



Understanding interest, barriers, and preferences related to yoga practice among cancer survivors

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Abstract

Purpose Despite growing evidence supporting the benefits of yoga for cancer-related symptom management, yoga usage among cancer survivors is low. To translate the evidence of yoga benefits into community practice, it is critical to understand interest in yoga as well as barriers and preferences that influence yoga usage among cancer survivors.

Method We conducted a cross-sectional survey study among cancer survivors, 18 years or older, with a primary diagnosis of cancer, and receiving treatment or follow-up care at outpatient clinics at five regional academic cancer center sites. We collected data and performed bivariate and multivariable analyses on self-reported yoga usage and interest in and barriers to practicing yoga, as well as preferred location and time for yoga practice.

Results Of 857 participants, 70.0% had never practiced yoga and 52.3% were interested in practicing yoga. Among those interested, 52.5% had never practiced yoga. Lower interest was independently associated with being male (odds ratio [OR] = 0.30, 95% confidence interval [CI] = 0.20–0.44, $p < 0.001$), unemployed (OR = 0.60, 95% CI = 0.39–0.91, $p = 0.016$), and white (OR = 0.42, 95% CI = 0.23–0.78, $p = 0.005$). Commonly cited barriers among those who were interested but had never practiced were not aware of yoga benefits (36.3%), difficulty motivating (28.7%), experiencing symptoms (22.9%), and not enough time (22.0%). Participants indicated “on-site and at a studio near home” (41.5%) as preferred location and evenings (3–8 pm, 34.0%) as preferred time for yoga practice.

Conclusion Although more than 50% of patients indicated interest in practicing yoga, use of yoga is low among cancer survivors. Barriers and patient preferences for yoga practice need to be addressed to design effective yoga programs for this population.

Keywords Yoga interest · Barriers · Cancer survivor

Introduction

A number of studies demonstrate the potential beneficial effects of yoga for cancer-related symptom management [1–8]. Evidence-based clinical guidelines from the Society for Integrative Oncology (SIO) recommend yoga for reducing anxiety, stress, and depression, as well as for improving mood disturbance and quality of life among cancer survivors during and after cancer treatments [9]. The National Cancer Institute (NCI) defines a person to be a cancer survivor from the time of cancer diagnosis until end of life [10]. Despite growing evidence of yoga inclusion in supportive cancer programming, the use of yoga is low (less than 10%) among cancer survivors [11–13]. Evaluating interest, barriers, and preferences regarding yoga practice is necessary to effectively deliver yoga based on the needs of cancer survivors and to design interventions to increase yoga uptake for cancer care.

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While the barriers and motivators surrounding yoga use have been evaluated in the general population and in some chronic disease populations [14–21], few studies have focused on cancer survivors. A qualitative study exploring cancer patients' experience with yoga use found scheduling, transportation, financial cost, and lack of time as barriers to practicing yoga. Participants preferred an easily accessed group yoga class in a conventional cancer facility [22]. A mixed-methods feasibility study with focus groups and surveys among ten breast cancer survivors found cost, lack of access to transparent and evidence-based yoga information, and misconceptions about yoga, such as yoga having a religious affiliation or needing special skills to perform yoga poses, as barriers to practicing yoga. The majority of study participants preferred a convenient location outside of a cancer center [23]. Lack of awareness about existing yoga programs also kept cancer survivors from using yoga for cancer symptom management [24].

Although these qualitative studies illuminate some factors surrounding yoga use, larger scale quantitative studies with diverse cancer type population are needed to further understand the factors that enhance or impede the use of yoga by cancer survivors for symptom management. Moreover, little is known about the level of and factors surrounding interest in yoga practice in this population [25, 26]. To fill this knowledge gap, our primary study objectives were to identify cancer survivors' interest in and barriers to yoga practice, as well as preferred location and time for practicing yoga.

Methods

Study design and patient population

We conducted a cross-sectional survey study at five regional locations of an urban academic cancer center. The study was part of the quality improvement program at Memorial Sloan Kettering (MSK) Cancer Center's Integrative Medicine Services. Eligible participants were 18 years or older with a primary diagnosis of cancer, including solid tumor and hematologic malignancies of any stage, receiving treatment or follow-up care at the outpatient clinics, and understood written English. Research staff approached the patients in the waiting area during their regular oncology clinical visits and asked them to voluntarily complete a self-administered survey. The Institutional Review Board at MSK approved the use of de-identified data for the research study.

Study variables and outcome measures

Based on the study aims, we developed questions regarding interest in yoga practice, use of yoga, barriers to practice,

preferred location and time, demographics, and clinical variables.

We assessed interest in yoga by asking, "Are you interested in practicing yoga during your cancer treatment and beyond?" The answers were dichotomized as "Yes" and "No." We also asked participants about their use of yoga: "Have you practiced yoga before and/or after your cancer diagnosis?" Response options included: Never practiced, practiced only before diagnosis, practiced only after diagnosis, and practiced before and after diagnosis. The answers were dichotomized as "practiced" and "never practiced."

