HHS Public Access

Author manuscript

Int J Yoga Therap. Author manuscript; available in PMC 2020 September 03.

Published in final edited form as:

Int J Yoga Therap. 2018 November ; 28(1): 79–85. doi:10.17761/2018-00039.

A Feasibility Study of Restorative Yoga versus Vigorous Yoga Intervention for Sedentary Breast or Ovarian Cancer Survivors

Kaitlyn Lapen[1], **Lara Benusis**[2], **Stephanie Pearson**[3], **Benjamin Search**[3], **Marci Coleton**[3], **Q. Li**[3], **Daniel Sjoberg**[4], **Jason Konner**[5], **Jun J Mao**[3], **Gary Deng**[3,*]

[1]Medical School, University of Illinois in Chicago, Chicago, IL

[2]Department of Biobehavioral Sciences, Columbia University, New York, NY

[3]Integrative Medicine Service, Memorial Sloan Kettering Cancer Center, New York, NY 10021

[4]Department of Epidemiology and Biostatistics, Memorial Sloan Kettering Cancer Center, New York, NY 10021

[5]Gynecologic Oncology Service, Memorial Sloan Kettering Cancer Center, New York, NY 10021

Abstract

Purpose—Yoga has been shown to improve cancer survivors' quality of life. Yet, regular yoga practice is a challenge for those who are sedentary. We conducted a pilot randomized controlled study to assess feasibility and adherence of two types of yoga interventions among sedentary cancer survivors.

Methods—Sedentary breast or ovarian cancer survivors were randomized to practice either restorative yoga (minimal physical exertion, Group R) or vigorous yoga (considerable physical exertion, Group V) in three 60-minute supervised sessions a week for 12 weeks, then 12-weeks of home practice. Accrual, adherence and attendance rates were assessed.

Results—Of the 226 eligible patients, 175(77%) declined to participate in the study, citing time commitment and travel as the most common barriers. Forty-two subjects consented to participate in the study. Of the 35 participants who began the intervention (20 in Group R and 15 in Group V), adherence rate (percentage remaining in the study at week 12) was 100% and 87% respectively. Rate of adequate attendance (more than 66% of the scheduled supervised sessions) was 85% and 73% respectively. Rate of completion of the home practice period was 85% and 77%, respectively.

Conclusion—In this study, we found that sedentary cancer survivors were able to adhere to a long-term, regular yoga regimen. Rate of adequate attendance was higher for restorative yoga. Future studies for sedentary patients should focus on reducing time commitment and travel requirement to improve recruitment and using restorative yoga as a more feasible intervention for this population.

*Corresponding Author: Gary Deng, MD, PhD, 1429 First Avenue, New York, NY 10021, dengg@mskcc.org.

Conflict of interest: none

Clinicaltrial.gov registration number: NCT02305498

Introduction

Yoga is a multifarious mind-body practice that combines physical movements through a series of different poses with breath control and meditation. It improves strength, flexibility and balance while also promoting relaxation, mental clarity and peace of mind. Several past studies have shown that yoga effectively improves quality of life amongst cancer patients and survivors (Buffart et al., 2012; Cramer, Lange, Klose, Paul, & Dobos, 2012; Sharma, Lingam, & Nahar, 2016; Smith & Pukall, 2009). Additionally, a recent meta-analysis of 23 randomized controlled trials that examined the effects of yoga on breast cancer survivors, found that yoga improves sleep quality and reduces fatigue, depression, and anxiety (Cramer et al., 2017). However, none of these studies focused on sedentary survivors (Paxton, Anderson, Sarkar, &Taylor, 2016).

Despite the benefits, getting sedentary individuals to do regular yoga practice has been challenging. Cancer survivors are on average less active and more sedentary than their peers who have not had cancer (Kim et al., 2013; Phillips et al., 2015). This trend is of particular concern because sedentary behavior or prolonged sitting has recently been identified as an additional risk factor for cancer progression and disease mortality, distinct from lack of physical activity (Kushi et al., 2012; Lynch, 2010; Lynch, Dunstan, Vallance, & Owen, 2013). Perceived barriers to physical activity in cancer survivors include fatigue, pain, anxiety and lack of time, self-discipline, and interest following pernicious cancer treatment (Leak Bryant et al., 2017; Ventura et al., 2013).

