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Review of Yoga Therapy During Cancer Treatment

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Abstract

Purpose—Reviews of yoga research that distinguish results of trials conducted *during* (versus after) cancer treatment are needed to guide future research and clinical practice. We therefore conducted a review of non-randomized studies and randomized controlled trials of yoga interventions for children and adults undergoing treatment for any cancer type.

Methods—Studies were identified via research databases and reference lists. Inclusion criteria: (1) children or adults undergoing cancer treatment; (2) intervention stated as yoga or component of yoga; and (3) publication in English in peer-reviewed journals through October 2015. Exclusion criteria: (1) samples receiving hormone therapy only; (2) interventions involving only meditation; and (3) yoga delivered within broader cancer recovery or mindfulness-based stress reduction programs.

Results—Results of non-randomized (adult: n=8, pediatric: n=4) and randomized controlled trials (adult: n=13, pediatric: n=0) conducted during cancer treatment are summarized separately by age group. Findings most consistently support improvement in psychological outcomes (e.g., depression, distress, anxiety). Several studies also found that yoga enhanced quality of life, though further investigation is needed to clarify domain-specific efficacy (e.g., physical, social, cancer-specific). Regarding physical and biomedical outcomes, evidence increasingly suggests that yoga ameliorates sleep and fatigue; additional research is needed to advance preliminary findings for other treatment sequelae and stress/immunity biomarkers.

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Conflict of Interest

All authors have no conflicts of interest to report. This review article did not involve primary or secondary data analysis; all source articles reviewed by authors are available from the source journals.

Conclusions—Among adults undergoing cancer treatment, evidence supports recommending yoga for improving psychological outcomes, with potential for also improving physical symptoms. Evidence is insufficient to evaluate the efficacy of yoga in pediatric oncology. We describe suggestions for strengthening yoga research methodology to inform clinical practice guidelines.

Keywords

yoga; cancer; chemotherapy; radiation therapy; symptoms; mind-body

Worldwide, more than 14 million people are diagnosed with and more than 8.2 million people die from cancer each year [1]. Behavioral risk factors such as high body mass index (BMI), tobacco use, physical inactivity, unhealthy diets, and excessive use of alcohol contribute to cancer etiology, progression and outcomes [1-3]. Moreover, chronic stress and depression can have direct and indirect effects on cancer by changing biology and influencing behaviors [4-6].

Cancer diagnosis and treatment can also increase distress and cause biomedical sequelae such as pain, sleep disturbances, fatigue, nausea/vomiting, and chemotherapy-induced immunosuppression. Some consequences of cancer are temporary, but many persist, leaving patients to manage them long term. Further, these effects increase patients' vulnerability to other illnesses. To manage these effects, people may use mind-body practices such as yoga, which is one of the most frequently used complementary modalities among men and women with cancer in the United States [7-9].

Psychophysiological Rationale for the Use of Yoga during Cancer

Treatment

Stress can have extensive physiologic effects [10], including telomere shortening, increased inflammatory cytokines and decreased cell-mediated immunity, which are associated with increased cancer risk and poorer cancer-related outcomes [4, 11-13]. Although stress may not directly cause cancer, it can promote cancer growth and progression through neuroendocrine pathways (e.g., sympathetic nervous system, hypothalamic-pituitary-adrenal axis) that increase inflammation, promote angiogenesis, reduce anoikis, and decrease the efficacy of chemotherapy [4, 6, 14]. Biobehavioral interventions such as yoga therefore have the potential to improve cancer outcomes by decreasing stress and disrupting its effects on cancer biology [4, 11, 15].

Previous reviews assessing the potential for yoga to benefit cancer survivors have not differentiated people receiving active cancer treatment from post-treatment survivors [16-18]. Initial attempts to examine the efficacy of yoga during cancer treatment versus post-treatment survivorship remain inconclusive [19]. Therefore, the need remains for research to evaluate the role of yoga during distinct phases of cancer survivorship [16, 20]. This review thus focuses specifically on people *during* cancer treatment.

Methods

To identify trials of yoga for people undergoing cancer treatment, search terms including yoga, cancer and related/Medical Subject Headings terms (e.g., neoplasm) were entered in CINAHL, MEDLINE, PsycINFO, and PubMed. Reference lists of identified articles were used to find additional relevant reports. Inclusion criteria were: (1) sample including children or adults undergoing cancer treatment; (2) intervention stated as yoga or component of yoga; and (3) published in English in peer-reviewed journals, through October 2015. Exclusion criteria included: (1) samples receiving hormone therapy only; (2) interventions involving only meditation; and (3) yoga delivered as part of a larger cancer recovery or mindfulness-based stress reduction program. Results of non-randomized studies (Table 1) and randomized controlled trials (RCTs) are summarized separately (Table 2). Details of each yoga intervention protocol are summarized in Table 3.

Results

Pediatric Studies: Non-Randomized Trials of Yoga during Cancer Treatment

No RCTs of yoga during cancer treatment in pediatric samples have been published. Only four single-arm pilot studies have been published in pediatric oncology [32-35]. Participants included a mean of 10 children with heterogeneous cancer diagnoses. All studies included parents/caregivers as yoga participants [32-34] and/or proxy respondents [32-33, 35].

Intervention Characteristics—Two pediatric studies used specific styles of yoga [33, 34]; two did not specify yoga style. All four included multiple yoga components, such as a combination of movements, breathing, relaxation and meditation. However, none provided detailed class sequences or treatment fidelity. Dose varied from a single 45-minute session to 8-24, 60-minute sessions, with 1 to 3 sessions per week, spread over 3-12 weeks. Three interventions were implemented as group classes [33-35]; one study did not specify delivery format [32]. None reported whether they provided instructions for home practice. Instructors in all studies were trained in teaching yoga, though only two studies used instructors with training specific to cancer or therapeutic yoga [33, 35].

Feasibility—Three of the four pediatric studies examined feasibility, attrition and adherence. Recruitment rates ranged from 42% to 55% [32, 34-35]. The majority (90% of children, 100% of adolescents) completed participation in the single-session study [34]. In the study of a 3-week program, 10 of 11 participants met the *a priori* criterion for feasibility (60% of sessions attended), and the median number of sessions attended was 9 [32]. Adherence to yoga sessions in the 12-week program was 55%, with 73% completing the assessments; reasons for non-adherence included vacation and illness [33]. Participants withdrew from multi-session trials for reasons such as time/scheduling conflicts and disliking yoga or viewing it as “not ‘fast paced’ enough” [32, 35]. Two pediatric studies specified that no adverse events related to yoga occurred [32, 35].

Outcomes—In two studies reporting on pediatric QOL, one documented statistically significant improvement in physical function [33], and one reported *clinically* important differences on all QOL factors as rated by children and parents/caregivers [35]. Additional

outcomes included statistically significant increases in children's functional mobility, flexibility, and physical activity [35] and statistically significant decreases in state anxiety among adolescents and parents participating in yoga [34]. Qualitative data supported these findings. Participants in pediatric studies described yoga as relaxing and helpful for managing stress/anxiety [32, 34]. They additionally noted improved energy, sleep and mood, decreased nausea, and reduced use of pain medication [32].