We inquired about barriers to practicing yoga using a 13-item barrier questionnaire. Participants who responded that they never practiced yoga, practiced only after diagnosis, and practiced before and after cancer diagnosis were asked, "Many people experience challenges to practicing yoga. What are some of the challenges you experience?" We assessed barriers using an adapted questionnaire developed in a previous study that evaluated barriers to physical activity among cancer survivors [27]. We modified the questionnaire by adding items relevant to yoga practice as mentioned in the yoga literature [15, 22, 23]. A list of 13 barriers was given to the study participants and they were able to select multiple barriers from the list that included the following: not aware of the benefits of yoga; no studio close to my house; not enough time/too busy; difficulty remaining disciplined; difficulty getting motivated; experiencing symptoms such as pain, fatigue, nausea, etc.; sadness; poor physical balance; lack of safe environment; lack of financial resources; surgical complications; my doctor told me not to exercise; and not interested. Participants who responded that they practiced yoga only before their cancer diagnosis were asked, "Why did you stop practicing yoga?," and were given a list of 12 of the above-mentioned barriers (excluding "not interested").

In addition, participants were asked about their preferred location for practicing yoga. The statement included "I would prefer to practice yoga..." and participants were asked to select one of the following options: "Onsite at the cancer center," "yoga studios near home," "home only," "both onsite and yoga studio near my home," and "no preference." We also asked participants a question regarding preferred time for yoga practice: "During which time do you prefer to practice yoga?" and gave multiple time points as response options.

Patients self-reported age, gender, race, and employment status as well as clinical variables such as type of cancer and years since cancer diagnosis.

Statistical analysis

All statistical analyses were conducted using STATA (version 15.0; STATA Corporation, College Station, TX). Descriptive statistics of the demographic and clinical variables of the study participants were summarized using number and percentage.

We analyzed interest in practicing yoga as well as barriers and preferred location and time for yoga practice using bivariate analysis. We completed further bivariate analysis to identify barriers among various subgroups, including interested but never practiced, not interested, and practiced but stopped. Chi square test of independence was used to compare sociodemographic and clinical characteristics of study participants who were interested and not interested in practicing yoga. A multivariate logistic regression model was then used to identify independent predictors of interest in yoga practice. Variables with $p < 0.10$ in the bivariate analyses were included in the multivariate analysis. All analyses were two-sided with a $p < 0.05$ indicating significance.

Results

The characteristics of the study participants are summarized in Table 1. Among 857 participants, 23.1% were younger than 40 years of age, 25.9% were between 40 and 60 years, and 51.0% were 60 years or above. Most participants were white (85.3%) and 61.5% were female; 56.2% of the participants were not employed, 36.9% were employed full-time, and 6.9% part-time. More than half of the study participants (59.0%) were less than two years from their cancer diagnosis. Among cancer types, 25.4% of participants had breast cancer, 20.7% gastrointestinal, 13.4% hematologic, 9.5% gynecologic, 8.4% thoracic, 6.5% prostate, 6.1% head/neck, 3.3% genitourinary, and 6.6% other cancer types.

Interest in practicing yoga

Among study participants, 52.3% were interested in practicing yoga during and/or beyond their cancer treatment. Among those interested, 52.5% had never practiced yoga. There was no significant bivariate association between interest in practicing yoga and age. However, race (67% non-white vs. 52.2% white; $p = 0.005$), gender (63.7% female vs. 36.0% male; $p < 0.001$), employment (50.0% unemployed vs. 58.8% full-time vs. 66% part-time; $p = 0.019$), and years since cancer diagnosis (56.7% <2 years vs. 47.6% 2 to 5 years vs. 44.8% > 5 years, $p = 0.015$), were all found to be significantly associated with expressing interest in practicing yoga. Based on the type of cancer, breast cancer survivors had the highest interest (69.5%) while prostate cancer survivors had the lowest (29.4%) interest in practicing yoga ($p < 0.005$). (Table 2)

We then developed a multivariable model to identify independent predictors of interest in practicing yoga. We included age, race, gender, employment, and years since cancer diagnosis in the model. Gender, race, and employment remained significantly associated with interest in practicing yoga in the multivariable analysis. Compared to females, males were less likely to be interested [OR = 0.30, 95% CI = 0.20–0.44, $p =$

<0.001]; compared to non-whites, whites were less likely to be interested [OR = 0.42, 95% CI = 0.23–0.78 $p = 0.005$]; and compared to full-time, not employed patients [OR = 0.60, 95% CI = 0.39–0.91, $p = 0.016$] were less likely to be interested in practicing yoga (Table 3).

Use of yoga

Among the study participants, 600 (70%) had never practiced yoga and 257 (30%) had practiced yoga at some point before and/or after diagnosis. Among those who had practiced yoga, 148 (17.3%) had practiced before cancer diagnosis, 27 (3.2%) practiced only after cancer diagnosis, and 82 (9.6%) practiced yoga before and after cancer diagnosis. Moreover, among those who practiced, 55 (21.4%) were current practitioners, which is 6.4% of the total study participants.