We are interested in determining if sedentary cancer survivors can participate and adhere to a regular yoga practice regimen. We conducted this randomized controlled pilot study to answer the following questions: are sedentary cancer survivors open to a yoga intervention, can they adhere to the yoga practice, and will they continue to practice yoga on their own once taught how to properly do so. Additionally, we compared adherence and attendance rates for two different types of yoga intervention (restorative and vigorous) to explore differences in how the interventions were received and whether physical exertion encourages or discourages full participation of the yoga programs. To our knowledge this is the first study that has compared the feasibility of two different types of yoga interventions for sedentary cancer survivors.

Methods

Design

This was a two-arm randomized controlled pilot study to evaluate two types of yoga interventions (vigorous and restorative) for sedentary cancer survivors, conducted at an urban comprehensive cancer center.

Study Population

Eligible subjects were sedentary women (>18 years) with a history of stage 0-III breast cancer or stage I-III ovarian cancer, who had completed all antitumor therapies with the exception of hormonal therapy, at least 60 days prior to enrollment and an ECOG Performance Status of 0–1 within 90 days of enrollment. Being sedentary was defined as

having engaged in less than 90 minutes/week of moderate-intensity (not exhausting, light perspiration, e.g. fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing) physical activity during the preceding two months, and less than 30 minutes/month of any high-intensity physical activity (heart beats rapidly, sweating, e.g. running, aerobics classes, cross country skiing, vigorous swimming, vigorous bicycling) in the preceding two months (Godin & Shephard, 1985). Exclusion criteria included: evidence of active malignant disease; breast implants (which limit the performance of many yoga poses); significant cardiopulmonary disease, severe arthritis, or any medical conditions that would make yoga practice unsafe; regular use of beta blockers or calcium channel blockers (may have a blunted response in heart rate to exertion,); unlikely to be compliant (usually social factors preventing patients from attending classes or doing home practice).

Recruitment

Potential study candidates were contacted by letters introducing the study, referred to the study by their clinicians, or self-referred after learning about the study from websites or flyers. Once in contact, patient eligibility was further assessed. Informed consent and medical clearance by one of the physician investigators was obtained for patients who were eligible and willing to participate in the study.

Randomization

Randomization was conducted by the Clinical Research Database (CRDB) at Memorial Sloan Kettering Cancer Center (MSKCC) in randomly permuted blocks. Assignment concealment was achieved by the CRDB computer system. Randomization was stratified by history of breast or ovarian cancer.

Intervention

Study participants were randomized to one of two 12-week yoga programs, restorative or vigorous. Both yoga programs were Vinyasa-based and utilized an approach to yoga that included transitions that were coordinated with inhale and exhale breaths. The restorative program consisted of stable, restful poses that were guided to be performed at a slow pace. The vigorous program consisted of difficult poses that required additional coordination and effort that were done at a pace quick enough to keep the subjects' heart rate (HR) at 60–70% of their HR max, considered moderate-intensity exercise. The participants' age-predicted heart rate max was calculated using the Haskell and Fox formula (HRmax = 220 – age) [PMID 4945367]. Subjects in the vigorous group wore heart rate monitors (Polar H7 made by Polar Electro, Inc.Bethpage, NY). The heart rate monitors are paired to an iPad via Bluetooth, on which up to 10 patients' heart rates can be monitored in real time on the screen using a Polar app. During supervised practice sessions changes in tempo and number of repetition of the yoga movements were made to keep the study participants' HR within this range. Both interventions involved 1) an initial intake session in which subjects were assessed for previous yoga experience, ability to perform the poses and any safety concerns that had not surfaced during the screening stage, 2) a 12-week practice period in which subjects attended 60-minute sessions, three times a week under the instruction of a yoga instructor, and 3) a 12-week home practice period in which subjects were instructed to practice at home what they had learned in the supervised sessions three times a week, each

time for 60 minutes. A minute-by-minute outline of a typical restorative and vigorous supervised yoga class is detailed in Table 1. The supervised sessions took place at MSKCC's Bendheim Integrative Medicine Center or the Integrative Medicine space at the Evelyn H. Lauder Breast and Imaging Center.