Adult Studies of Yoga during Cancer Treatment: Non-Randomized Trials (Table 1)

Participant Demographics—Nine adult non-randomized studies (Table 1) enrolled a total $N=155$ (average $N=17$), primarily Caucasian (78%) and female (81%) participants [21-29]. Various cancer types (e.g., lymphoma, gynecologic, breast, lung) and all stages (0-IV) were represented. Treatments received while participating in yoga interventions included chemotherapy ($n=61$) and radiation ($n=40$), when specified.

Intervention Characteristics—Seven interventions were based in a specific yoga style or combination of yoga traditions (see Table 3). Most included multiple components of yoga, such as movement, breathing, meditation, and/or yogic philosophy [21-22, 24, 26-29], whereas two studies included only movements [23] or breathing [25]. Two studies also included facilitated group discussions [21, 26]. Three of the nine articles presented specific class sequences, and five indicated that movements were adapted to individual needs. One study ensured treatment fidelity by using an intervention manual and reviewing videotaped sessions [21].

Dose of yoga varied (i.e., ranged from 1-18 total sessions, 15-120 minutes, every 3 weeks to 3 sessions per week, duration 3-10 weeks). Five interventions were delivered as group classes, and two included caregivers with patients; one occurred individually in the chemotherapy chair. Five studies additionally provided instructions for practicing at home, and one provided access to online classes.

Feasibility—Recruitment rates reported by five studies ranged from 16% (letters sent) to 74% (approached in person) [22, 26-29]. In another study, recruitment challenges prevented study completion [24]. Seven studies reported attrition rates ranging from 8% (selected from an ongoing yoga class) to 43% (selected from women receiving treatment), for reasons such as traveling distance, change in interest, scheduling difficulties, and health issues [21-23, 26-29]. One study reported that those who completed the intervention had higher baseline levels of fatigue than those who withdrew, suggesting that symptoms may motivate participation [21]. Conversely, physical function at baseline was marginally significantly worse among patients who withdrew versus those who completed another study [27].

Seven studies with a range of 1-10 planned sessions reported adherence to in-person yoga sessions ranging from 59-88% [21, 24, 26-29]. Particularly high adherence rates were achieved in studies that included family caregivers [27-28] or a group discussion component [21, 26]. Five studies also described adherence to home practice, which varied widely. For example, in a case study of four women, home adherence was bimodal, with two participants at 80% adherence and two participants under 50% [24]. Studies measuring home practice by number of occurrences reported means between 2-3, range 0-9 [26-28], while another study

described home practice as an average of 21 minutes per day [21]. In the five studies that assessed satisfaction with yoga, mean satisfaction ratings were high (i.e., $\geq 9/10$), and the majority rated yoga as useful or helpful [21-22, 26-28].

Outcomes—The nine non-randomized adult trials reported on a variety of outcomes including quality of life (QOL) and mental, physical, and spiritual health. Because these studies typically lack comparison groups and adequate power to detect statistically significant changes, outcomes provide preliminary data on effects of yoga that warrant further examination in fully-powered trials. In this early phase of study, effect sizes (indicators of clinical significance; e.g., Cohen's *d*: 0.2 small, 0.5 medium, 0.8 large) and qualitative data are especially informative [30-31].

Statistically and/or clinically significant improvements in mental health included anxiety, depression, mood, negative affect, relaxation and overall mental health [22, 27-29], which were further corroborated by qualitative feedback [22, 24, 28]. Additional qualitative findings included improvements in cognition, benefit finding, spiritual well-being, social support, self-efficacy and coping [21-24, 28].

Physical health significantly improved in terms of physical QOL, fatigue, invigoration, most-bothersome symptom, and upregulation of genes involved in immunity [22-23, 25]. Qualitative reports supported these findings and suggested increased strength, relief of tension, physical invigoration, and use of yoga in other situations (e.g., when trying to sleep, during medical testing) [22-24]. In addition, yoga demonstrated a medium effect size and a dose-response effect on sleep [27-28].

Adult Studies of Yoga during Cancer Treatment: Randomized Controlled Trials (Table 2)

Participant Demographics—Thirteen randomized studies (Table 2), reported in 23 manuscripts, were reviewed with a total $N = 1022$, including $n = 504$ assigned to yoga and $n = 518$ assigned to a control group [36-58]. Studies were relatively small, averaging 39 participants per study (range 8-84) assigned to yoga, and included mostly women with breast cancer ($n = 927$; 91%). Age of participants ranged from 18-79. Only 5 studies reported participants' race/ethnicity, with 51% Caucasian, 25% African American, 18% Latino, 2% Asian, and 4% other or unspecified race participants [40, 42-43, 47, 58]. RCTs that specified participants' cancer stage included the following: DCIS ($n = 28$), I ($n = 170$), II ($n = 243$), III ($n = 186$), and IV ($n = 68$). Treatments received while participating included surgery ($n = 121$), chemotherapy ($n = 239$), radiation ($n = 660$), and unspecified medical treatment ($n = 164$).

Intervention Characteristics—Among studies that described yoga style, three were based in general yoga traditions and six used a specific style of yoga (see Table 3). Most adult RCTs included a combination of yoga components, such as movements, breathing, and meditation. Three studies omitted yoga movements; two focused solely on breathing, while another featured breathing, concentration and an intention to manage uncertainty and fear [39, 43-46].

Dose, where specified, varied from 7-18 sessions, lasting 60-90 minutes each session, with 1 session per day to 3 sessions per week, spread over 1-12 weeks. Six studies delivered yoga in group classes [38, 41-42, 44-47, 57], five in one-on-one sessions [40, 43, 48-52, 54-56, 58], and two did not specify the format [36, 39]. Most (9 of 13) provided audio or printed materials for home practice. Few studies provided information about the qualifications of the yoga instructors delivering their intervention (see Table 3), and only one reported using an instructor with cancer-specific yoga teacher training [42].

Feasibility—Across three studies, attrition averaged 20% prior to or immediately after randomization (i.e., before beginning yoga classes) [40, 43, 58], but one trial reported 56% attrition immediately following randomization among participants assigned to yoga [37]. In studies with sufficient information to compare, attrition was greater among yoga participants in two studies [37, 47], among control participants in three studies [38, 48-49, 51-52, 54-56], and approximately equal across groups in four studies [41-43, 58]. Two trials reported 100% completion [39, 57].

Although participants' satisfaction with the yoga interventions was reported by only two studies, perceived benefits and enjoyment were generally high [41-42]. With the exception of three studies [41-42, 47], most reported high levels of adherence (>70% completing the majority of classes). Rates of home practice, when reported, were variable. In a trial of pranayama, participants averaged 3.2 hours per week of home practice [43]. In studies including movement, up to 19% did not engage in home practice, while more than half practiced at home at least 3 days per week [40, 44-47].