Table 1 Demographic and clinical characteristics of study participants ($N = 857$)^a

Characteristics	<i>N</i>	%
Age (years)		
<40	132	23.1
≥40 to <60	148	25.9
≥60	292	51.0
Gender		
Female	477	61.5
Male	297	38.3
Race/ethnicity		
White	615	85.3
Non-white	106	14.7
Employment		
Full-time	267	36.9
Part-time	50	6.9
Not employed	406	56.2
Years since cancer diagnosis		
<2	483	59.0
2 to 5	210	25.7
>5	125	15.3
Cancer type		
Breast	200	25.4
Prostate	51	6.5
Thoracic	66	8.4
Gastrointestinal	163	20.7
Head/neck	48	6.1
Hematological	105	13.4
Gynecological	75	9.5
Genitourinary ^b	26	3.3
Other	52	6.6

^a Numbers do not add up to 857 due to missing data

^b Genitourinary cancer excludes prostate cancer

Table 2 Demographic and clinical characteristics of study participants and interest in practicing yoga

	Interested in yoga practice		<i>P</i> value
	<i>N</i>	%	
Total	448	52.3	
Age (years)			0.163
<40	74	56.1	
≥40 and <60	90	60.8	
≥60	150	51.4	
Gender			<0.001
Female	304	63.7	
Male	107	36.0	
Race/ethnicity			0.005
Non-white	71	67.0	
White	321	52.2	
Employment			0.019
Full-time	157	58.8	
Part-time	33	66.0	
Not employed	203	50.0	
Years since cancer diagnosis			0.015
<2	274	56.7	
2 to 5	100	47.6	
>5	56	44.8	
Cancer type			<0.001
Breast	139	69.5	
Prostate	15	29.4	
Thoracic	29	43.9	
GI	86	52.8	
Head/neck	19	39.6	
Hematologic	52	49.5	
GYN	43	57.3	
GU	9	34.6	
Other	25	48.1	

Perceived barriers to practicing yoga

Among the 674 participants who noted at least one barrier—excluding those who practiced yoga before diagnosis but stopped—the most commonly perceived barriers to practicing yoga were the following: not interested in practicing yoga (27.6%, *N* = 186), not aware of the benefits of yoga (25.7%, *N* = 173), and not enough time/too busy (20.5%, *N* = 138). Among these, 31 patients (18%) who selected not aware of the benefit of yoga also selected not interested in yoga; and 18 patients (13%) who selected no time/too busy also selected not interested in yoga.

Additional barriers to yoga practice were difficulty getting motivated (17.8%, *N* = 120); experiencing symptoms such as pain, fatigue, and nausea (17.6%, *N* = 119); difficulty remaining disciplined (13.5%, *N* = 91); and poor physical balance

Table 3 Multivariate model of factors associated with interest in practicing yoga

	OR	95% CI	<i>P</i> value
Age			
<40	1		
≥40 and <60	0.95	0.54–1.65	0.85
≥60	0.98	0.61–1.57	0.93
Gender			
Female	1		
Male	0.30	0.20–0.44	<0.001
Race			
Non-white	1		
White	0.42	0.23–0.78	0.005
Employment			
Full-time	1		
Part-time	1.01	0.43–2.38	0.99
Not employed	0.60	0.39–0.91	0.016
Years since diagnosis			
<2	1		
2 to 5	0.75	0.47–1.19	0.22
>5	0.75	0.44–1.28	0.29

OR odds ratio, CI confidence interval

(13.4%, *N* = 90). Only 3 study participants (0.1%) mentioned “my doctor told me not to exercise” as a barrier to yoga practice. We excluded barriers with responses less than 5% from further analysis. All barriers are presented in Fig. 1.

Among the 148 study participants who practiced yoga before their cancer diagnosis and stopped, reasons for stopping included not enough time/too busy (38.5%, *N* = 57), difficulty remaining disciplined (21.6%, *N* = 32), experiencing symptoms (21.6%, *N* = 32), and difficulty getting motivated (17.6%, *N* = 26).

The most commonly perceived barriers among 223 participants who were interested but never practiced yoga included not being aware of the benefits of yoga (*N* = 81, 36.3%); difficulty getting motivated (*N* = 64, 28.7%); experiencing symptoms such as pain, fatigue, and nausea (*N* = 51, 22.9%); not enough time/too busy (*N* = 49, 22.0%); poor physical balance (*N* = 44, 19.7%); difficulty remaining disciplined (*N* = 42, 18.8%); and lack of financial resources (*N* = 26, 11.6%). Among 367 study participants who were not interested in practicing yoga, the most common barrier was not aware of the benefits of yoga (*N* = 91, 24.8%), followed by not enough time/too busy (*N* = 65, 17.7%), difficulty getting motivated (*N* = 49, 13.4%), experiencing symptoms such as pain, fatigue, and nausea (*N* = 48, 13%), and poor physical balance (*N* = 38, 10.4%) (Fig. 2).

