

Active Practice of Iyengar Yoga as an Intervention for Breast Cancer Survivors

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Abstract

The Iyengar system of Yoga is well suited to meet the guidelines for physical activity for breast cancer survivors. Attention to alignment and symmetry, the use of props, and careful sequencing all improve stamina, strength, flexibility, and confidence, while decreasing stress and side effects. Women (n = 18, ages 48 to 69 years) diagnosed with stage I–III breast cancer and receiving antiestrogen or aromatase inhibitor hormonal therapy were recruited for this study. The range of time since chemotherapy and/or radiation treatment was three months to eight years. The subjects were randomized to either a Yoga (n = 9) or wait-list control group. Beginning level Iyengar Yoga classes were conducted two times per week for eight weeks. The women were given a home instruction sheet to practice once a week at home for a total of three Yoga sessions per week. A 92.9% ± 9.8% (mean ± SD) compliance rate for weekly home practice was achieved. During the sixth week of classes, the subjects were asked to complete a 31-question self-report survey that focused on their feelings of stress, level of physical and mental effort during class sessions, and perceptions about how Yoga practice had influenced their awareness. The preliminary findings indicate that the Yoga class was well tolerated by the participants. 75% of the women reported that they would not prefer a slower paced class with less demanding poses. Yoga practice relieved

the joint aches and shoulder stiffness associated with the side effects of hormonal treatment for 25% of the participants. Over 60% of the women reported improved mood and less anxiety as an outcome of the Yoga practice.

Introduction

A small body of experimental evidence indicates that Iyengar Yoga may reduce physical symptoms, such as fatigue,¹ and emotional distress, such as anxiety and depression,² in clinical populations. Our research focuses on the impact of active Yoga practice, taught in the Iyengar tradition, as an integrative medical intervention for breast cancer survivors. The purpose of this manuscript is twofold: 1) to consider the importance of an active Yoga practice for breast cancer survivorship and 2) to describe a pilot study of the benefits of an Iyengar Yoga intervention for breast cancer survivors. The structured 8-week intervention provides systematic training in Yoga postures and relaxation as a self-regulation approach for reducing stress and fatigue.

Breast Cancer Survival

A cancer survivor is anyone diagnosed with cancer, from the time of diagnosis through the remainder of life.³ The cancer survivorship continuum includes those in

recovery with no apparent disease and those living with advanced cancer.⁴ As of January 2001, the National Cancer Institute estimated that there were 9.6 million cancer survivors in the United States; 22% of these survivors were women diagnosed with breast cancer.^{5,6}

Breast cancer is the most prevalent type of invasive cancer among women in the United States.^{7,8} Approximately 212,118 American women will be diagnosed with breast cancer in 2005.⁹ The lifetime probability of any woman living in the United States developing breast cancer is 13.4%, or 1 in 8.¹⁰ From 1995–2000, the relative 5-year survival rate for breast cancer survivors across race and ethnic groups was 88%.^{11,12}

Cancer Survival and Physical Activity

In 2003, the American Cancer Society (ACS) published guidelines for nutrition and physical activity during and after cancer treatment.¹³ These guidelines, based on scientific evidence and best clinical practices, vary depending on the cancer site, phase of treatment and recovery, and the unique needs and preferences of each survivor. A committee of experts stated there was insufficient scientific evidence to conclude that increasing physical activity during treatment alters survival rate or risk of breast cancer recurrence. However, increasing physical activity during treatment was found to have probable benefit for quality of life. In addition, the committee concluded that women who increase physical activity after breast cancer treatment have possible benefit for reduced incidence of cancer recurrence and increased overall survival, as well as probable benefit for quality of life.

