychological Health, Quality of Life and Physical Health of Patients with Cancer: A Meta Analysis. *Evid Based Complement Alternat Med, 2011*. doi:10.1155/2011/659876

23) DeStasio, S. (2007, May). Integrating Yoga Into Cancer Care. *Clinical Journal of Oncology Nursing*, *12*(1), 125-130.

24) Lasater, J. (1995). *Relax and Renew Restful Yoga for Stressful Times.* Berkeley, CA: Publishers Group West.

25) Bower, J. E., Woolery, A., Sternlieb, B., & Garet, D. (2005). Yoga for Cancer Patients and Survivors. *Cancer Control*, *12*(3),165-171.

26) Carlson, L., Beattie, T., Giese-Davis, J., Faris, P., Ramagawa, R., Fick, L., . . . Speca, M. (2015, February 1). Mindfulness-Based Cancer Recovery and Supportive-Expressive Therapy Maintain Telomere Length Relative to Controls in Distressed Breast Cancer Survivors. *Cancer*, 476-484. doi:10.1002/cncr.29063

27) Culos-Reed, S. N., Mackenzie, M. J., Sohl, S. J., Jesse, M. T., Zahavich, A. N., & Danhauer, S. C. (2012, April 5). Yoga & Cancer Interventions: A Review of the Clinical Significance of Patient Reported Outcomes for Cancer Survivors.

Evidence-Based Complementary and Alternative Medicine, 2012. doi:10.1155/2012/642576

28) McCall, M., McDonald, M., Thorne, S., Ward, A., & Heneghan, C. (2015, May 26). Yoga for Health-Related Quality of Life in Adult Cancer: A Randomized Controlled Feasibility Study. *Evidence-Based Complementary and Alternative Medicine, 2015*. doi:10.1155/2015/816820

29) FACT-G (2010). Retrieved from http://www.facit.org/LiteratureRetrieve.aspx?ID=42149

30) FACIT-Sp (2010). Retrieved from http://www.facit.org/LiteratureRetrieve.aspx?ID=42314

Figures

Figure 1: HYCS Active Practices

The active practice included reclining poses for gentle pelvic mobilization and lymphatic drainage; seated poses for spinal mobilization and lymphatic drainage; kneeling poses for deeper flexion and extension of the spine and hip, and lymphatic drainage; standing poses for balance, strength and stamina; and restorative poses including passive supported inversions to initiate the relaxation response.