Preferred location for practicing yoga

When asked about their preferred location for practicing yoga, 186 (41.5%) study participants who were interested in

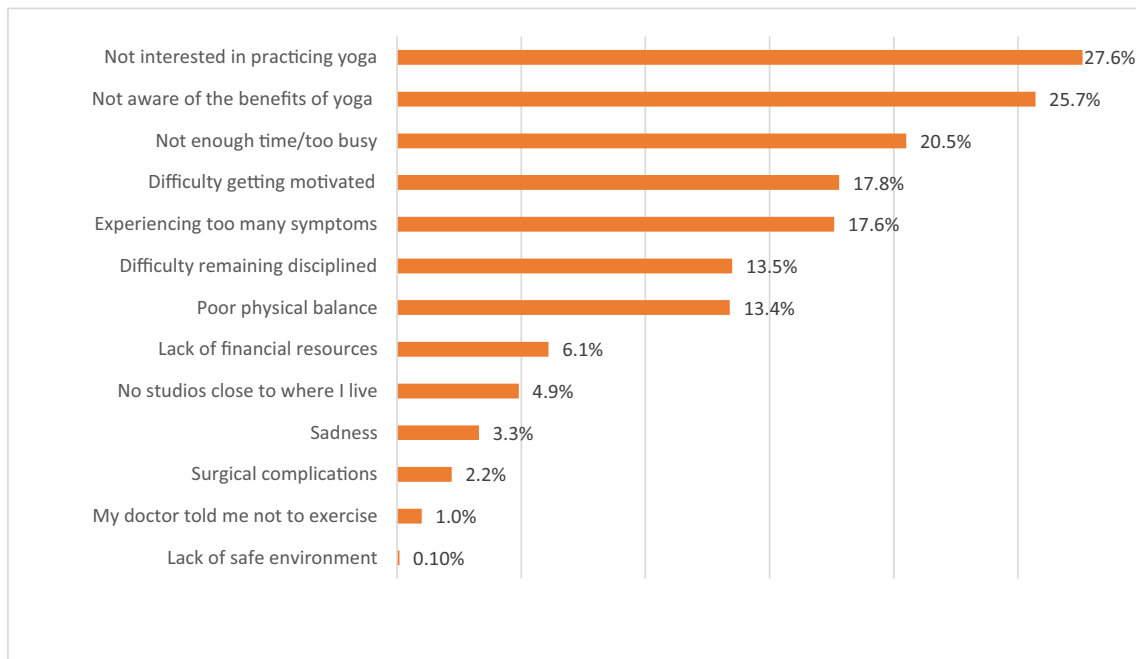


Fig. 1 Barriers to practicing yoga (N = 674)

practicing yoga chose “cancer center and studio close to home” as preferred locations. “Only studio close to home” was selected by 127 (28.4%) participants followed by “only cancer center” (71, 15.8%) and “home practice only” (26, 5.8%); 38 (8.5%) participants had no preference.

Preferred time for practicing yoga

Among participants who responded to this question, the preferred time among those interested in practicing yoga was 3–8 pm (N = 100, 34.0%), followed by 6–11 am (N = 79, 26.9%)

and 11 am–3 pm (N = 64, 21.8%); 51 (17.4%) of the study participants had no time preference.

Discussion

In this large cross-sectional study among 857 cancer survivors, more than half of the study participants were interested in practicing yoga; however, the use of yoga was low. Those interested were more likely to be full-time employed, non-whites, and females. The study provides insight into numerous

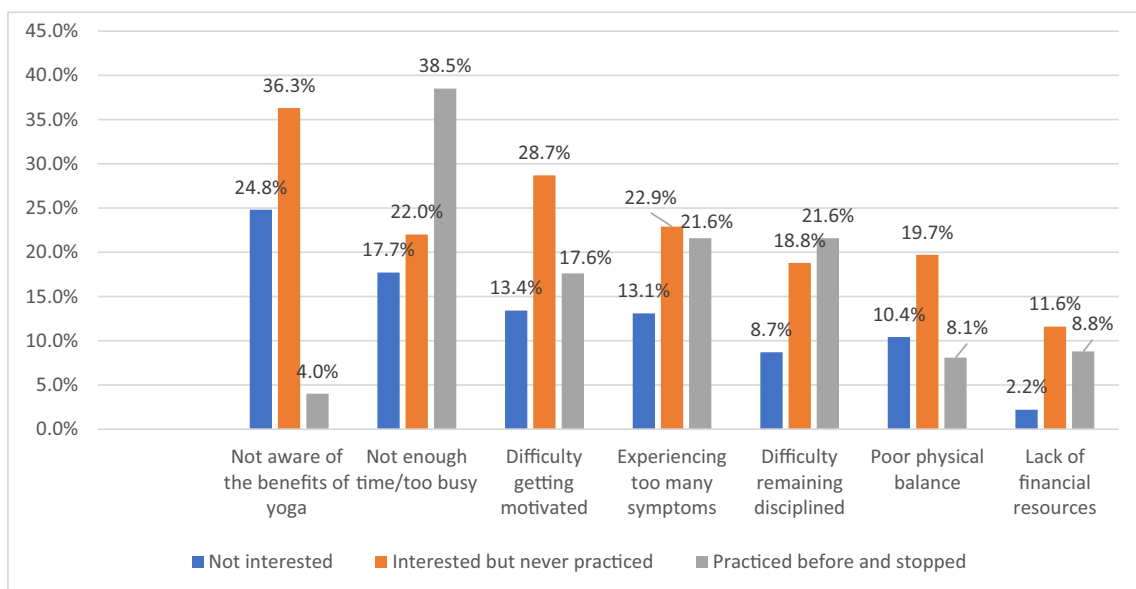


Fig. 2 Percentages of participants endorsing specific barriers among not interested, interested but never practiced, and practiced before and stopped yoga

barriers cancer survivors' experience in initiating or continuing a yoga practice after a cancer diagnosis, along with their preferred location and time for yoga practice. Our findings emphasize the need for developing strategies to reduce barriers and designing effective yoga programs based on the preferences of cancer survivors to improve access and increase acceptability of yoga for cancer care.