Breast cancer survivors who have excess body fat have an increased risk for recurrent disease and/or decreased survival.^{14,15} Interventions that address weight control, weight maintenance, and/or increase lean body mass during and after breast cancer treatment should be

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encouraged.¹⁶ The Surgeon General¹⁷ and the ACS recommend 150 minutes/week of moderate to vigorous intensity sports or recreational physical activity, excluding household and gardening activities, for the general population. Decreasing body fat and preventing weight gain, however, may require more physical activity than recommended by the Surgeon General. According to the 2005 *Dietary Guidelines for Americans*, one must “participate in at least 60 to 90 minutes of daily moderate-intensity physical activity while not exceeding caloric intake requirements” to sustain weight loss.¹⁸

A population-based, multi-center, multi-ethnic, prospective cohort study of breast cancer survivors found that only 32% of breast cancer survivors participated in the Surgeon General’s recommended level of sports/recreational physical activity.¹⁹ When participation in household and gardening activities was included, however, 73% of the breast cancer survivors engaged in 150 minutes/week of moderate-intensity physical activity. The

authors of this study concluded that breast cancer patients and survivors benefit from maintaining and increasing their physical activity during and following cancer treatment.

These results are consistent with a comprehensive literature review by Chlebowski et al.²⁰ on chronic disease management for women with breast cancer. The authors concluded that increased physical activity helps to decrease obesity or maintain a healthy weight and improves breast cancer prognosis, perhaps by modifying hormonal regulation required for breast cancer development. Another literature review, by Galvão and Newton,²¹ reviewed exercise intervention studies for survivors during and after cancer treatment. These authors concluded that participation in regular exercise sessions during and after cancer treatment provides physiological benefits, such as increased skeletal muscle mass and strength and improved cardiopulmonary capacity. Based on their review, the authors recommended the following physical activity guidelines: 1) anabolic/resistance exercises (frequency: 1–3 sessions per week, volume: 1–4 sets per muscle group, intensity: 6–12 repetition maximum), 2) cardiovascular exercise (frequency: 3–5 sessions per week, volume: 20–60 minutes, intensity: 55–90% age-predicted maximal heart rate, calculated as 220 minus age), 3) flexibility exercise (frequency: 2–3 sessions per week, volume: 2–4 sets per muscle group, intensity: not determined).

Recent prospective research on breast cancer survival supports the importance of physical activity for breast cancer survivors. Holmes et al.²² examined the self-reported physical activity patterns of 2,987 women enrolled in the Nurses’ Health Study

(median duration of participation = 38 months) who were diagnosed with stage I, II, or III breast cancer. Those survivors who reported physical activity levels of greater than 3 MET-hours per week (equivalent to walking at a pace of 2 to 3 mph for 1 hour a week) had reduced risk of death from breast cancer, compared to those who reported less than 3 MET-hours per week. The improved survival benefits from physical activity were particularly evident for women who reported physical activity levels of between 3 and 9 MET-hours per week, women diagnosed with stage III breast cancer, and women diagnosed with hormone-responsive tumors. Factors that did not substantially change risk of death from breast cancer among these women included: amount of physical activity prior to diagnosis, type (e.g., walking, swimming, aerobic exercise, golfing, cycling, lawn mowing) of physical activity engaged in after diagnosis, or participation in vigorous exercise that exceeded 9 MET-hours per week. Although the authors categorized Yoga practice as lower-intensity activity similar to “stretching,” an important conclusion drawn from the study was that active participation in physical activity, regardless of the type of activity, may help breast cancer survivors live longer.

All of these general guidelines for type, frequency, duration, and intensity of physical activity must be adapted to the individual, taking into account age, previous exercise experience, type of cancer, stage of treatment, type of therapy, and comorbid conditions.²³

Yoga as a Medical Intervention for Cancer Survivors

Although many cancer centers offer Yoga classes for survivors,

research is limited on the efficacy of Yoga intervention. A 16-month study of the Stanford Cancer Supportive Care Program for cancer patients found that restorative Yoga was effective at reducing stress and pain, and increasing energy, well-being, and restful sleep.²⁴ A 7-week clinical trial of Tibetan Yoga, which emphasizes gentle, simple movements, controlled breathing, visualization, and mindfulness techniques, was effective in improving overall sleep quality and reduced sleep medication use in lymphoma survivors.²⁵ Several studies have examined the benefits of mindfulness-based stress reduction (MBSR), a popular group-based clinical program used by over 240 medical facilities worldwide that incorporates gentle stretching and mindful Yoga into meditation practices.^{26,27} Studies with early and late stage cancer survivors, including breast cancer, indicate that MBSR intervention plus home practice can reduce stress symptoms²⁸ and improve sleep quality^{29,30} and overall quality of life.³¹