Outcomes—Several of the 13 RCTs demonstrated significant improvements in yoga participants' mental health, including positive and negative affect, distress, depression, and anxiety [38, 42-46, 48-49, 52-56]. Yoga participants, compared to controls, also reported significantly better emotional, mental, social, physical, and general QOL [42-43, 48]. Although outcomes such as self-esteem, spiritual well-being and cognitive function were measured infrequently, yoga participants reported favorable results in these domains as well [42, 44-47, 56].

Regarding physical and biomedical outcomes, yoga participants had better self-reported health than controls in two studies, including the only trial with an active control group [40, 58]. Treatment-related side effects, including sleep, fatigue, pain, appetite loss, nausea and vomiting, sequelae-related distress, and toxicity, improved among yoga participants in several studies [39, 41, 48-49, 52, 54, 57]. One study documented better post-operative outcomes, including decreased drain retention, earlier suture removal, and shorter hospitalization, among yoga vs. control participants [51].

Two studies examined stress hormone regulation. Compared to controls, yoga participants had lower 6:00 am and mean pooled levels of salivary cortisol [54-56] and a steeper cortisol slope [58], which may predict improved survival [59-60]. In the other two studies investigating physiologic results, yoga participants demonstrated a favorable immune response (i.e., serum immunoglobulins and lymphocytes, TNF-alpha) [51-52] and decreased DNA damage [38, 51-52].

Discussion

Summary and Limitations

Among children undergoing cancer treatment, only four single-arm pilot studies of yoga have been published. Initial findings from these non-randomized trials support the feasibility, safety and potential efficacy of yoga in pediatric oncology. However, its effectiveness cannot be determined until more rigorous trials are conducted (e.g., RCTs, larger sample sizes).

Nine non-randomized studies and 13 RCTs have examined the effects of yoga for adults undergoing treatment for cancer. Results from both non-randomized and randomized trials most consistently support the efficacy of yoga to improve psychological outcomes such as depression, distress, and anxiety. Several studies, particularly RCTs, also documented improved QOL among yoga participants, though further investigation is needed to clarify the efficacy of yoga for different types of QOL (e.g., mental, social, physical, cancer-specific) and for spiritual well-being. Researchers less frequently reported physical and biomedical outcomes, though it is unknown whether this stems from a tendency not to measure these outcomes or not to publish null findings. In both non-randomized trials and RCTs, sleep and fatigue were the most commonly measured non-psychological outcomes, generating a growing body of evidence that yoga ameliorates sleep and fatigue among people undergoing treatment for cancer. Additional studies are needed to advance preliminary findings for other effects of treatment (e.g., nausea, surgical outcomes, cognitive function) and biomarkers of stress and immunity.

Findings are constrained by multiple limitations of previous research samples and methods. For example, the vast majority of studies have relied exclusively on self-reported measures. In addition, with only a few exceptions, samples predominantly include females with breast cancer. People with Stage IV cancer of any type are rarely included in yoga trials, despite the fact that yoga may be gentle enough for individuals with advanced disease and potentially affect important outcomes (e.g., distress, QOL).

Generalizability is further limited by variability in intervention protocols. Most studies combined several elements of yoga (e.g., movement, breathing, meditation), but intervention delivery (e.g., group vs. individual; instructor-delivered vs. home practice) and dose of yoga (i.e., frequency, duration) have varied widely among studies, as have retention and adherence rates. The amount of yoga practice needed to yield effects therefore remains unknown. In some studies yoga participants improved on outcomes such as psychological distress, fatigue and immunity while the waitlist control group worsened [38, 51, 57]. However, only two studies included an active control group [44-46, 58]. As a result, “active ingredients” (e.g., movement, breathing) cannot be distinguished from non-specific, but potentially effective, components of yoga interventions (e.g., social support, attention).

Recruitment methods and other elements of study design may also affect participation, outcomes and generalizability. For example, enrollment and retention rates may be especially high when sampling from people already enrolled in yoga classes. Researchers have rarely published details of their yoga teachers’ training and experience specifically with

people with cancer, although these factors may influence participants' adherence and efficacy of interventions. Information about studies' treatment fidelity efforts also is scant, compounding the difficulty of interpreting and applying results.

Despite these limitations, studies have demonstrated that yoga is likely to benefit adult cancer patients during active treatment. Moreover, no studies reported any adverse events of practicing yoga during treatment. Thus, there is sufficient evidence to recommend yoga to adults undergoing cancer treatment, especially women with breast cancer [61].

Future Directions

Although the number and quality of studies of yoga for cancer patients have increased recently, more rigorous methodology is still needed to advance the science in this field. Guidelines are available for developing yoga interventions for use in RCTs; researchers should consider the rationale for selecting the yoga style, dose, components, sequence, modifications, instructors, and home practice, as well as the measurement of intervention fidelity [62]. Developing criteria for reporting on these interventions and other elements of study methodology, similar to the STRICTA framework for acupuncture research [63], would further improve the interpretation and applicability of yoga research findings. We additionally offer suggestions below for improving the following elements of yoga research: (1) sample selection; (2) recruitment, retention, and adherence; (3) research design; and (4) inclusion of objective and novel measures. We conclude with the suggestion to examine yoga as more than a combination of movement, breathing and relaxation, but rather as a broader lifestyle intervention.

Based on this review, future studies of yoga for people undergoing cancer treatment should consider several suggestions for improving the sample selection. First, yoga research with pediatric and adolescent oncology patients is scant, but existing feasibility data and preliminary outcomes indicate that more trials with younger age groups are warranted. As yoga research with pediatric oncology samples expands, it is important to ensure these studies explore the clinical implications of developmental and familial components (e.g., young children vs. adolescents; inclusion of siblings or parents) that may influence outcomes.

Regardless of patients' age, offering yoga to all may be useful for buffering treatment effects. However, given the differing adverse effect profiles of various cancer treatments, better specification of the efficacy of yoga for improving outcomes and decreasing symptom burden will require study samples with limited heterogeneity of treatment types or with power to examine treatment type as a moderator. Furthermore, future work should consider eligibility requirements that select participants with a demonstrated clinical need – for example, a minimal level of symptoms (e.g., distress, fatigue, cognitive impairment) or a history of depression or anxiety. This targeted approach to recruitment may enhance our understanding of the efficacy of yoga for treating specific symptoms and help reach those most in need, thereby maximizing the limited funding available for this type of program.