Our study found high interest in using yoga during cancer treatment and beyond among study participants. Similar to Complementary and Alternative Medicine (CAM) and yoga use literature [28–31], interest in yoga, in the present study, was significantly higher among females and full-time employed cancer survivors. However, even though yoga use has been found to be higher among white survivors [28], our study found higher interest in yoga use among non-white survivors. One possible explanation is that although non-white survivors have higher interest, they may not be able to practice yoga due to difficulty accessing yoga classes. Disparities in healthcare access are common among minority cancer survivors [32]. Moreover, prior research has also shown that yoga studios tend to be concentrated in upper-income neighborhoods, creating disparities in the availability of such services [33]. Further research is needed to better understand the barriers and needs of non-white cancer survivors to provide equitable access to yoga for cancer care.

Although there was high interest in practicing yoga among study participants and evidence supports the integration of yoga into supportive cancer care [9], few cancer survivors utilized yoga for symptom management. Only 6.4% of surveyed cancer patients in our research had a current yoga practice, revealing that substantial barriers to yoga practice exist among cancer survivors.

One of the key barriers we identified in our study that prevent cancer survivors from utilizing yoga was lack of awareness about the benefits of yoga. Hence, educating cancer patients is imperative in increasing yoga awareness and utilization. Health care providers can also play a key role in improving yoga awareness by discussing with their patients how yoga may help improve treatment-related side effects and by referring patients to existing yoga programs. They can provide educational yoga materials during patient visits and assist patients in making decisions regarding use of yoga for supportive cancer care. However, not all oncology providers are well-informed about the evidence-based benefits of yoga in cancer care and might hesitate in referring patients to yoga programs [23]. Increasing providers' awareness regarding the benefits of yoga is necessary for greater yoga service utilization [34]. Therefore, developing multi-level educational interventions for patients as well as oncology providers is critical in increasing yoga awareness and use of yoga for cancer care.

Our study also found that not enough time/too busy was a major challenge to cancer survivors' ability to access yoga, especially among those who practiced before diagnosis and

then stopped. Travel burden to clinic visits and treatment schedules, as well as added stress from the diagnosis might contribute to stopping yoga practice post cancer diagnosis. This suggests the need for providing easy access to yoga classes that fits within the cancer care, for example, coordinating oncology appointments with yoga class times. Moreover, the majority of our study participants preferred evening times (3–8 pm) followed by morning times (6–11 am) for practicing yoga. Demanding jobs and family obligations along with scheduling difficulties are common barriers that affect adherence to yoga practice [14, 15, 17, 19, 22, 35]. Considering the time preferences of cancer survivors and providing yoga classes at multiple time points to accommodate their schedules may be particularly important in designing a sustainable in-person yoga program.

Innovative virtual yoga delivery models may also play an important role in addressing the “not enough time/too busy” barrier because they are convenient and allow for flexibility regarding time [36]. Internet delivery has been shown to have significant potential in increasing acceptability and improving accessibility to various mind-body interventions including yoga among cancer survivors [37]. Preliminary studies have shown the feasibility and acceptability of online yoga interventions [38–41]; however, some of the limitations of online programs such as access or familiarity with technology, lack of social support, and inability to see or interact with other participants may need to be addressed [36, 38, 41, 42]. Future research needs to evaluate both virtual and in-person delivery of yoga to increase access to and impact of yoga as part of comprehensive support programming for cancer survivors.

Symptom burden has been identified as one of the key barriers in our study among those interested in yoga, but who had never practiced it. Cancer survivors often suffer from various disease and treatment-related comorbidities that make it difficult to adhere to a yoga practice. Hence, it is important to tailor yoga classes to accommodate symptom-related needs and functional limitations unique to cancer survivors. Designing gentle forms of practice, such as restorative yoga, with modified poses using blocks, props, and chairs, and taught by instructors trained in cancer-specific yoga might appeal to cancer survivors in various stages of cancer treatment and recovery.

This study also emphasizes the role and importance of community and group interaction in a yoga class among cancer survivors. Most study participants stated that their preferred location for yoga practice was both the “cancer center and yoga studio close to home” (41.5%) followed by “only studio close to home” (28.4%). Only 6% preferred to practice in their home. Hence, providing easy access to yoga studios and instructors that cater to the needs of cancer survivors is important. Community and academic cancer centers could consider developing partnerships with yoga studios in the community which would allow patients to attend yoga classes

either at the cancer center or to be referred to a vetted community yoga studio where they could practice yoga with instructors who address the needs of cancer survivors. Moreover, partnering with community yoga studios is a viable alternative for cancer centers that do not have the resources to provide yoga services to their patients.