Outcome Measures

The primary objective of this pilot study was to determine the feasibility of yoga practice for previously sedentary breast or ovarian cancer survivors. The numbers of study participants at each step from recruitment to completion of the study were recorded. For feasibility outcome, subjects were considered to have adequate attendance if they attended no less than 66.7% of the supervised yoga sessions. A yoga regimen was deemed feasible if at least 75% of the participants in the group had adequate attendance. This was defined *a priori*.

Results

Recruitment

Between January 2014 and February 2017, a total of 518 patients were assessed for eligibility; of these, 226 were found to be eligible. Reasons for non-eligibility are outlined in Table 2. Of the 226 eligible subjects we identified, 175 (77%) declined to participate, 9 (4%) were lost to follow up, and 42 (19%) consented to participate. Reasons for nonparticipation (Table 3) included (1) Time commitment (n=70; 40.0%); (2) Travel (n =44; 25.1%); (3) Reason not specified (n=25; 14.3%); (4) Unable to contact (n=21; 12.0%); (5) No longer sedentary (n=11; 6.3%); (6) Recent injury (n=2; 1.1%); and (7) Not interested in yoga (n=2; 1.1%).

Initial Intake Session

Following consent and randomization, an initial intake session was done. Of the 42 subjects who consented to participate in the study, 21 were assigned to the restorative yoga group and 21 were assigned to the vigorous yoga group. The initial intake sessions, which were done before the first supervised yoga class, were specific to the intervention groups. One subject in the restorative yoga group was excluded during the intake session because it was discovered that she was no longer sedentary as defined by the study protocol. Six subjects were lost from the vigorous yoga group; two participants were excluded due to scheduling issues, two due to unrelated cardiac incidents that found after registration (one patient had history of atrial fibrillation, another abnormal stress test), one due to an easily elevated heart rate, and another due to high blood pressure that required calcium blockers to control. Participants from both groups who were no longer in the study were excluded from our feasibility assessment, thus leaving 20 patients in the restorative yoga arm and 15 in the vigorous yoga arm.

Participant characteristics

A total of 35 participants began treatment after randomization and the initial intake session, 20 in the restorative yoga group and 15 in the vigorous yoga group. The median age in the restorative yoga arm was 55 (interquartile range 53–60) and 58 (54–62) in the vigorous yoga arm. Most participants were Caucasian with a history of breast cancer (Table 4).

Intervention Adherence and Attendance

Adherence rate was defined as the proportion of participants in each group that did not leave the study during the 12-week supervised class period. Twenty (20, 100%) participants in the restorative yoga group and 13 (87%) participants in the vigorous yoga group attended classes for the entire 12-week intervention period. Two participants in the vigorous yoga arm withdrew from the study during this time due to exacerbation of joint pain, leaving 13 to continue on to the home practice phase. Both participants reported having prior musculoskeletal injuries that were aggravated by the vigorous yoga practice. Of the 36 individual supervised yoga sessions that took place over the course of 12-week, the average attendance rate was 80% for group R and 74% for group V. Participants were considered to have adequate attendance if they attended at least two-thirds (66.7%) of the supervised yoga classes. By this definition, 17 (85%) participants in the restorative yoga arm and 11 (73%) participants in the vigorous yoga arm had adequate attendance and were considered to have completed the intervention, the latter not reaching our *a priori* threshold for feasibility of 75%. Following the supervised sessions, participants were instructed to continue practicing their respective yoga type at home. During this follow up period, three participants from each intervention group were lost to follow up. Thus, 17 (85%) of the 20 participants in the restorative yoga group and 10 (77%) of the remaining 13 participants in the vigorous yoga group continued practicing yoga at home for an additional 12-weeks on their own. The CONSORT diagram is shown in Figure 1.