Because of the common physical or cognitive dysfunction associated with cancer treatment, many Yoga classes for cancer survivors incorporate gentle or restorative postures. These approaches typically emphasize the relaxation component of Yoga practice. The relaxation response, as described by Benson,³² is considered to be an important component in the healing and recovery process. This well-characterized response, which occurs when one performs “repetitive mental or physical activity and passively ignores distracting thoughts,”³³ is associated with rapid reductions in sympathetic physiological responses, such as heart rate, arterial blood pressure, respiratory rate, and whole body oxygen uptake.^{34,35} Therapeutic

use of the relaxation response improves symptoms related to various stress-related diseases, as well as some indices of immune status in breast cancer survivors.³⁶

An active *âsana* practice in the Iyengar tradition differs from the gentle restorative practices typically offered to cancer survivors by incorporating all of the components of physical fitness. However, Yoga taught in the Iyengar tradition also includes some restorative poses and a deep relaxation at the end of the practice session. For this reason, an Iyengar Yoga practice may provide many of the same benefits as relaxation-based Yoga interventions.

Yoga *Âsana* Practice and Physical Activity Guidelines

How does Yoga taught in the Iyengar tradition address the cancer survivorship guidelines for physical activity? Yoga *âsanas* require muscular strength and endurance, flexibility, and balance, and each *âsana* can be sustained for several seconds to 5–10 minutes or longer, depending on the skill level and goals of the practitioner. Dynamic *âsana* sequences (*vinyasa*) and jumpings that are incorporated into a Yoga practice constitute rigorous whole body exercise. Moderate to strenuous Yoga *vinyasa* and jumpings would be expected to promote cardiovascular endurance if the practice were sufficiently long.

Blank and Krieger³⁷ evaluated acute cardiovascular, metabolic, and ventilatory responses to Hatha-Yoga *âsanas* practiced in the Iyengar tradition. Intermediate/advanced level Yoga practitioners (n = 15 females) were monitored for heart rate, whole body oxygen uptake, and brachial arterial blood pressure (n = 9)

while following a 90-minute videotaped instruction of an *âsana* practice. The practice included supine, seated, and standing poses, as well as inversions and the full back bend, *ûrdhva-dhanurâsana*. Poses were sustained for 1–5 minutes. Cardiovascular, metabolic, and ventilatory responses were sig-

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nificantly greater in standing *âsanas*, inversions, and *ûrdhva-dhanurâsana*, compared to supine and seated *âsanas*. The average metabolic expenditure (METs) of each pose did not exceed 5 METs (i.e., 5 x energy cost of rest). Average heart rate did not exceed 80% of age-predicted maximal heart rate (220 minus age). The 90-minute *âsana* practice was classified as mild to moderate intensity exercise (~1.9 MET-hours) without evidence of a sustained elevated heart rate. Intermediate and advanced practitioners maintained poses for up to 5 minutes without stimulating an undesirable pressor response (disproportionate increase in heart rate relative to the change in whole body oxygen uptake). In general, the cardiorespiratory responses to *âsanas* were similar to changes observed in subjects who perform weightlifting circuit exercise.

The above physiological data from apparently healthy individuals provide preliminary evidence

that Yoga can meet many of the physical activity guidelines for breast cancer survivors.³⁸ An active Yoga practice can be designed to meet the weekly energy expenditure (MET-hours) requirements considered beneficial for survival after breast cancer diagnosis. As described above, the 90-minute practice performed by intermediate and advanced practitioners was equivalent to 1.9 MET-hours. Three practices per week would exceed the minimum activity level described as beneficial to breast cancer survivorship. In comparison to more advanced practitioners, beginning Yoga students may require more practice times per week to compensate for *âsana* sequences that are less physically demanding. We recommend pre-screening this population for physical and cognitive abilities prior to beginning an active Yoga class and designing a progression of postures that is optimal for all participants.