Yoga is a mind-body exercise with a strong evidence base in improving psychosocial wellbeing among cancer survivors [9], but how yoga should be used in addition to other forms of exercises or in replacement of other forms of exercises remain unclear. Based on robust evidence, the American College of Sports Medicine (ACSM) guidelines recommend aerobic exercise, resistance training, or a combination of two for greatly improving various health-related outcomes among cancer survivors [43]. However, there is not a sufficient evidence base to recommend one form of exercise over another in reducing cancer-related side effects [44]. Hence, more research is needed to compare the effects of yoga with aerobic and strength training exercises to increase the evidence base and inform patient-centered decision making.

It is important to acknowledge several limitations of this study. The study relied on self-report. Therefore, social desirability and recall bias may be present. We have evaluated perceived barriers which may be different than the actual barriers. Also, we did not collect data on participants' treatment status or cancer stage, which may have influenced their interest, barriers, and preferences for yoga practice. Barriers have been assessed only from the patients' perspective. Provider or institutional barriers to yoga practice, which were not examined in the present study, may exist. Moreover, the majority of our study participants were white, and our study was completed at five regional locations of an urban academic cancer center. Hence, our study results may not be generalizable to other races and ethnicities and to practice settings outside of an academic medical center.

Future research should focus on the development, implementation, and access to educational interventions for cancer patients as well as healthcare providers and determining whether such educational efforts increase the utilization of yoga. Identification of barriers towards integrating yoga for cancer care from the health care providers' and institutions' perspective is needed to develop scalable and sustainable yoga intervention programs. Moreover, research is needed to better understand the barriers and needs specific to non-white patients towards yoga practice to translate their interest into actual practice.

Nonetheless, to our knowledge this is the first large-scale, quantitative study with diverse cancer types to identify interest in, barriers to, and preferences of cancer survivors for the use of yoga for cancer-related symptom management. Our study reveals that although the majority of patients express interest in practicing yoga, among cancer survivors the use of yoga is low. Barriers and patient preferences for yoga practice need to

be addressed in the design of yoga programs tailored to the needs of cancer survivors. Effective yoga delivery may help improve access to and dissemination of the benefits of yoga in cancer care.

Code availability Not applicable.

Author contributions Krupali Desai: conceptualization, investigation, methodology, data curation, formal analysis, writing-first draft, writing-review, and editing. Ting Bao: conceptualization, methodology, investigation, writing-review, and editing. Qing S Li: conceptualization, data curation, methodology, formal analysis, writing-review, and editing. Nirupa Raghunathan: conceptualization, methodology, data curation, formal analysis, writing-review and editing. Kelly Trevino: conceptualization, investigation, writing-review, and editing. Angela Green: conceptualization, methodology, investigation, writing-review, and editing. Jun J. Mao: conceptualization, visualization, data curation, funding acquisition, investigation, methodology, writing-original draft, writing-review, and editing.

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Data availability Not applicable.

Declarations

Ethics approval The Institutional Review Board at Memorial Sloan Kettering Cancer Center approved the use of de-identified data for the research study.

Consent to participate Not applicable.

Consent to publication Not applicable.

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References

1. 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. <https://doi.org/10.1186/1471-2407-12-559>
2. 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. <https://doi.org/10.1002/cncr.26702>