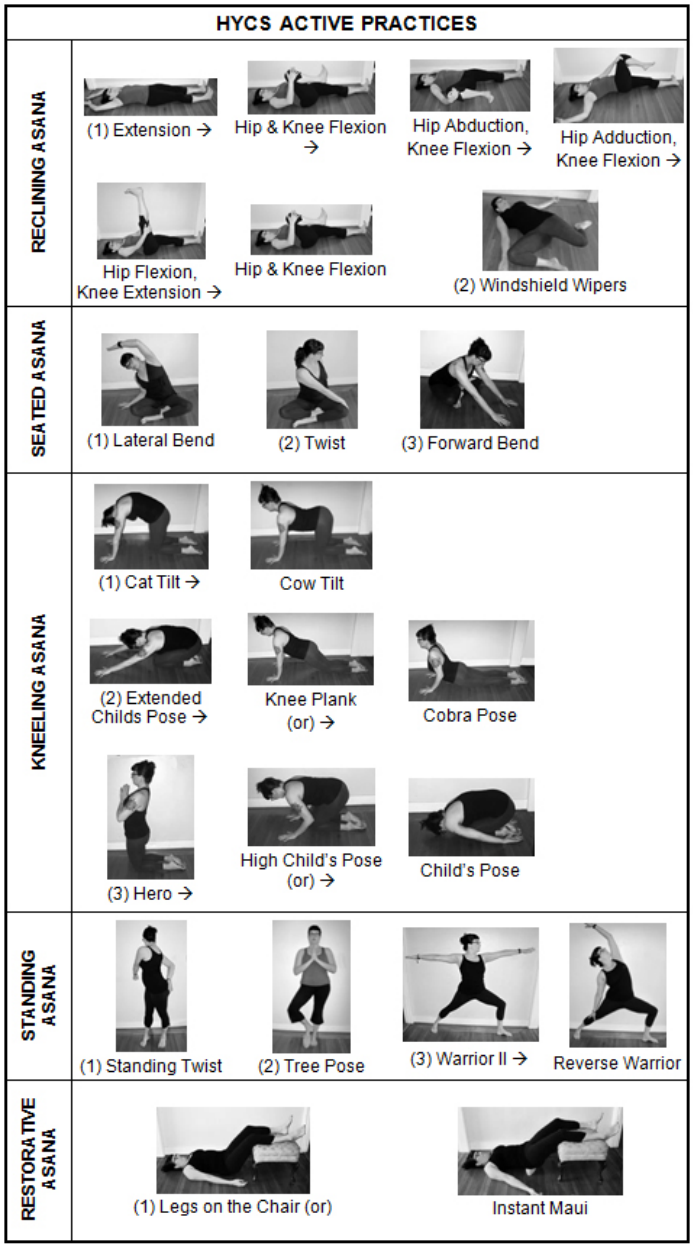


Figure 2: HYCS Alternate to Kneeling Asana

Alternate positions were offered to those who had difficulty putting pressure on the knees in the kneeling asana section.

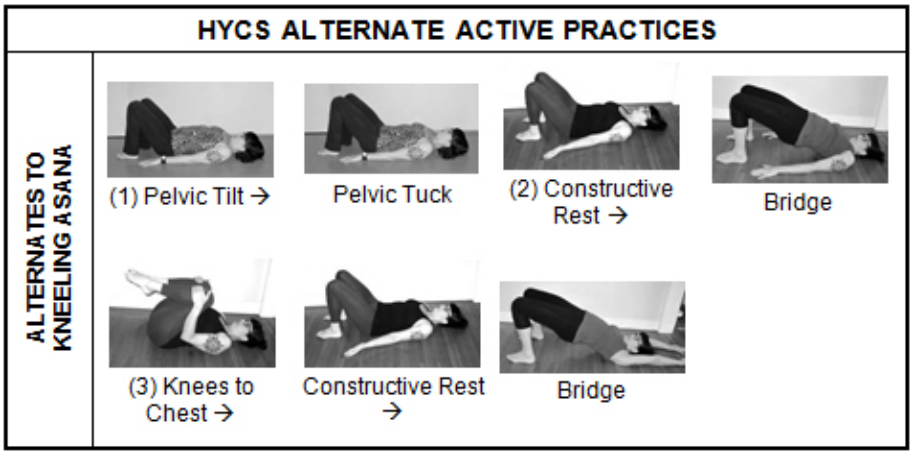


Figure 3: HYCS Contemplative Practices

The contemplative practices included stating an intention, to plant a transformative thought deep in the mind; chanting vowel sounds to increase awareness of the body and breath; mudras to direct vital energy into the body and mind; pranayama to distribute vital energy throughout the body and elicit relaxation; a body scan to systematically relax the body and the mind; and final relaxation for integration.