Barriers to recruitment, retention, and adherence include difficulties with scheduling and travel, changes in interest or symptoms, and health issues [21-23, 27, 29]. Studies suggest

that symptoms or health concerns can both promote *and* inhibit participation. When designing studies of yoga for people undergoing cancer treatment, flexibility of design and scheduling may be needed to accommodate patients' treatment-related symptoms and other competing demands (e.g., medical appointments). For example, interventions could include inpatient, outpatient, and home-based alternatives [35, 64]. Offering yoga from home via technologies such as multi-point videoconferencing could increase patients' access to cancer-specific yoga classes with a qualified instructor and with others in treatment. Including a family member in yoga interventions may also facilitate recruitment and retention of cancer patients, in addition to improving caregivers' health and well-being [21, 24, 27-29]. Finally, some evidence suggests that participants practice yoga in other settings (e.g., during medical tests) and that outcomes improve with increased engagement in yoga [22, 24, 47]. Therefore, carefully documenting adherence to instructor-led and autonomous practice is essential for understanding the dose and potential efficacy of yoga interventions, as well as the minimum amount of in-person instruction patients need to practice yoga safely on their own.

From the biomedical perspective, the ideal research design is a randomized, double blind, placebocontrolled trial, but double-blinded trials of mind-body interventions are challenging. Using an activity that has face validity as the active control can at least blind participants to whether or not they are in the "real" intervention. For example, a single-blinded RCT of tai chi vs. wellness education plus stretching for people with fibromyalgia was presented to participants as a study examining the effects of two different kinds of exercise [65]. Studies without an active control group (i.e., wait-list control studies) cannot attribute results specifically to yoga because non-specific aspects of the intervention (e.g., attention, social support) may confer some benefit. Moreover, including a third group of participants receiving usual care [58] can help to determine whether practicing yoga during cancer treatment can prevent or buffer the negative side effects of treatment.

While self-reported outcomes remain important, future studies of yoga during cancer treatment should incorporate more objective measures (e.g., pro-inflammatory cytokines, cortisol, heart rate variability, actigraphy, genomic and epigenetic measures). Qualitative results suggest point to additional constructs that may be important to quantify in future studies; for example, participants have described improvements in coping, self-efficacy, self-compassion, relief of tension, physical and mental strength/invigoration, and social support [21-24, 34]. Cognitive function is another important and relatively unexplored potential benefit of yoga for cancer patients, which can be assessed with objective behavioral and neuroimaging measures. Finally, research has not yet determined whether yoga interventions influence healthcare utilization and costs. Examining these bottom-line outcomes could provide data to support incorporating yoga into clinical settings [66].

Clinical Implications and Conclusions

The current evidence is sufficient to recommend yoga to adults undergoing cancer treatment, particularly women with breast cancer [61, 70]. Results from existing studies suggest that yoga will lead to improvements in or buffer treatment-related changes in mental health, fatigue, sleep quality, and other aspects of quality of life. Support for additional benefits may

become apparent with further research. Treatment-related symptoms and stress may motivate some people with cancer to participate in yoga [7, 21], and barriers to participating in yoga during cancer treatment may be lower than other types of exercise [9]. Some research shows an association between frequency in in yoga participation and improved outcomes [e.g., 27-28]. As such, reducing barriers by offering variable class schedules and formats, incorporating the use of novel technologies, and including family members is recommended. Notably, none of the trials in this review reported any adverse events. Therefore, compared to higher-impact forms of exercise, yoga may be especially safe and appealing to people receiving cancer treatment.

In conclusion, research has demonstrated that yoga interventions can improve psychological distress, QOL, physical function, and some biological outcomes among adults receiving cancer treatment. However, the potential for yoga to benefit people with cancer may not have been fully captured yet. Yoga theoretically extends beyond the elements that most studies include (i.e., movement, breathing, meditation). Its broader philosophy and approach may influence healthful living as a whole (i.e., food choices, exercise, life purpose, relationships). Initial studies suggest that holistic lifestyle interventions have great potential for integration with biomedical cancer treatments [67-68]. Cancer survivors tend to live longer after diagnosis if they have normal BMI, are physically active, eat a primarily plant-based diet, abstain from tobacco, avoid harmful use of alcohol, and are not depressed [1-3, 14, 69]. Future research therefore could examine whether a comprehensive yoga approach facilitates these outcomes, thereby helping people manage side effects of cancer treatments, improving clinical outcomes, and perhaps extending and enhancing survival.

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Table 1

Non-Randomized Studies of Yoga for Adults during Cancer Treatment

Author	Design/Sample	Cancer Type and Treatment	Adherence	Outcome Measures	Results
Last Name Year Country	- Design - N (n or % by Sex) - Age: Mean (SD, range) - Race/ethnicity	- Cancer type - Stage - Treatment(s) received during the study	- Completing protocol (n or %) - Class adherence (% or # of classes)	- Timing of assessment - Primary measures	*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$
Carson et al., 2007 [21] USA	- Single-arm pilot - N=21 (100% F) - 59 (NR; 44-75) - 11 Caucasian, 2 African American	- Breast (N=13) - Metastatic - Chemotherapy (n=7)	- n=13 - Mean # of sessions attended: 7 of 8 (range 5-8)	- Baseline (daily for 2 weeks prior to intervention), post-intervention (Weeks 6-8) - Daily VAS of pain, fatigue, distress, invigoration, acceptance, relaxation - Satisfaction (0-10 ratings) - Qualitative responses	- Main effect for change over time: invigoration, ** acceptance* - Lagged effects from one day to the next: pain * fatigue,* - Satisfaction, ** acceptance,* relaxation* - Likelihood to recommend M=9.6; - Qualitative: sessions useful, applying skills to life, self-compassion, group support
Danhauer et al., 2008 [22] USA	- Single-arm pilot - N=51 (100% F) - 58.9 (11.2; 34-82) - 45 Caucasian, 5 African American, 1 Asian/Pacific Islander	- Ovarian (n=37), Breast (n=14) - 0-IV - Chemotherapy (n=29); Radiation (n=5)	- n=43 completed post-intervention follow-up; n=38 completed final follow-up - Mean # of classes attended: 5.9 of 10 (SD=3.2) - 51% attended >7 of 10 classes, 26% attended 0-2 classes	- Baseline, post-intervention (Week 10), Final Follow-Up (Week 18) - OOL (SF-12 MCS/PCS), depressive symptoms (CES-D), affect (PANAS), anxiety (STAI), cancer-specific QOL (FACT-G), spirituality (FACT-Sp), fatigue (FACT Fatigue), satisfaction, qualitative responses	- Week 10: overall mental health,* depressive symptoms,** negative affect,** overall QOL,* physical QOL,** fatigue** - 88% liked class "quite a bit" or "very much" - Qualitative: group experience, physical and emotional benefits, relaxation
Duncan et al., 2008 [23] Canada	- Single-arm pilot - N=24 (n=23 F, n=1 M) - 49 (NR) - 20 Caucasian	- Breast (n=10), gynecologic (n=4), lymphoma (n=3); other (n=7) - 16 undergoing treatment (type NR) at baseline	- 100% provided post-intervention data - NR	- Baseline, weeks 5 and 10 of the program, and 6 weeks after the program - Most bothersome symptom (Measure Your Medical Outcome Profile 2 instrument), FACT-G, FACT-Sp, POMS-SF - Qualitative Responses provided by n=6 selected participants	- Week 10: Most-bothersome symptom,*** FACT-G,*** FACIT-Sp,*** POMS-SF TMD*** - Qualitative: reported additional benefits (physical, relaxation), props useful, appreciated intro to mindfulness, social support
Galantino et al., 2012 [24] USA	- Case series - N=4 (100% F) - 54.8 (NR; 44-65) - 4 Caucasian	- Breast (N=4) - II - Chemotherapy (n=4); Radiation (n=2)	- NR - 60%-70% class adherence - Home adherence: 80% for n=2, <50% for n=2	- Baseline, 6, and 12 weeks during chemotherapy, and at 1 and 3 months after study conclusion - CogState, Perceived Cognition Questionnaire, FACT-B, POMS, Sit and Reach, Functional Reach, qualitative responses	- No quantitative findings reported - Qualitative: yoga appeared to impact cognition, specifically reduced errors and increased speed. Flexibility, balance, mood changes and QOL also maintained/improved
Kumar & Balkrishna, 2009 [25] India	- NR - N=8 (100% M) - NR (NR; 18-55) - NR	- CLL (N=8) - NR - NR	- NR - NR	- NR - Gene expression	- Increased gene expression* (AK, BC, NM BX, R-26, hCG) in practitioners vs. an apparently non-randomized control group (details NR on this group)