3. Mustian KM (2013) Yoga as treatment for insomnia among cancer patients and survivors: a systematic review. *Eur Med J Oncol* 1: 106–115
4. Raghavendra RM, Nagarathna R, Nagendra HR, Gopinath KS, Srinath BS, Ravi BD, Patil S, Ramesh BS, Nalini R (2007) Effects of an integrated yoga programme on chemotherapy-induced nausea and emesis in breast cancer patients. *European Journal of Cancer Care* 16(6):462–474. <https://doi.org/10.1111/j.1365-2354.2006.00739.x>
5. Carson JW, Carson KM, Porter LS, Keefe FJ, Shaw H, Miller JM (2007) Yoga for women with metastatic breast cancer: Results from a pilot study. *Journal of Pain and Symptom Management* 33(3): 331–341. <https://doi.org/10.1016/j.jpainsymman.2006.08.009>
6. Banasik J, Williams H, Haberman M, Blank SE, Bendel R (2011) Effect of Iyengar yoga practice on fatigue and diurnal salivary cortisol concentration in breast cancer survivors. *Journal of the American Academy of Nurse Practitioners* 23(3):135–142. <https://doi.org/10.1111/j.1745-7599.2010.00573.x>
7. Lundt A, Jentschke E (2019) Long-term changes of symptoms of anxiety, depression, and fatigue in cancer patients 6 months after the end of yoga therapy. *Integr Cancer Ther* 18: 1534735418822096. <https://doi.org/10.1177/1534735418822096>
8. Cohen L, Warneke C, Fouladi RT, Rodriguez MA, Chaoul-Reich A (2004) Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer* 100(10):2253–2260. <https://doi.org/10.1002/ncr.20236>
9. Lyman GH, Greenlee H, Bohlke K, Bao T, DeMichele AM, Deng GE, Fouladbakhsh JM, Gil B, Hershman DL, Mansfield S, Mussallem DM, Mustian KM, Price E, Raffo S, Cohen L (2018) Integrative Therapies during and after breast cancer treatment: ASCO endorsement of the SIO Clinical Practice Guideline. *Journal of Clinical Oncology* 36(25):2647–2655. <https://doi.org/10.1200/jco.2018.79.2721>
10. National Cancer Institute NCI Dictionary of Cancer Terms <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/survivor> Accessed Sept. 9th 2020
11. Yildiz I, Ozguroglu M, Toptas T, Turna H, Sen F, Yildiz M (2013) Patterns of complementary and alternative medicine use among Turkish cancer patients. *J Palliat Med* 16(4):383–390. <https://doi.org/10.1089/jpm.2012.0226>
12. Mao JJ, Palmer CS, Healy KE, Desai K, Amsterdam J (2011) Complementary and alternative medicine use among cancer survivors: a population-based study. *J Cancer Surviv* 5(1):8–17. <https://doi.org/10.1007/s11764-010-0153-7>
13. Boon HS, Olatunde F, Zick SM (2007) Trends in complementary/alternative medicine use by breast cancer survivors: comparing survey data from 1998 and 2005. *BMC Womens Health* 7:4. <https://doi.org/10.1186/1472-6874-7-4>
14. Atkinson NL, Permut-Levine R (2009) Benefits, barriers, and cues to action of yoga practice: a focus group approach. *Am J Health Behav* 33(1):3–14. <https://doi.org/10.5993/ajhb.33.1.1>
15. Brems C, Justice L, Sulenes K, Girasa L, Ray J, Davis M, Freitas J, Shean M, Colgan D (2015) Improving access to yoga: barriers to and motivators for practice among health professions students. *Adv Mind Body Med* 29(3):6–13
16. Combs MA, Thorn BE (2014) Barriers and facilitators to yoga use in a population of individuals with self-reported chronic low back pain: a qualitative approach. *Complement Ther Clin Pract* 20(4): 268–275. <https://doi.org/10.1016/j.ctcp.2014.07.006>
17. Dayananda H, Ilavarasu JV, Rajesh S, Babu N (2014) Barriers in the path of yoga practice: An online survey. *Int J Yoga* 7(1):66–71. <https://doi.org/10.4103/0973-6131.123490>
18. Harris A, Austin M, Blake TM, Bird ML (2019) Perceived benefits and barriers to yoga participation after stroke: a focus group approach. *Complement Ther Clin Pract* 34:153–156. <https://doi.org/10.1016/j.ctcp.2018.11.015>
19. Spadola CE, Rottapel R, Khandpur N, Kontos E, Bertisch SM, Johnson DA, Quante M, Khalsa SBS, Saper RB, Redline S (2017) Enhancing yoga participation: a qualitative investigation of barriers and facilitators to yoga among predominantly racial/ethnic minority, low-income adults. *Complement Ther Clin Pract* 29:97–104. <https://doi.org/10.1016/j.ctcp.2017.09.001>
20. Baspure S, Jagannathan A, Kumar S, Varambally S, Thirthalli J, Venkatasubramanian G, Nagendra H, Gangadhar BN (2012) Barriers to yoga therapy as an add-on treatment for schizophrenia in India. *Int J Yoga* 5(1):70–73. <https://doi.org/10.4103/0973-6131.91718>
21. Hewett ZL, Pumpa KL, Smith CA, Fahey PP, Cheema BS (2019) Predictors of and barriers to adherence in a 16-week randomised controlled trial of Bikram yoga in stressed and sedentary adults. *Complement Ther Med* 42:374–380. <https://doi.org/10.1016/j.ctim.2018.12.015>
22. 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. <https://doi.org/10.1186/s12906-015-0738-9>
23. Slocum-Gori S, Howard AF, Balneaves LG, Kazanjian A (2013) Investigating the perceived feasibility of integrative medicine in a conventional oncology setting: yoga therapy as a treatment for breast cancer survivors. *Integr Cancer Ther* 12(2):103–112. <https://doi.org/10.1177/1534735412443851>
24. Raghunathan NJ, Korenstein D, Li QS, Mao JJ (2019) Awareness of yoga for supportive care in cancer: implications for dissemination. *J Altern Complement Med* 25(8):809–813. <https://doi.org/10.1089/acm.2018.0510>
25. Nightingale CL, Steffen LE, Tooze JA, Petty W, Danhauer SC, Badr H, Weaver KE (2019) Lung cancer patient and caregiver health vulnerabilities and interest in health promotion interventions: an exploratory study. *Glob Adv Health Med* 8:2164956119865160. <https://doi.org/10.1177/2164956119865160>
26. Lopez G, Liu W, Madden K, Fellman B, Li Y, Bruera E (2018) Adolescent-young adults (AYA) with cancer seeking integrative oncology consultations: demographics, characteristics, and self-reported outcomes. *Support Care Cancer* 26(4):1161–1167. <https://doi.org/10.1007/s00520-017-3937-8>
27. Romero SAD, Brown JC, Bauml JM, Hay JL, Li QS, Cohen RB, Mao JJ (2018) Barriers to physical activity: a study of academic and community cancer survivors with pain. *J Cancer Surviv* 12(6):744–752. <https://doi.org/10.1007/s11764-018-0711-y>
28. Desai K, Bowman MA, Galantino ML, Hughes-Halbert C, Vapiwala N, Demichele A, Mao JJ (2010) Predictors of yoga use among patients with breast cancer. *Explore (NY)* 6(6):359–363. <https://doi.org/10.1016/j.explore.2010.08.002>
29. Garrow D, Egede LE (2006) National patterns and correlates of complementary and alternative medicine use in adults with diabetes. *J Altern Complement Med* 12(9):895–902. <https://doi.org/10.1089/acm.2006.12.895>
30. Fox P, Coughlan B, Butler M, Kelleher C (2010) Complementary alternative medicine (CAM) use in Ireland: a secondary analysis of SLAN data. *Complement Ther Med* 18(2):95–103. <https://doi.org/10.1016/j.ctim.2010.02.001>
31. Fang L, Schinke SP (2007) Complementary alternative medicine use among Chinese Americans: findings from a community mental health service population. *Psychiatr Serv* 58(3):402–404. <https://doi.org/10.1176/ps.2007.58.3.402>
32. Ward E, Jemal A, Cokkinides V, Singh GK, Cardinez C, Ghafoor A, Thun M (2004) Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin* 54(2):78–93. <https://doi.org/10.3322/canjclin.54.2.78>