Discussion

Yoga has been shown to benefit cancer patients and cancer survivors. Yet we do not know whether sedentary cancer survivors will practice yoga regularly and what the barriers to regular practice are. We conducted a two-arm randomized controlled trial to assess the feasibility of two types of yoga interventions for sedentary breast or ovarian cancer survivors. The two distinct yoga interventions, restorative and vigorous yoga, involved different degrees of physical exertion. We found that: 1) very few patients (1 %) were not interested in yoga, yet 77% could not participate in the study mainly due to difficulties with time and travel; 2) most of those who participated did stay for the entire 12-week program; 3) most of those who finished the supervised sessions continued with home practice; and 4) physical exertion appears a barrier for attendance rate as those in the vigorous yoga group attended fewer supervised practice sessions than desired.

A large percentage (77%) of eligible subjects declined to participate in the study. The two most commonly cited reasons for declining to participate were time commitment and travel distance to the instructor-lead yoga class locations. On the other hand, only 1% of the cancer survivors contacted said they were not interested in yoga. The yoga classes in the study were held at a large comprehensive cancer center in New York City that attracts patients from a wide array of geographical locations; this potentially explains why time and travel limited our ability to recruit participants from the patient population. Past studies have faced similar recruitment barriers (Danhauer et al., 2009; McCall, McDonald, Thorne, Ward, & Heneghan, 2015). Additionally, a qualitative study that evaluated yoga for cancer survivors found that transportation, time, and scheduling were prominent barriers to yoga practice

(McCall, Thorne, Ward, & Heneghan, 2015). Our findings, in conjunction with the findings from those studies, demonstrate the need to develop ways for cancer survivors to practice yoga remotely. Offering classes in regional locations closer to patients or providing online video instructions for yoga practice could alleviate the time needed to travel to class and allow cancer survivors to practice yoga on their own accord.

During the course of the 12-week supervised yoga practice, 100% of the participants in the restorative yoga group and 87% of the participants in the vigorous yoga group were retained. The dropout rate for the vigorous yoga practice was 13% (2 of the 15 participants). One patient withdrew due to back pain while the other withdrew due to a shoulder injury that was aggravated by the vigorous yoga practice. According to a systematic review that evaluated sixteen past yoga trials, the dropout rate has ranged from 0–38% (Buffart et al., 2012). Of the sixteen studies included in this review, two trials evaluated yoga programs that lasted 12 weeks or longer and none of them required participants to attend class three times a week like our study. A recent 6-month yoga trial that asked participants to practice three hours a week had a fairly high dropout rate; 11 of the 31 (35%) participants in the yoga arm withdrew from the study (Hughes et al., 2015). Considering the length and class frequency of our program, the fact that 100% and 87% of participants were able to adhere to the restorative and vigorous yoga programs respectively and stayed for 12 weeks is encouraging and promising. The result indicates that motivated patients were willing to continue taking part in a long regular yoga program even when they may not be able to attend every session.

Attendance rates were high for both groups. On average, participants in the restorative arm attended a larger proportion of the supervised yoga sessions (80%) than participants in the vigorous arm (74%). Both of these attendance rates are comparable to those observed in similar yoga trials (Bower et al., 2012; Bower et al., 2014; McCall, McDonald, et al., 2015; Speed-Andrews, Stevinson, Belanger, Mirus, & Courneya, 2012). However the attendance rate in the vigorous group did not meet our *a priori* criterion for feasibility. We defined feasibility as 75% of participants in each group attending no less than two-thirds of the supervised class sessions. Based on this definition, the restorative yoga intervention was found to be feasible (85%) while the vigorous yoga intervention missed the mark by 2% (73%). There were four participants in the vigorous yoga group that were unable to attend at least two-thirds of the supervised sessions; two of which dropped out of the study due to pain, one who missed several classes due to knee pain, and another who missed several classes due to family circumstances. The fact that three patients dropped out or missed class due to pain is worrisome and likely indicates that a vigorous yoga intervention may be too taxing for previously sedentary cancer survivors. To our knowledge, this is the first study that has sought to see if sedentary cancer survivors can do a vigorous, vinyasa based yoga practice. Prior studies have mainly used Iyengar, restorative or hatha yoga, all of which are much gentler (Buffart et al., 2012; Sharma et al., 2016). There have been other studies in which cancer survivors have successfully engaged in moderate-intensity physical activity but they have used 15 to 40-minute biking or walking routines to increase the participants' heart rates above 60% of their HRmax (Drum, Klika, Carter, Sprod, & Donath, 2016; Schmitt, Lindner, Reuss-Borst, Holmberg, & Sperlich, 2016). The vigorous yoga practice in this study was demanding and more dynamic than these interventions as it required participants to perform a wide array of movements using several different muscle groups to change from

one yoga pose to another in 60-minute sessions, whereas in those studies biking or walking routines involved mostly repetitive lower body movements in the same stance for 15–40 minutes.