A Preliminary Study of a Yoga Intervention

To date, we have conducted two pilot studies for breast cancer survivors using Yoga *âsanas* taught in the Iyengar tradition. The findings from our first study have been previously reported and will not be included herein.^{39,40}

A short-term goal for our Yoga intervention was to meet the guidelines for physical activities as described above, but not specifically to assess various dimensions of physical fitness outcomes from Yoga practice. The findings reported here focus on the ability of breast cancer survivors to complete a Yoga intervention that

meets the guidelines for physical activities as well as provides the physical and psychological benefits associated with the practice.

Method

Participants

Our second and ongoing study includes women (n = 18, ages 48 to 69 years) diagnosed with stage I–III breast cancer and receiving antiestrogen or aromatase inhibitor hormonal therapy. Women were recruited by an announcement describing the study, which was endorsed by the attending oncologists at a local cancer care facility. The announcement was sent to all breast cancer patients under care at this facility. Those women who met the above primary inclusion criteria and who were approved for participation by their physician were allowed to volunteer for the study.

Final inclusion criteria included: 1) a minimum of eight weeks post chemotherapy, 2) estrogen receptor positive status, 3) surgery for lumpectomy, modified mastectomy, or full mastectomy (with/without reconstruction), 4) a life expectancy greater than six months, 5) adequate blood cell counts and kidney, liver, and cardiac function, and 6) the physical and mental ability to attend all the Yoga training sessions. Women on Herceptin® therapy, current steroid therapy, or other known immunomodulating medications were excluded. The following additional exclusion criteria were applied: 1) pregnancy or current lactation, 2) a past or current history of another neoplasm, active serious infection, or immune deficiency, 3) documented alcohol or drug abuse,

and 4) a history of psychiatric disorders requiring use of psychotropic medications.

Design

Women were randomized to either a Yoga (n = 9) or wait-list control (n = 9) group. Yoga classes were conducted two times per week for eight weeks. The women in the Yoga group were given a home instruction sheet to practice once a week at home, for a total of three Yoga sessions per week. During the sixth week of classes, the participants were asked to complete a 31-question self-report survey about their feelings of stress, level of physical and mental effort during class sessions, and perceptions about how Yoga practice had influenced their awareness. The study protocol was approved by Washington State University's Institutional Review Board, and written consent was obtained before data collection.

Considerations for Working with Breast Cancer Survivors

Teaching Yoga to a group of breast cancer survivors undergoing hormonal therapy presents some unique challenges. These women have all faced their mortality and continue to live with the ongoing psychological stress of the possibility of cancer recurrence. The women in our Yoga groups have completed their initial treatment for breast cancer, which includes surgery (lumpectomy or mastectomy and possibly lymph node dissection), followed by radiation and/or chemotherapy. When the original cancer cells (estrogen receptor positive, ER+) are fueled by estrogen, hormonal treatment is prescribed for

a number of years (generally 5 or more). The medications act to reduce, as much as possible, the amount of estrogen in a woman's body.

In this study, 50% of the women in the Yoga group had received chemotherapy for their breast cancer. Over 60% of the women in this group had also received radiation therapy in their cancer treatment. The range of time since treatment was three months to eight years. Two of the women in the Yoga group had also undergone reconstructive breast surgery using their own tissues as a transplant (TRAM flap). In the TRAM flap procedure, the lower belly skin, fat, and part of the transverse rectus abdominis muscle are removed and sculpted to make a new breast.

These treatments can leave women feeling emotionally and physically traumatized, with their sense of femininity compromised. Chemotherapy often causes a premenopausal woman to go into menopause. Hormonal therapy can have ongoing side effects, such as hot flashes, mood swings, difficulty sleeping, sexual side effects, and joint stiffness. There also are numerous physical consequences of treatment, many related to the chest and arm. A mastectomy with lymph node dissection often results in very tight pectoralis major and minor muscles, as well as tightness in all muscles that intersect the armpit. This tightness can then draw the humerus (upper arm) bone forward into internal rotation, and the scapula (shoulder blade) into protraction, creating weak and overstretched rhomboid muscles. Range of motion and strength in the affected arm can be decreased both initially following treatment, and,

for many women, for years after treatment.