33. Saper R (2016) Integrative medicine and health disparities. *Glob Adv Health Med* 5(1):5–8. <https://doi.org/10.7453/gahmj.2015.133>
34. Koula MJ, Knight JM (2018) Increasing provider awareness of and recommendations for yoga and meditation classes for cancer patients. *Support Care Cancer* 26(10):3635–3640. <https://doi.org/10.1007/s00520-018-4220-3>
35. Quilty MT, Saper RB, Goldstein R, Khalsa SB (2013) Yoga in the real world: perceptions, motivators, barriers, and patterns of use. *Glob Adv Health Med* 2(1):44–49. <https://doi.org/10.7453/gahmj.2013.2.1.008>
36. Huberty J, Eckert R, Larkey L, Gowin K, Mitchell J, Mesa R (2018) Perceptions of myeloproliferative neoplasm patients participating in an online yoga intervention: a qualitative study. *Integr Cancer Ther* 17(4):1150–1162. <https://doi.org/10.1177/1534735418808595>
37. Trevino KM, Raghunathan N, Latte-Naor S, Polubriaginof FCG, Jensen C, Atkinson TM, Emard N, Seluzicki CM, Ostroff JS, Mao JJ (2020) Rapid deployment of virtual mind-body interventions during the COVID-19 outbreak: feasibility, acceptability, and implications for future care. *Support Care Cancer*. 29:543–546. <https://doi.org/10.1007/s00520-020-05740-2>
38. Addington EL, Sohl SJ, Tooze JA, Danhauer SC (2018) Convenient and Live Movement (CALM) for women undergoing breast cancer treatment: challenges and recommendations for internet-based yoga research. *Complement Ther Med* 37:77–79. <https://doi.org/10.1016/j.ctim.2018.02.001>
39. Huberty J, Eckert R, Dueck A, Kosiorek H, Larkey L, Gowin K, Mesa R (2019) Online yoga in myeloproliferative neoplasm patients: results of a randomized pilot trial to inform future research. *BMC Complement Altern Med* 19(1):121. <https://doi.org/10.1186/s12906-019-2530-8>
40. Huberty J, Eckert R, Gowin K, Mitchell J, Dueck AC, Ginos BF, Larkey L, Mesa R (2017) Feasibility study of online yoga for symptom management in patients with myeloproliferative neoplasms. *Haematologica* 102(10):e384–e388. <https://doi.org/10.3324/haematol.2017.168583>
41. Selman L, McDermott K, Donesky D, Citron T, Howie-Esquivel J (2015) Appropriateness and acceptability of a Tele-Yoga intervention for people with heart failure and chronic obstructive pulmonary disease: qualitative findings from a controlled pilot study. *BMC Complement Altern Med* 15:21. <https://doi.org/10.1186/s12906-015-0540-8>
42. Hoch DB, Watson AJ, Linton DA, Bello HE, Senelly M, Milik MT, Baim MA, Jethwani K, Fricchione GL, Benson H, Kvedar JC (2012) The feasibility and impact of delivering a mind-body intervention in a virtual world. *PLoS One* 7(3):e33843. <https://doi.org/10.1371/journal.pone.0033843>
43. ACSM Guidelines for Exercise and Cancer (2019). <https://www.acsm.org/blog-detail/acsm-certified-blog/2019/11/25/acsm-guidelines-exercise-cancer-download>. Accessed December 14 2020
44. El-Hashimi D, Gorey KM (2019) Yoga-Specific enhancement of quality of life among women with breast cancer: systematic review and exploratory meta-analysis of randomized controlled trials. *J Evid Based Integr Med* 24:2515690X19828325. doi:<https://doi.org/10.1177/2515690X19828325>

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