Our study has some limitations that need to be acknowledged. First, this was a pilot study with a small sample size, 42 participants consented and 35 began the intervention. Second, seven participants were excluded from the study during the initial intake session before they had started the intervention but after they had been randomized. As a result, the restorative yoga group started with 20 participants while the vigorous yoga group started with 15. Although five of the participants excluded would have been dismissed regardless of intervention group, two participants excluded from the vigorous group were taken off the study due to concerns picked up by the heart rate monitors (quickly exceeding 60% HRmax with minimal exertion from only a few yoga moves). The restorative yoga group did not wear heart rate monitors at any point during the study as the physical movements were too gentle to significantly increase their heart rates. Third, participants who chose to partake in the study were likely to be familiar with and accepting of yoga resulting in self-selection bias. Lastly, the study only included women with a history of breast or ovarian cancer, limiting the study's generalizability to other cancers.

Despite these limitations, to our knowledge this is the first trial that assessed the feasibility of a vigorous yoga intervention for any type of cancer survivor. It is also the first study to examine differences in adherence and attendance rates for two different types of yoga practice, restorative and vigorous. Findings from our study shed light on how to improve recruitment, adherence and attendance to future yoga studies for sedentary cancer survivors.

Conclusions

We found that sedentary breast or ovarian cancer survivors are able to adhere to a long-term, regular yoga practice. Time commitment and travel were major barriers to recruitment for this yoga study. Restorative yoga had a higher rate of adequate attendance within this study, thus appears to be more feasible for future study of this particular population. Physical exertion in the vigorous yoga intervention appeared to have deterred the cancer survivors from attending the sessions frequently enough and caused higher drop-out. However, attribution of adherence and feasibility for any vigorous yoga practice with sedentary cancer survivors is potentially influenced by the selection of postures, the guidance of transitions to match the motor skills and adeptness to respond to the verbal cues within a group setting of the practitioner, in addition to the instructor's ability to influence these factors. Most study participants were able to continue the yoga practice at home after completing the supervised period. Future studies should focus on reducing time commitment and travel requirement to improve recruitment and using restorative yoga as the more feasible intervention for sedentary cancer survivors.

Acknowledgements:

The authors thank Pasha Hogan, Joseph Glaser, Catherine Genzler (yoga instructors); and Andrew Vickers, PhD (biostatistician) for their work in this study.

Funding/Support:

This study was supported in part by the Integrative Medicine and Translational Research Grant from Memorial Sloan Kettering Cancer Center, the Rockefeller Fund and NIH/NCI Cancer Center Support Grant P30 CA008748.

Research reported in this paper was also supported by the National Cancer Institute of the National Institutes of Health under Award Number R25CA020449. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1). Bower JE, Garet D, Sternlieb B, Ganz PA, Irwin MR, Olmstead R, & Greendale G (2012). Yoga for persistent fatigue in breast cancer survivors: a randomized controlled trial. Cancer, 118(15), 3766–3775. doi:10.1002/cncr.26702 [PubMed: 22180393]

2). Bower JE, Greendale G, Crosswell AD, Garet D, Sternlieb B, Ganz PA, … Cole SW (2014). Yoga reduces inflammatory signaling in fatigued breast cancer survivors: a randomized controlled trial. Psychoneuroendocrinology, 43, 20–29. doi:10.1016/j.psyneuen.2014.01.019 [PubMed: 24703167]

3). Buffart LM, van Uffelen JG, Riphagen II, Brug J, van Mechelen W, Brown WJ, & Chinapaw MJ (2012). 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. doi:10.1186/1471-2407-12-559 [PubMed: 23181734]