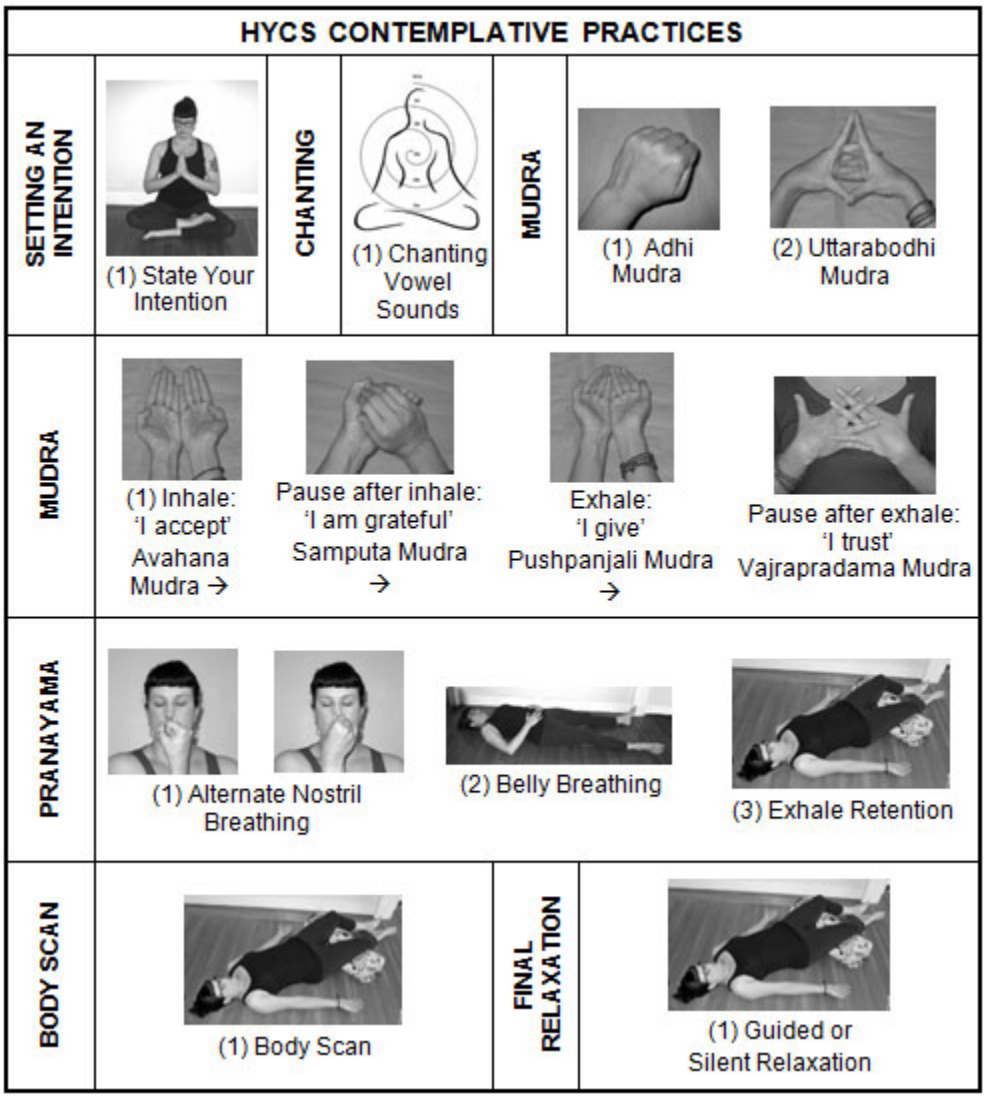
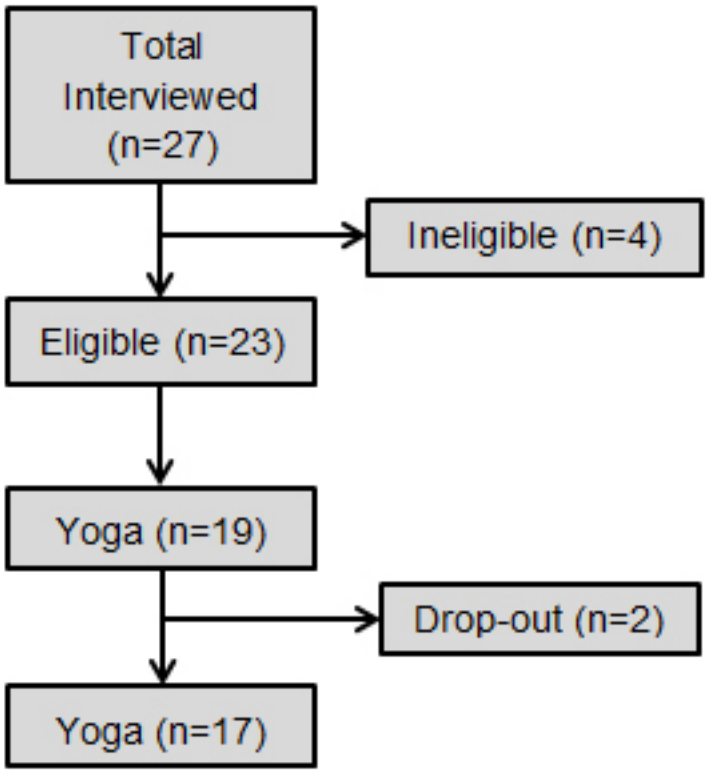


Figure 4: Cohort Diagram

Flow diagram for study cohort.



Tables

Table 1: Participant Characteristics

Characteristics of yoga participants including gender, age, ethnicity, diagnosis, staging, treatments received in past 10 years, mean time since treatment, previous yoga experience and current status of yoga practice.

CHARACTERISTICS	VALUE N=17
Female (%)	15 (88%)
Median age in years (range)	55 (37-74)
Ethnicity (%)	
• Non-Hispanic white	14 (82%)
• Non-Hispanic black	2 (12%)
• Hispanic	1 (6%)
Diagnosis (%)	
• Breast cancer	6 (34%)
• Lymphoma	2 (12%)
• Melanoma	2 (12%)
• Ovarian	2 (12%)
• Endometrial	1 (6%)
• Kidney	1 (6%)
• Leukemia	1 (6%)
• Neuroendocrine	1 (6%)
• Rectal	1 (6%)
Staging Information at time of study (%)	
• Stage I	1 (6%)
• Stage II	4 (23.5%)
• Stage III	4 (23.5%)
• Stage IV	4 (23.5%)
• Unknown	4 (23.5%)
Treatments received in past 10 years (%)	
• Surgery	14 (82%)
• Chemotherapy	12 (71%)
• Hormone	6 (35%)
• Radiation	5 (29%)
• Stem Cell Transplant	2 (12%)
• No Treatment	1 (6%)
Mean time since treatment in months (range)	39 (6-200)
Previous yoga experience (%) • (Hatha, Vinyasa, Siddha, Prenatal, Bikram, Gentle, Seniors, Kundalini, Yin)	16 (94%)
Currently practicing yoga (%)	9 (53%)

Table 2: Active Yoga and Quality of Life

The results from generalized estimating equations for the association between active yoga practice and quality of life.