Women also typically experience loss of sensation and awareness in the affected side in the armpit/chest area. There is often tightness of the intercostal muscles of the front and side ribcage, as well as tightness in the pectoralis muscle. These changes can reduce the capacity to fully inhale and expand the ribcage. Many women experience asymmetry of the upper body. Lymphedema, a possible side effect of lymph node dissection or removal, can cause a swollen and painful arm. One of the women in the study had lymphedema, and she wore a compression sleeve during the Yoga class to minimize edema.

Breast reconstruction, while desirable for many reasons, can also result in residual discomfort. Difficulties following this surgery include the loss of range of motion in trunk extension, as well as tightness in side bending and twisting. There may be some weakness of the abdominal muscles due to removal of part of the transverse rectus abdominis for use in the TRAM flap procedure.

The Yoga Intervention

Our intervention focused on two important benefits for cancer survivors: meeting the recommended guidelines for physical activity and inducing the relaxation response.

Our class was taught as a beginning level Iyengar Yoga class, as the Iyengar system of Yoga is well suited to meet the needs of these women. Attention to alignment and symmetry, the use of props, and careful sequencing all improve stamina, strength, flexibility, and confidence, while decreasing stress and side effects.

The women in this study had no previous experience with Iyengar

Yoga. Because of the advanced age of many of the women, and the physical challenges associated with aging and/or previous injuries not associated with breast cancer survivorship, the class was taken at a slower pace than would be expected for a younger group without these considerations. Some poses were adapted to the age and fitness level of the women. Modifications to poses also were made on an individual basis due to neck, knee, and rotator cuff conditions, as well as low back pain. Approximately 50% of the women had high blood pressure that was controlled by medication, and this also was taken into account when sequencing the classes.

Each class started with a check-in period to discuss any questions or concerns, and this discussion was followed by 5 minutes of seated meditation. After meditation, Yoga philosophy was introduced. An active *âsana* practice followed meditation, and was completed with a restorative pose and 10 minutes of *shavâsana*. Each class closed by chanting *om* in a seated position.

The following types of poses were included over the eight-week course:

Standing poses. Standing poses included: *ardha-chandrâsana* (half moon pose) with supporting arm on chair seat, *prasârîta-pâdottânâsana I* (wide-legged standing forward bend), *tâdâsana* (mountain pose), *utkatâsana* (chair pose, or fierce pose), *utthita-pârshvakonâsana* (extended side angle pose), *utthita-trikonâsana* (extended triangle pose; see Figure 1), *vîrabhadrâsana I* (warrior I pose), *vîrabhadrâsana II* (warrior II pose; see Figure 2), and *vrikshhâsana* (tree pose). Props and variations for standing poses included a chair, blocks, a

strap for arms overhead as needed, and using the wall for alignment and support.

Chest and shoulder openers. Because of the side effects associated with breast cancer treatment, chest and shoulder opening poses were emphasized more in this class than in a general beginning Iyengar class. Specific instructions directed to the armpit/chest area can help improve awareness and movement despite nerve damage and loss of sensation. Following are examples of chest and shoulder opening *âsanas* included in the class: *ûrdhva-hastâsana* (raised arms pose, arms overhead and parallel); *ûrdhva-baddhanguliyâsana* (raised interlocked fingers pose, arms overhead, palms to ceiling); *gomukhâsana* (cow face pose, arms with belt; see Figure 3); *viparîta-karanî* (legs up wall pose with arms overhead); the pectoralis muscle stretch: at the wall, or supine over blanket, block, or bolster at shoulder blades (see Figures 4 and 5); *setubandha-sarvângâsana* (bridge pose with crossed bolsters and sacrum on a block; see Figure 6); and *chatushpâdâsana* (like bridge pose, with a belt to front ankles; see Figure 7). Supported *setubandha-sarvângâsana* was emphasized in accordance with a traditional Iyengar Yoga approach, as described by Sparrowe and Walden.⁴¹ According to these authors, this pose can improve regulation of blood pressure and attenuate anxiety, mood swings, hot flashes, tension headaches, and depression. *Ûrdhva-mukha-shvanâsana* (upward facing dog pose using chair and blocks) and plank pose were taught near the end of the 8-week session.