4). Cramer H, Lange S, Klose P, Paul A, & Dobos G (2012). Yoga for breast cancer patients and survivors: a systematic review and meta-analysis. BMC Cancer, 12, 412. doi:10.1186/1471-2407-12-412 [PubMed: 22988934]

5). Cramer H, Lauche R, Klose P, Lange S, Langhorst J, & Dobos GJ (2017). Yoga for improving health-related quality of life, mental health and cancer-related symptoms in women diagnosed with breast cancer. Cochrane Database Syst Rev, 1, CD010802. doi:10.1002/14651858.CD010802.pub2 [PubMed: 28045199]

6). Danhauer SC, Mihalko SL, Russell GB, Campbell CR, Felder L, Daley K, & Levine EA (2009). Restorative yoga for women with breast cancer: findings from a randomized pilot study. Psychooncology, 18(4), 360–368. doi:10.1002/pon.1503 [PubMed: 19242916]

7). Drum SN, Klika RJ, Carter SD, Sprod LK, & Donath L (2016). A Feasibility Study Related To Inactive Cancer Survivors Compared with NonCancer Controls during Aerobic Exercise Training. J Sports Sci Med, 15(4), 592–600. [PubMed: 27928204]

8). Godin G, & Shephard RJ (1985). A simple method to assess exercise behavior in the community. Can J Appl Sport Sci, 10(3), 141–146. [PubMed: 4053261]

9). Hughes DC, Darby N, Gonzalez K, Boggess T, Morris RM, & Ramirez AG (2015). Effect of a six-month yoga exercise intervention on fitness outcomes for breast cancer survivors. Physiother Theory Pract, 31(7), 451–460. doi:10.3109/09593985.2015.1037409 [PubMed: 26395825]

10). Kim RB, Phillips A, Herrick K, Helou M, Rafie C, Anscher MS, … Ning Y (2013). Physical activity and sedentary behavior of cancer survivors and non-cancer individuals: results from a national survey. PLoS One, 8(3), e57598. doi:10.1371/journal.pone.0057598 [PubMed: 23483916]

11). Kushi LH, Doyle C, McCullough M, Rock CL, Demark-Wahnefried W, Bandera EV, … Physical Activity Guidelines Advisory, C. (2012). American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. CA Cancer J Clin, 62(1), 30–67. doi:10.3322/caac.20140 [PubMed: 22237782]

12). Leak Bryant A, Walton AL, Pergolotti M, Phillips B, Bailey C, Mayer DK, & Battaglini C (2017). Perceived Benefits and Barriers to Exercise for Recently Treated Adults With Acute Leukemia. Oncol Nurs Forum, 44(4), 413–420. doi:10.1188/17.ONF.413-420 [PubMed: 28632248]

13). Lynch BM (2010). Sedentary behavior and cancer: a systematic review of the literature and proposed biological mechanisms. Cancer Epidemiol Biomarkers Prev, 19(11), 2691–2709. doi:10.1158/1055-9965.EPI-10-0815 [PubMed: 20833969]

14). Lynch BM, Dunstan DW, Vallance JK, & Owen N (2013). Don't take cancer sitting down: a new survivorship research agenda. Cancer, 119(11), 1928–1935. doi:10.1002/cncr.28028 [PubMed: 23504979]

15). McCall M, McDonald M, Thorne S, Ward A, & Heneghan C (2015). Yoga for Health-Related Quality of Life in Adult Cancer: A Randomized Controlled Feasibility Study. Evid Based Complement Alternat Med, 2015, 816820. doi:10.1155/2015/816820 [PubMed: 26170884]

16). McCall M, Thorne S, Ward A, & Heneghan C (2015). Yoga in adult cancer: an exploratory, qualitative analysis of the patient experience. BMC Complement Altern Med, 15, 245. doi:10.1186/s12906-015-0738-9 [PubMed: 26198820]

17). Paxton RJ, Anderson A, Sarkar S, & Taylor WC (2016). Breaking Up Sedentary Behavior: Perceptions From Cancer Survivors. Cancer Nurs, 39(4), 272–278. doi: 10.1097/NCC.0000000000000330 [PubMed: 26713501]