Type of ppractice	Physical Well-being		Functional Well-being		Emotional Well-being		Spiritual Well-being (Peace)	
	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value
All Active	1.24 (0.62-2.47)	0.55	1.65 (0.78-3.48)	0.19	1.60 (1.06-2.40)	0.02	1.96 (1.07-3.61)	0.03
Reclining Asana	0.79 (0.05-11.59)	0.87	2.57 (0.17-38.82)	0.49	6.24 (1.44-27.10)	0.01	11.07 (0.99-123.44)	0.05
Seated Asana	1.49 (0.23-9.50)	0.67	7.27 (0.81-65.42)	0.08	3.51 (0.95-12.88)	0.59	6.36 (1.27-31.87)	0.02
Kneeling Asana	1.08 (0.21-5.44)	0.93	0.81 (0.07-9.72)	0.86	0.94 (0.20-4.43)	0.94	1.40 (0.21-9.38)	0.73
Standing Asana	5.98 (0.52-69.34)	0.15	5.98 (0.41-87.53)	0.19	6.06 (1.08-33.85)	0.04	6.91 (0.64-74.59)	0.11
Restorative Asana	2.22 (0.31-16.04)	0.43	8.57 (0.93-78.80)	0.06	5.07 (1.15-22.42)	0.03	14.42 (2.63-79.25)	<0.01

*Adjusting for time

Table 3: Contemplative Yoga and Quality of Life

The results from generalized estimating equations for the association between contemplative practice and quality of life.

Type of Practice	Physical Well-being		Functional Well-being		Emotional Well-being		Spiritual Well-being (Peace)	
	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value	Risk Ratio* (95CI)	p-value
All Contemplative	0.98 (0.53-1.80)	0.94	1.60 (0.87-2.94)	0.13	1.09 (0.72-1.65)	0.67	1.87 (1.12-3.11)	0.02
Setting Intention	0.53 (0.03-8.39)	0.65	5.36 (0.22-128.06)	0.30	1.75 (0.22-13.84)	0.59	16.58 (0.82-335.75)	0.07
Pranayama	1.28 (0.07-23.47)	0.87	3.74 (0.23-61.23)	0.36	3.41 (0.44-26.55)	0.24	7.50 (0.86-65.5)	0.07
Mudra	0.80 (0.12-5.28)	0.82	1.72 (0.22-13.32)	0.60	0.29 (0.05-1.75)	0.18	1.74 (0.24-12.66)	0.58
Chanting	2.22 (0.30-16.50)	0.44	4.05 (0.68-23.99)	0.12	0.40 (0.07-2.31)	0.30	3.57 (0.75-17.13)	0.11
Body Scan	0.50 (0.08-2.95)	0.44	2.97 (0.43-20.42)	0.27	4.20 (0.73-24.33)	0.11	4.78 (1.31-17.43)	0.02
Final Relaxation	1.16 (0.39-3.48)	0.79	2.54 (0.53-12.28)	0.25	1.55 (0.52-4.63)	0.44	3.62 (1.10-11.87)	0.03

*Adjusting for time

Figures and Tables Legend

Figure 1: HYCS Active Practices - The active practice included reclining poses for gentle pelvic mobilization and lymphatic drainage; seated poses for spinal mobilization and lymphatic drainage; kneeling poses for deeper flexion and extension of the spine and hip, and lymphatic drainage; standing poses for balance, strength and stamina; and restorative poses including passive supported inversions to initiate the relaxation response.

Figure 2: HYCS Alternate to Kneeling Asana - Alternate positions were offered to those who had difficulty putting pressure on the knees in the kneeling asana section.

Figure 3: HYCS Contemplative Practices - The contemplative practices included stating an intention, to plant a transformative thought deep in the mind; chanting vowel sounds to increase awareness of the body and breath; mudras to direct vital energy into the body and mind; pranayama to distribute vital energy throughout the body and elicit relaxation; a body scan to systematically relax the body and the mind; and final relaxation for integration.

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