Author	Design/Sample	Cancer Type and Treatment	Adherence	Outcome Measures	Results
McCall et al., 2015 [26] Canada	- 3-arm feasibility pilot - N=15 (n=11 F) - 51.3 (NR, 33-72) - NR	- Breast (n=6), prostate (n=2), other (n=7) - I-IV - Chemo (n=7), radiation (n=8)	- n=13 - Mean # of yoga sessions: A: 4, B: 5, C: 12.8 - Mean # of online yoga sessions: A: 2.5, B: 0, C: 0	- Pre- and post-intervention - Satisfaction, HRQOL (QOL-CA, CS mean difference), perceived utility of yoga (0-10), cost efficiency, qualitative responses	- Satisfaction with amount: n=1 offered "the right amount of yoga," n=1 too much, n=9 not enough - Satisfaction with yoga practice: A 6.5, B 9, C 8.8 - HRQOL: A 0.7 (1.3), B -0.1 (0.8), C 0.2 (0.5) - Utility of yoga: A 8.5, B 7.3, C 9 - Cost-efficiency: A NR, B 100%, C 53%; 0 in B and C used online classes - Qualitative: participants in all groups preferred small, cancer-specific classes; stretching, breathing, meditation and postures for strength and relaxation; found group discussion helpful; barriers: fatigue, side effects, cost, transportation, disinterest
Milbury et al., 2014 [27] USA	- Single-arm pilot - N=10 patients (n=5 F, n=5 M); - N=10 caregivers (n=9 F, n=1 M) - Patients 71.22 (6.16; 61-82); - caregivers = 68.77 (5.99; 61-78) - Patients: n=8 Caucasian, n=1 Hispanic; caregivers: n=8 Caucasian, n=1 Hispanic	- Lung (n=10) - I and III - Radiation (n=10), - Chemotherapy (n=7)	- 10/14 dyads (71%) - Mean # of classes attended: 12 of 18 (SD=2.91; range: 6-15) - Home practice M=2.63 times (SD= 2.62; range 0-9)	- Baseline and during last week of patients' radiotherapy - All completed by patients and caregivers. Distress (CES-D), anxiety dimension (BSI-18), sleep disturbance (PSQ), fatigue (BFI), health-related QOL (SF-36 PCS, MCS), spiritual well-being (FACIT-Sp), Finding Meaning in Cancer scale; satisfaction	- Patients: spiritual well-being. * Medium effect sizes for sleep disturbances and depressive symptoms; small effect sizes for anxiety and QOL - Majority (92.2%) rated program as useful or very useful
Milbury et al., 2015 [28] USA	- Single-arm pilot - N=15 patients (n=4 F, n=11 M); N=15 caregivers (n=6 F, n=9 M) - Patients: 62.16 (14.03; 33-81); - caregivers 58.95 (15.67; 28-78) - Patients: n=8 White, n=1 Latino/Hispanic; caregivers: n=9 White	- Non-small cell lung cancer (N=15) - I-IIIb - Chemoradiation (N=15)	- n=9 dyads (60%) - M=10 classes attended (SD=3.15; range 4-14); - 78% of dyads attended >50% of classes - Home practice: as individual, M=2.18 times (SD=1.94, range 0-7); as dyad, M=0.52 times (SD=1.04, range 0-4)	- Baseline and last week of radiation - Distress (BSI-18), sleep (PSQ), fatigue (BFI), HRQOL (SF-36), spiritual well-being (FACIT-Sp well-being), benefit finding (BFCS), emotional intimacy (PCR)	- Patients: anxiety, * mental QOL. * Medium effect sizes for benefit finding, sleep, spiritual well-being, increased somatization - Dose response for patients' sleep - Immediately post-session, 79% felt relaxed, 75% calm, 68% content, 46% happy; sessions rated as easy to moderate exertion - 89% rated yoga "very useful;" 100% reported that all components of yoga intervention were useful
Sohl et al., 2012 [29] USA	- Single-arm pilot - N=7 (100% F) - 61.7 (6.7; NR) - n=7 Caucasian, n=1 Hispanic	- Ovarian (N=7) - NR - Chemotherapy (N=7)	- NR - Session 1: n=7 (100%); - session 2: n=4 (57%); - session 3: n=3 (43%)	- VAS for anxiety and relaxation assessed immediately pre- and post-session - Qualitative responses	- Large effect sizes for immediate change in anxiety, d=-0.82; relaxation, d=0.83 - Qualitative: use yoga practices such as relaxation and breathing during daily activity (i.e., prayers, bedtime)

Notes. ALL = acute lymphocytic leukemia; AML = acute myeloid leukemia; BFCS = Benefit Finding in Cancer Scale; BFI = Brief Fatigue Inventory; BMT = bone marrow transplant; BSI-18 = Brief Symptom Inventory-18; CES-D = Centers for Epidemiological Studies-Depression; CLL = chronic lymphocytic leukemia; CML = chronic myeloid leukemia; CNS = central nervous system; FACIT-Fatigue = Functional Assessment of Cancer Therapy - Fatigue; FACT-G = Functional Assessment of Cancer Therapy -General; FACIT-Sp= Functional Assessment of Chronic Illness-Spiritual; MCS = Mental Component Summary; NR = not reported; PANAS = Positive and Negative Affect Scale; PCR = Perceived Closeness and Responsiveness; PCS = Physical Component Summary; POMS = Profile of Mood States; POMS-SF = POMS-Short Form; PSQI = Pittsburgh Sleep Quality Index; QOL = quality of life; SF-12 = Medical Outcomes Study 12-item short-form; SF-36 = Medical Outcomes Study 36-item short-form; STAI = State Trait Anxiety Inventory; VAS = Visual Analog Scale