Inversions. Beginning inversions included in the class were: *adhomukha-shvanâsana* (downward facing dog pose; see Figure 8),

uttanâsana (standing forward bend), *prasârîta-pâdottânâsana* (wide-legged standing forward bend), *viparîta-karanî* (legs up the wall pose,



Figure 1: Utthita-pârshvakonâsana (extended side angle pose)



Figure 2: Vîrabhadrâsana II (warrior II pose)

supported at the wall and unsupported with buttocks on one or two bolsters; see Figure 9). Inversions were emphasized for their restorative effects. *Viparîta-karanî* was practiced regularly due to the ability of everyone to achieve this pose, as well as for its many benefits. According to the teachings of B. K. S. Iyengar, *viparîta-karanî* can help calm nerves and balance the endocrine system⁴² and help with the regulation of blood pressure.⁴³ *Shâlamba-sarvangâsana* (shoulder stand) was not taught due to the number of physical limitations present in the group. Had this not



Figure 3: Gomukhâsana (cow face pose, arms with belt)



Figure 4: Pectoralis muscle stretch, supine over blanket

been the case, supported shoulder stand would have been taught near the end of the 8-week session.

Results

Reasons for participation. The women in the Yoga group were asked the primary reasons they volunteered to participate in a Yoga study. Their answers included: a desire to try different things and have new experiences, the oncologist's recommendation to participate, the fact that the Yoga class was part of a research study with the potential to benefit other survivors, and a desire to gain health benefits after the physical and psychological trauma from cancer treatment. The women in the Yoga group were also



Figure 5: Pectoralis muscle stretch, arms with belt



Figure 6: Setubandha-sarvângâsana (bridge pose with crossed bolsters and sacrum on a block)



Figure 7: Chatushpâdâsana (like bridge pose, with a belt to front ankles)

asked to state what they hoped to achieve by participating in the study. All respondents mentioned physical outcomes such as improved posture, reduced aches and pains, improved flexibility, and improved physical health. Sixty percent of the women reported that they hoped to improve their ability to manage stress.

Appropriateness of the class for breast cancer survivors. The sequencing of the âsanas and progression of the classes were well tolerated by the participants. When asked if they would have preferred a slower paced class with less demanding poses, over 75% of the women responded that



Figure 8: Adho-mukha-shvanâsana (downward facing dog pose)



Figure 9: Viparîta-karânî (legs up the wall pose, unsupported with buttocks on one or two bolsters)

they benefited from the structure of the class and would not prefer a more gentle Yoga class. One participant stated, "I am very grateful for the time spent in class, as I have renewed strength, more mobility, a sense of caring about each other, and I would highly recommend it to others, which I have already done."

Physical and psychological outcomes. Twenty-five percent of the women reported that Yoga practice relieved the joint aches and shoulder stiffness associated with the side effects of hormonal treatment. All of the women reported that they felt less stressed immediately after class, compared with feelings of stress when they arrived for class. Eighty-eight percent of the women reported that they felt more relaxed in their daily lives, were more aware of their body posture, and had improved body image. Sixty-three percent of the women reported improved mood and less anxiety as an outcome of the Yoga practice. On a scale of

1–10, where 1 is “not at all relaxed” and 10 is “very relaxed,” the ability to relax the body in *shavâsana* was rated as 8.5 ± 1.8 , the ability to relax the mind was rated as 8.4 ± 1.4 , and the ability to achieve inner quiet was rated as 8.9 ± 1.3 .

After the intervention. Due to the brevity of the Yoga session (8 weeks), we were interested in whether the participants intended to continue their Yoga practice at home and/or in formal Yoga classes offered within the local community. On a scale of 1–10, where 1 is “unlikely” and 10 is “extremely likely,” the intent to continue practicing at home was rated as 6.2 ± 2.7 and intent to continue practicing in formal classes was rated as 5.5 ± 3.4 . Reasons given for not continuing practice included financial constraints, family responsibilities, and/or job conflicts.