18). Phillips SM, Dodd KW, Steeves J, McClain J, Alfano CM, & McAuley E (2015). Physical activity and sedentary behavior in breast cancer survivors: New insight into activity patterns and potential intervention targets. Gynecol Oncol, 138(2), 398–404. doi:10.1016/j.ygyno.2015.05.026 [PubMed: 26026737]

19). Schmitt J, Lindner N, Reuss-Borst M, Holmberg HC, & Sperlich B (2016). A 3-week multimodal intervention involving high-intensity interval training in female cancer survivors: a randomized controlled trial. Physiol Rep, 4(3). doi:10.14814/phy2.12693

20). Sharma M, Lingam VC, & Nahar VK (2016). A systematic review of yoga interventions as integrative treatment in breast cancer. J Cancer Res Clin Oncol, 142(12), 2523–2540. doi:10.1007/s00432-016-2269-2 [PubMed: 27630024]

21). Smith KB, & Pukall CF (2009). An evidence-based review of yoga as a complementary intervention for patients with cancer. Psychooncology, 18(5), 465–475. doi:10.1002/pon.1411 [PubMed: 18821529]

22). Speed-Andrews AE, Stevinson C, Belanger LJ, Mirus JJ, & Courneya KS (2012). Predictors of adherence to an Iyengar yoga program in breast cancer survivors. Int J Yoga, 5(1), 3–9. doi:10.4103/0973-6131.91693 [PubMed: 22346059]

23). Ventura EE, Ganz PA, Bower JE, Abascal L, Petersen L, Stanton AL, & Crespi CM (2013). Barriers to physical activity and healthy eating in young breast cancer survivors: modifiable risk factors and associations with body mass index. Breast Cancer Res Treat, 142(2), 423–433. doi: 10.1007/s10549-013-2749-x [PubMed: 24177756]