Table 2

Randomized Controlled Trials of Yoga for Adults during Cancer Treatment

Author	Design/Sample	Cancer Type and Treatment	Adherence	Outcome Measures	Results
Last Name Year Country	- Control group(s) - N (n or % by Sex) - Age: Mean (SD; range) - Race/ethnicity	- Cancer type - Stage - Treatment(s) received during the study	- Completing protocol (n or %) - Class adherence (% or # of classes)	- Timing of assessment - Primary measures	** <i>p</i> <0.001 ** <i>p</i> <0.01 ** <i>p</i> <0.05
Archer & Forshaw, 2015; Archer et al., 2015 [36-37] UK	- TAU - N=66 (100% F) - NR - NR	- Gynaecologic (N=66) - NR - Surgery, chemo, radiation (n's NR)	- yoga: 56%, control: 97% - NR	- Pre- and post-intervention, 4 month follow-up - QOL (EORTC QLQ-C30); pain, anxiety, fatigue and global QOL (VAS weekly diary); qualitative/focus groups	- QOL: NR - Breathing: used often outside of formal yoga practice to enhance relaxation and sleep, manage rumination, and increase body awareness - Movements: intimidating for participants without yoga experience or with more comorbidities, others enjoyed physical activity and benefitted in strength, flexibility and pain management - Social: group class decreased isolation, increased sense of community, allowed exchange of information and support
Banejee et al., 2007 [38] India	- Supportive counseling - N=68 (100% F) - 44 (1.3; NR) - NR	- Breast (N=58) - II-III - Radiation (N=58)	- <i>n</i> =35 yoga; <i>n</i> =23 control - NR	- Pre- and post-radiation - Anxiety and depression (HADS), stress (PSS), DNA damage (alkaline single-cell gel electrophoresis)	- Anxiety, ** depression, ** stress, ** DNA damage *** - HADS and PSS increased in control group vs. decrease in yoga group - Fatigue***
Chakrabarty et al., 2015 [39] India	- TAU - N=160 (100% F) - yoga: 43.57 (8.5; NR); control: 43.57 (8.5; NR)-NR	- Breast (N=160) - I-3 - Radiation (N=160)	- NR - NR	- Pre- and post-radiation - Fatigue (CRFS)	- Fatigue***
Chandwani et al., 2010 [40] US	- Waitlist - N=61 (100% F) - yoga: 51.39 (7.97; 37.1-67.6); control: 54.02 (9.96; 31.8-67.9) - n=3 African American, n=47 Caucasian, n=5 Hispanic, n=1 Asian/Pacific Islander, n=3 Other	- Breast (N=61) - 0-III - Radiation (N=61)	- N=81 enrolled; <i>n</i> =10 withdrew prior to randomization; <i>n</i> =10 at T1, T2, T3, T4; yoga=30, 27, 26, 27; control=31, 31, 27, 29 - 15 (50%) completed all 12 classes - 8 (28%) attended 11 - 1 (3%) attended 10 - 1 each attended 2, 3, 4, 5, 7, 8 classes - 8 (28%) practiced daily, 12 (40%) >2 times per week, 8 (28%) 2times per week, 1 (3%) no home practice	- Pre-RT/yoga (T1) and 1 week (T2), 1 month (T3) and 3 months (T4) after last RT session - QOL (SF-36), fatigue (BF), sleep (PSQI), depression (CES-D), anxiety (STATE), intrusion and avoidance (IES), benefit finding (BFS)	- Sleep, depression, fatigue and anxiety were all NS; yoga reported better physical QOL, * general health, ** and physical function* than control at T2 - At T3, intrusion** - At T4, benefit finding** - Intrusive thoughts at T3 were positively associated with BFS at T4
Chandwani et al., 2014 [58] US	- Stretching, waitlist - N=163 (100% F) - yoga: 52.38 (1.35; 26-77); stretch: 51.14	- Breast (N=163) - 0-III - Radiation (N=163)	- N=191 consented; <i>n</i> =13 withdrew prior to randomization; <i>n</i> =15 withdrew after randomization	- pre-RT/yoga (T1) and 1 week (T2), 1 month (T3), 3 months (T4) and 6 months (T5) after last RT session	- Depression and sleep NS at all time points; at T2, fatigue* with yoga and stretch both lower than control but not different from each other

Author	Design/Sample	Cancer Type and Treatment	Adherence	Outcome Measures	Results
Cohen et al., 2004 [41] USA	- Waitlist - N=39 (n=12 F) - 51 (NR) - NR (1.32; 25-79); waitlist: 52.11 (1.34; 30-69) - n=25 African American, n=97 Caucasian, n=17 Hispanic, n=7 Asian/ Pacific Islander, n=4 Other	- Lymphoma (N=39) - I-IV - Chemotherapy (n=24)	- n=19 in each group (1 yoga patient dropped out before beginning classes); - n=6 / 32% attended all 7 sessions; 5 / 26% attended 5-6; 6 / 32% attended 2-3; 2 / 10% attended only 1 session; 19 / 84% of yoga group and 14 / 74% of controls completed at least 1 of 3 follow-up assessments	- 1-3 weeks prior to start of yoga classes; then 1 week, 1 month and 3 months after last session - Distress (IES); anxiety (STATE); depression (CES-D); fatigue (BFI); sleep disturbance (PSQI)	- at T3, yoga physical QOL better than control*, physical function** and general health** better than stretch - at T4, yoga physical QOL* better than control, yoga physical function* and general health* better than stretch and control - at T5, yoga physical function* better than control - cortisol slope steeper in yoga at T2 (vs. stretch* and control**) and at T3 (vs. control*) - On average, TY participants rated each element (breathing, mindfulness, movement, etc.) as beneficial (~4.5 on 5 point scale) - TY group reported better overall sleep,** sleep quality,* sleep latency,** duration,* and less sleep medication use*
Danhauer et al., 2009 [42] USA	- Waitlist - N=44 (100% F) - yoga: 54.3 (9.6; 38-76); control: 57.2 (10.2; 41-79) - n=39 Caucasian, n=3 African American, n=2 Asian/Pacific Islander	- Breast (N=44) - 0-IV - Chemotherapy (n=11); radiation during study (n=9)	- Mean # yoga classes attended = 5.7; n=11 attended 7 of 10 classes, n=6 attended 3-6, n=5 attended 2; - complete data analyzed from 13 yoga and 14 control (9 yoga and 7 control did not return questionnaire, 1 control dropped out)	- Baseline (week 0) and week 10 (within 1 week of last class); - Perceived health and functioning (SF-12), QOL (FACT-B), fatigue (FACT-Fatigue), spiritual well-being (FACT-Spirituality), depression (CES-D), sleep (PSQI), affect (PANAS)	- Group effects for mental functioning**, depression*, positive affect**, spiritual well-being (peace/meaning)*** - Baseline x group interactions for negative affect,* emotional well-being*, significant relationship between # classes and physical functioning,* breast cancer QOL,* physical well-being,** functional well-being** - 92% liked class quite a bit - very much. Scale 0-4 mean rating teach competent 3.8, teacher made class enjoyable 3.7, liked classes 3.7, classes helpful 3.2, will continue 2.5
Dhruva et al., 2012 [43] USA	- Waitlist - N=23 (n=2 M) - yoga: 52.4 (14.6; NR); control: 56.0 (11.9; NR) - n=10 Caucasian	- Breast (n=8); Other (n=8) - Non-metastatic and metastatic - Chemotherapy (n=23)	- 3 yoga, 2 control withdrew immediately after randomization - n=9 per group completed treatment; n=8 per group analyzed - 100% class attendance in control, 97% in yoga group - average home practice 2.4h/week control, 3.2h/week yoga	- Baseline, midpoint (after cycle 1), study end - Fatigue (revised PFS), sleep disturbance (GSDS), anxiety and depression (HADS), stress (PSS), QOL (SF-12)	- Amount of practice was associated with decreased sleep disturbance,* decreased anxiety,* and improved mental QOL* - No statistical analyses presented for the between group effects
Kovacic et al., 2013; Kovacic & Kovacic 2011a, 2011b [44-46] Slovenia	- Standard physiotherapy - N=32 (100% F) - NR - NR	- Breast (N=32) - I-II - Surgery, followed by chemotherapy and radiation (N=32)	- NR - All participants completed home practice 5-7 times per week	- Baseline (post-surgery), 1 week after attendance, 4 weeks after attendance - distress (GHQ-12; RSCL- psychological subscale); perceived stress (PSS); self-esteem (RSE); anxiety (STAI)	- Distress (GHQ and RSCL),** anxiety** and self-esteem* at T2 and T3; perceived stress** at T3 (not measured at T2)