Discussion

The preliminary findings of this study indicate that the Yoga intervention was beneficial for improving body image and reducing self-reported symptoms of stress in female breast cancer survivors. Offering an active Yoga practice to this population created opportunities for the practitioner to explore physical and psychological limitations due to breast cancer treatment and/or other comorbid conditions.

The success of the Yoga intervention was highly dependent on the Yoga instructor’s ability to evaluate the physical and cognitive abilities of the students during class participation. Women who had physical limitations, such as joint range of motion restrictions, required modifications of the

poses. It was apparent from observation that the emphasis on chest/shoulder opening poses pre-

The Yoga intervention was beneficial for improving body image and reducing self-reported symptoms of stress in female breast cancer survivors.

sented the most challenges to the women. Women who had difficulty following the verbal instructions given in class required more tactile adjustments during *âsana* practice.

An active Yoga practice is particularly promising because increased physical activity is associated with a number of important physical and psychological benefits for breast cancer survivors. This study demonstrates that an active Yoga practice taught in the Iyengar tradition can be successfully offered to breast cancer survivors who are at least three months post-chemotherapy treatment and who are receiving antiestrogen or aromatase inhibitor hormonal therapy.

Future Directions

We look forward to the continued progress of this study and plan to conduct quantitative analyses on the effects of this Yoga intervention on the quality of life and selected immune indices of breast cancer survivors. It is our hope that these preliminary investigations will provide sufficient scientific evidence to support more rigorous and long-term research studies on the efficacy

of Yoga intervention for cancer survivors.

Endnotes

1. Oken, B. S., S. Kishiyama, D. Zajdel, D. Bourdette, J. Carlsen, M. Haas, C. Hugos, D. F. Kraemer, J. Lawrence, and M. Mass. Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology*, 2004, 62:2058–2064.
2. Woolery, A., H. Myers, B. Sternlieb, and L. A. Zeltzer. Yoga intervention for young adults with elevated symptoms of depression. *Alternative Therapies in Health and Medicine*, 2004, 10:60–63.
3. Brown, J. K., T. Byers, C. Doyle, et al. Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices. *CA: A Cancer Journal for Clinicians*, 2003, 53:268–291.
4. *Ibid*, pp. 268–291.
5. Ries, L. A. G., M. P. Eisner, C. L. Kosary, B. F. Hankey, B. A. Miller, L. Clegg, A. Mariotto, E. J. Feuer, and B. K. Edwards. SEER cancer statistics review, 1975–2001. Bethesda, Md.: National Cancer Institute, 2004. URL: http://seer.cancer.gov/csr/1975_2001.
6. National Cancer Institute. Cancer control and population sciences: Research findings. Washington, D.C.: National Cancer Institute, 2003. URL: <http://dcccps.nci.nih.gov/ocs/prevalence/index.htm>.
7. Brown et al., op. cit.
8. Ries et al., op. cit.
9. American Cancer Society. Cancer statistics 2005: A presentation from the American Cancer Society. Washington, D.C.: American Cancer Society, 2005. URL: http://www.cancer.org/docroot/PRO/content/PRO_1_1_Cancer_Statistics_2005_Presentation.asp.
10. National Cancer Institute. Probability of breast cancer in American women. Washington, D.C.: National Cancer Institute, 2005. URL: http://cis.nci.nih.gov/fact/5_6.htm.
11. Ries et al., op. cit.
12. Jemal, A., L. X. Clegg, E. Ward, et al. Annual report to the nation on the status of cancer, 1975–2001, with a special fea-