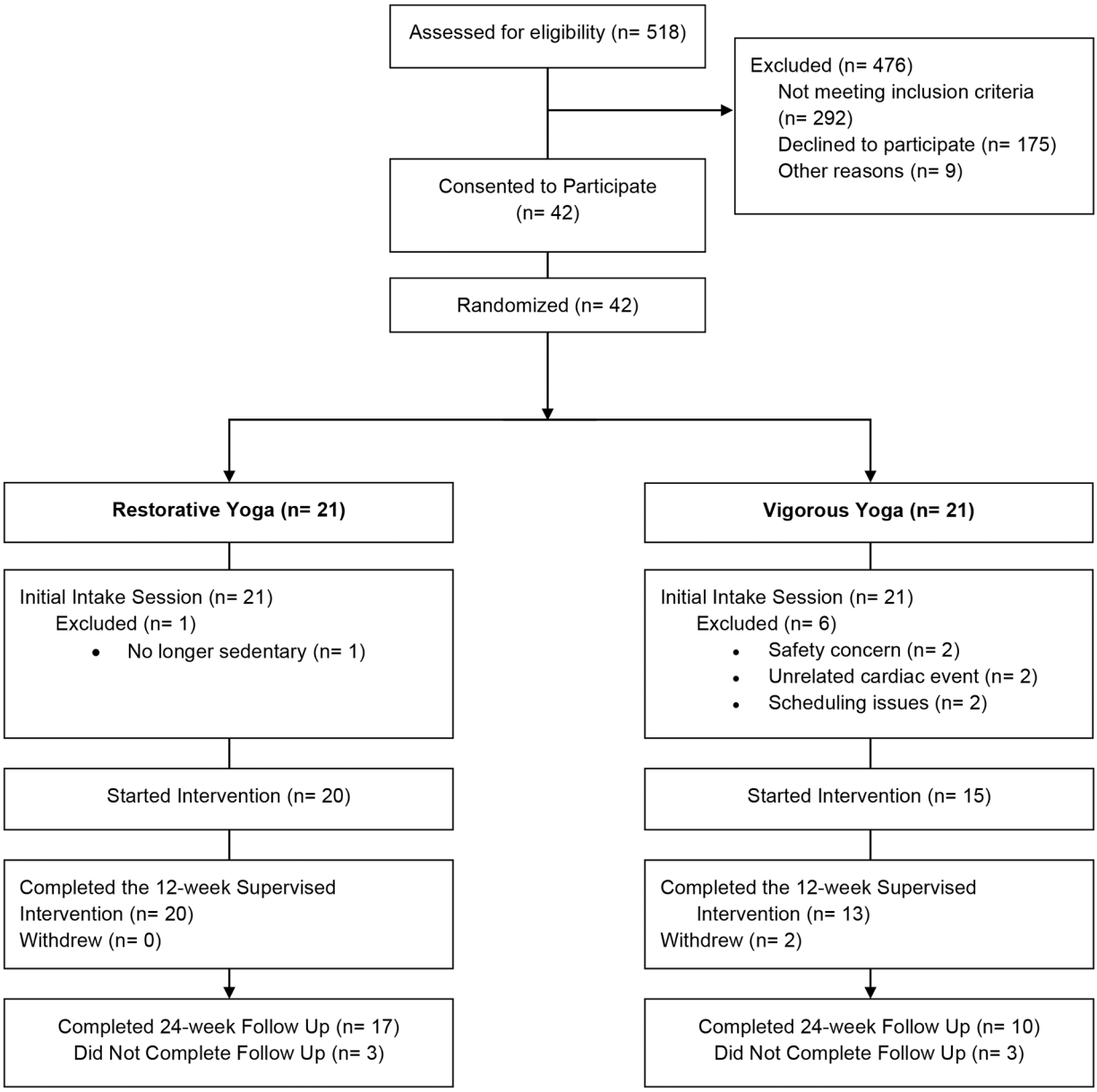

Figure 1.
CONSORT diagram of study enrollment and participant adherence

Table 1.

Breakdown of a 60-minute yoga session

	Restorative Yoga	**Vigorous Yoga (60%−70% HRmax)**
5 min	*Supported Fish Pose*	*Supine warm-up*
5 min	*Supported side resting postures*	*Quadruped warm-up*
5 min	*Seated upright postures*	*Sun Salutations*
5 min		
5 min	*Quadruped postures*	*Breathing exercise*
5 min		*Standing Poses*
5 min	*Prone postures*	
5 min		
5 min	*Child Pose*	
5 min	*Supine postures*	*Inversions*
5 min		*Stretch/Cool down*
5 min	*Relaxation*	*Centering/Closing*

Table 2.

Recruitment Information; reason for ineligibility

Assessed for Eligibility	518 (100%)
Eligible	226 (43.6%)
Ineligible	292 (56.4%)
Not sedentary	94 (32.3%)
Interfering medical condition	74 (25.3%)
Interfering medication	36 (12.3%)
No history of stage I-III breast or ovarian cancer	22 (7.5%)
Breast Implants	10 (3.4%)
Evidence of active disease	5 (1.7%)
Receiving treatment	4 (1.4%)
Other	47 (16.1%)

Table 3.

Recruitment Information; reason for declining to participate

Eligible Participants	226 (100%)
Consented to Participate	42 (18.6%)
Declined to Participate	175 (77.4%)
Unable to make time commitment	70 (40.0%)
Unable to travel	44 (25.1%)
Not specified	25 (14.3%)
Unable to contact	21 (12.0%)
No longer sedentary	11 (6.3%)
Recent injury	2 (1.1%)
Not interested in yoga	2 (1.1%)
Other	9 (4.0%)

Table 4.

Participant Characteristics

	Restorative Yoga (N=20; 57%)	**Vigorous Yoga (N=15; 43%)**
Age, years	55 (53, 60)	58 (54, 62)
Race		
White	16 (80%)	13 (87%)
Black	3 (15%)	0 (0%)
Asian	1 (5.0%)	1 (6.7%)
Unknown	0 (0%)	1 (6.7%)
Hispanic	1 (5.0%)	0 (0%)
Cancer Type		
Breast cancer	18 (90%)	13 (87%)
Ovarian cancer	2 (10%)	2 (13%)