Author	Design/Sample	Cancer Type and Treatment	Adherence	Outcome Measures	Results
Moadel et al., 2007 [47] USA	- TAU - N=164 (100% F) - 54.82 (9.95; 28-75) - n=54 African American, n=40 Hispanic, n=29 Caucasian, n=5 Other	- Breast (N=164) - I-IV - 48% receiving medical treatment (e.g., 27% chemotherapy and 30% antiestrogen therapy at baseline)	- n=16 yoga, 8 control lost to follow-up; n=5 yoga, 3 control refused further participation; n=3 yoga, 1 control withdrew due to change in health status (attrition: 22% yoga, 21% control) - 32% of yoga participants with baseline and 3mo data attended 0 classes, 39% attended >6 of 12 classes; 19% reported 0 home practice, 51% few times/week	- Baseline, 1 month, 3 month, 6month - QOL (FACT); fatigue (FACT-Fatigue); spiritual and existential well-being (FACT-Sp); distressed mood (POMS)	- Social well-being decreased more in control group compared to yoga group from baseline to 3mo* - within yoga group, those attending >6 classes had less fatigue than 1-6* and 0 classes,*** better physical well-being than 1-6* and than 0*** classes, and less distress than 0*** classes
Raghavendra et al., 2007; Rao et al., 2009, 2008a, 2008b, 2008c, 2015 [48-53] India	- Supportive therapy - N=98 (100% F) - 49.2 (9.6; NR) - NR	- Breast (N=98) - II-III - Surgery followed by standard protocol of radiation and chemotherapy	- n=18 yoga, 20 control completed; 12 yoga, 17 controls discontinued post-surgery + 15 yoga, 13 controls did not receive standard regimen of radiation/chemotherapy	- Pre-surgery, post-surgery, during and after RT and chemo - Anxiety (STAD); depression (BDI); treatment-related symptoms (study-specific measure); nausea and vomiting (MANE); QOL (FLIC); post-operative outcomes; immune biomarkers (serum and plasma)	- Lower state anxiety* and symptom distress* at all time points in yoga vs. control completers; intention-to-treat analysis showed women randomized to yoga had lower anxiety post-surgery* and lower depression during radiation** and during chemo***; yoga reduced post-chemo nausea frequency** and severity,** vomiting severity,* QOL during chemo,*** yoga fewer days drain retention, suture removal and hospital stay post-surgery; no difference in post-op complications. IL2r-alpha or IFN-gamma; yoga group TNF-alpha significantly decreased*** while control group TNF-alpha significantly increased**
Taso et al., 2014 [57] Taiwan	- TAU - N=60 (100% F) - 49.27 (10.23; NR) - NR	- Breast (N=60) - I-III - Chemotherapy (N=60)	- 100% completion; 80% adherence - n=3 attended 13-14 of 16 classes; n=13 attended all 16 classes	- Pre-intervention, 4 weeks (mid), 8 weeks (post) and 4-week follow-up - Depression and anxiety (POMS), fatigue (BFI-Taiwan)	- Time by group interactions: anxiety and depression both NS; fatigue*** and effect of fatigue on daily life;*** within experimental group main effects: fatigue*** and fatigue effect on daily life*** at 8week post (vs. fatigue and its effect on daily life increased, both***, within the control group) - Among individuals with low fatigue, intervention reduced fatigue and its effects on daily life at post-test* and follow-up*
Vadiraaja et al., 2009a, 2009b, 2009c [54-56] India	- Supportive counseling - N=88 (100% F) - yoga: 46.7 (9.3; NR); control: 48.5 (10.2; NR) - NR	- Breast (N=88) - I-III - Adjuvant radiation (n=75)	- n=2 yoga dropouts; 11 control dropouts; - 30% attended 10-20 of 36 sessions; 57% attended 20-25; 14% attended >25 of 36 sessions	- Pre- and post-RT - Anxiety and depression (HADS); perceived stress (PSS); distress, physical and functional status and global QOL (RSCL); treatment-related symptoms (EORTC QOL C30); affect (PANAS); diurnal salivary cortisol	- Anxiety,*** depression,* perceived stress,*** psychological distress;*** fatigue,** insomnia** appetite loss,** pain,* nausea/vomiting;* positive affect,** negative affect,** emotional** and cognitive* function; 6am* and mean pooled diurnal cortisol*

Note. BFI=Brief Fatigue Inventory; BFS=Benefit Finding Scale; CES-D=Center for Epidemiologic Studies Depression Scale; CRFS=Cancer-Related Fatigue Scale; EORTC=European Organization for the Research and Treatment of Cancer; F=female; FLIC=Functional Living Index of Cancer; GSDS=General Sleep Disturbance Scale; HADS=Hospital Anxiety and Depression Scale; HADS-A=HADS-Anxiety; HADS-D=HADS Depression; IES=Impact of Events Scale; M=male; MANE=Morrow Assessment of Nausea and Emesis Questionnaire; NR = not reported; PANAS=Positive and Negative Affect