- ture regarding survival. *Cancer*, 2004, 101:3–27.
13. Brown et al., op. cit. pp. 268–291
14. Brown et al., op. cit., pp. 268–291.
15. Irwin, M. L., A. McTiernan, R. N. Baumgartner, K. B. Baumgartner, L. Bernstein, F. D. Gilliland, and R. Ballard-Barbash. Changes in body fat and weight after a breast cancer diagnosis: Influence of demographic, prognostic, and lifestyle factors. *Journal of Clinical Oncology*, 2005, 23:774–782.
16. Brown et al., op. cit., pp. 268–291.
17. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. Physical activity and health: A report of the Surgeon General. Atlanta, Ga.: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996, p. 5.
18. U.S. Department of Health and Human Services, U.S. Department of Agriculture. Dietary guidelines for Americans. Washington, D.C.: U.S. Department of Health and Human Services, U.S. Department of Agriculture, 2005, pp. 19–21.
19. Irwin, M. L., A. McTiernan, L. Bernstein, F. D. Gilliland, R. N. Baumgartner, K. Baumgartner, and R. Ballard-Barbash. Physical activity levels among breast cancer survivors. *Medicine & Science in Sports & Exercise*, 2004, 36:1484–1491.
20. Chlebowski, R.T., E. Aiello, and A. McTiernan. Weight loss in breast cancer patient management. *Journal of Clinical Oncology*, 2002, 20:1128–1143.
21. Galvão, D. A., and R. U. Newton. Review of exercise intervention studies in cancer patients. *Journal of Clinical Oncology*, 2005, 23:899–909.
22. Holmes, D. M., W. Y. Chen, D. Feskanich, C. H. Kroenke, and G. A. Colditz. Physical activity and survival after breast cancer diagnosis. *Journal of the American Medical Association*, 2005, 293: 2479–2485.
23. Brown et al., op. cit., pp. 268–291.
24. Rosenbaum, E., H. Gautier, P. Fobair, et al. Cancer supportive care, improving the quality of life for cancer patients. A program evaluation report. *Supportive Care in Cancer*, 2004, 12:293–301.
25. Cohen, L., C. Warneke, R. T. Fouladi, M. A. Rodriguez, and A. Chaoul-Reich. Psychological adjustment and sleep quality in a randomized trial of the effects of Tibetan Yoga intervention in patients with lymphoma. *Cancer*, 2004, 100:2253–2260.
26. Shapiro S. L., R. R. Bootzin, A. J. Figueredo, A. M. Lopez, and G. E. Schwartz. The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer: An exploratory study. *Journal of Psychosomatic Research*, 2003, 54:85–91.
27. Kabat-Zinn, J. An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, 1984, 4:33–47.
28. Speca, M., L. Carlson, E. Goodey, and M. Angen. A randomized wait-list controlled trial: The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosomatic Medicine*, 2000, 62:613–622.
29. Shapiro et al., op. cit., pp. 85–91.
30. Carlson, L. E., M. Speca, K. D. Patel, and E. Goodey. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology*, 2004, 9:448–474.
31. Ibid.
32. Benson, H., J. F. Beary, and M. P. Carol. The relaxation response. *Psychiatry*, 1974, 37:37–45.
33. Esch, T., G. L. Fricchione, and G. B. Stefano. The therapeutic use of the relaxation response in stress-related diseases. *Medical Science Monitor*, 2003, 9:RA-23–34.
34. Ibid., pp. RA23–34.
35. Benson et al., op. cit., pp. 37–45.
36. Esch et al., op. cit., pp. RA23–34.
37. Blank, S. E., and J. K. Krieger. Physiological responses to Iyengar Yoga performed by trained practitioners. (Under review.)
38. Galvão and Newton, op. cit., pp. 899–909.
39. Blank, S. E., J. L. Banasik, M. A. Crowe, M. Matson, J. C. Nichols, R. Bendel, and M. R. Haberman. Immune and psychosocial outcomes in stage II-IV HER-2+ breast cancer survivors following an 8-week complementary yoga intervention. 11th Annual Meeting of the PsychoNeuroImmunology Research Society, Titisee, Germany, 2004.
40. Crowe, M. A., M. R. Haberman, J. L. Banasik, J. C. Nichols, M. Matson, and S. E. Blank. Complementary yoga intervention increases nuclear NF- κ B in stimulated lymphocytes of women with stage II-IV HER-2+ breast cancer. 11th Annual Meeting of the PsychoNeuroImmunology Research Society, Titisee, Germany, 2004.
41. Sparrowe, L., and P. Walden. *The Woman's Book of Yoga and Health: A Lifelong Guide to Wellness*. Boston, Mass.: Shambhala Publications, 2002, pp. 51, 80.
42. Ibid.
43. Iyengar, B. K. S. *The Path to Holistic Health*. London: Dorling Kindersley, 2001, p. 216.

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