Scale; PFS=Piper Fatigue Scale; PSQJ=Pittsburgh Sleep Quality Index; RCT=randomized controlled trial; RSCL=Rotterdam Symptom Checklist; RSE=Rosenberg Self-Esteem Scale; SF-12=Medical Outcomes Study 12-item short-form survey; SF-36=Medical Outcomes Study 36-item short-form survey; STATE=Speilberger State Anxiety Inventory State Portion; TAU = treatment as usual

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Table 3

Yoga Protocol Details for Adult Studies

Author, year	Name/Style of yoga - Intervention components ¹	Duration, Frequency - Delivery - Home Practice	Instructor Qualifications - Cancer-Specific Yoga - Training	Specific class sequence - Modifications available? - Progression - Treatment fidelity assessed?
Archer & Forshaw, 2015; Archer et al., 2015 [36-37]	- Hatha - NR, although qualitative responses discussed breathing and movements	- 10 weekly 60-minute sessions - NR - NR	- NR - NR	- NR - NR - NR - NR
Banerjee et al., 2007 [38]	- VYASA - Movements, pranayama, meditation, yoga nidra, chanting	- 90-minute sessions for 6 weeks, frequency NR - NR - Audio recordings provided	- NR - NR	- NR - NR - NR - NR
Carson et al., 2007 [21]	- Broad spectrum of traditional yogic techniques - Movements, pranayama, meditation, study of pertinent topics, group discussions	- 8 weekly 120-minute sessions - Group classes - 10 minutes daily with CDs or audiotapes, illustrated handbooks	- Jointly led by a yoga teacher registered with national Yoga Alliance and a clinical health psychologist - Extensive experience in teaching yoga to medical patients	- Manual was developed - Yes - NR - Yes
Chakrabarty et al., 2015 [39]	- NR - Pranayama	- 20 minutes twice/day, 5 days/week for 6 weeks - NR - NR	- NR - NR	- Sequence provided - Yes - NR - NR
Chandwani et al., 2010 [40]	- VYASA - Movements, pranayama, savasana, meditation, yama and niyama	- 60-minute sessions, up to 2 times per week for 6 weeks - Group classes (most implemented individually due to scheduling) - Daily, with audio CD and printed manual	- VYASA-trained teachers - NR	- Provided in publication - NR - NR - NR
Chandwani et al., 2014 [58]	- VYASA - Movements, breathing, savasana, meditation	- 60-minute sessions, up to 3 times per week for 6 weeks - Group classes (most implemented individually due to scheduling) - Audio CD and printed manual provided	- VYASA-trained teachers - NR	- Provided in publication - NR - NR - NR
Cohen et al., 2004 [41]	- Tibetan (Tsa lung and Trul khor) - Breathing, visualization, meditation, movements	- 7 weekly sessions, duration NR - Group classes - Daily, with printed materials; audiotape provided after final session	- Experienced TY instructor - NR	- NR - NR - NR - NR
Danhauer et al., 2008 [22]	- Restorative - Movements, breathing, deep relaxation, guiding principle of ahimsa (non-violence)	- 10 weekly 75-minute sessions - Group classes - NR	- Registered with National Yoga Alliance - Integral Yoga Therapy in Cancer and Chronic Illness	- Sequence provided - Yes - NR - NR
Danhauer et al., 2009 [42]	- Restorative - Movements, breathing, deep relaxation, guiding principle of ahimsa (non-violence)	- 10 weekly 75-minute sessions - Group classes - NR	- Registered with National Yoga Alliance - Integral Yoga Therapy in Cancer and Chronic Illness	- Sequence provided - Yes - NR - NR

Author, year	- Name/Style of yoga - Intervention components ¹	- Duration, Frequency - Delivery - Home Practice	- Instructor Qualifications - Cancer-Specific Yoga - Training	- Specific class sequence - Modifications available? - Progression - Treatment fidelity assessed?
Dhruva et al., 2012 [43]	- NR - Breathing	- 4 weekly 60-minute sessions - Group classes (most sessions had 1-2 participants) - 2 times/day for 20-30 minutes total	- Yoga instructors with training in therapeutic yoga - Experience teaching yoga to people with cancer	- NR - NR - NR - Yes
Duncan et al., 2008 [23]	- Iyengar - NR	- 4 weekly 90-minute sessions - Group classes - NR	- NR - NR	- Provided in publication - NR - NR - NR
Galanino et al., 2012 [24]	- Iyengar-inspired - Postures, breathing, meditation	- 70-minute sessions twice/week for 6 weeks and once/week for next 6 weeks (12 weeks total) - Group classes - 15 minutes 3 times/week, beginning in week 6	- Certified yoga instructors - NR	- Provided in publication - Yes - Decreased use of props - NR
Kovacic et al., 2013; Kovacic & Kovacic 2011a, 2011b [44-46]	- Yoga in Daily Life (YIDL) - Breathing, relaxation, meditation	- Daily 45-minute sessions for 1 week post-surgery - Group classes - Post-intervention: daily for 3 weeks with audio recording	- 7 years experience with YIDL - 3 years experience with oncology patients	- Provided in publication - NR - NR - NR
Kumar & Balkrishna, 2009 [25]	- Swami Ramdev Yog - Breathing	- NR - NR - NR	- NR - NR	- 7 sequences of Swami Ramdev Yog - NR - NR - NR
McCaill et al., 2015 [26]	- NR - Pranayama, relaxation, asana, meditation, group discussion	- A, low-dose: 45-minute intro; B, medium-dose: 45-minute intro + 120 minute workshop + online class access; C, high-dose: 45-minute intro + 60-minute weekly class x 3 weeks + online class access	- NR - NR	- Outline provided in publication - Yes - NR - NR
Milbury et al., 2014 [27]	- Tibetan (Tsa lung) - Breathing, visualization, meditation, movements	- 2-3 weekly sessions (45-60 minutes) over 5-6 weeks - Individual sessions per dyad - On days not meeting with instructor, with printed materials and CD	- NR - NR	- NR - NR - Sessions 1-4 focused on gradually introducing techniques, sessions 5-15 focused on refining and practicing the techniques - NR
Milbury et al., 2015 [28]	- Vivekananda Yoga - Movements, breathing, relaxation, meditation	- 2-3 60-minute sessions/week for 5-6 weeks - NR - Printed materials	- NR - NR	- Available - Yes - Sessions 1-4 focused on gradually introducing techniques, sessions 5-15 focused on refining and practicing the techniques - NR
Moadel et al., 2007 [47]	- Hatha - Movements (all seated or reclined with props), breathing, meditation	- 12 weekly 90-minute sessions - Group classes - NR	- NR - NR	- NR - NR - NR - NR
Raghavendra et al., 2007; Rao et al., 2009, 2008a,	- VYASA	- 4 sessions pre- and post-surgery; 3 weekly sessions during 6 weeks of radiation; 1 session every 10 days during chemotherapy	- Jointly led by naturopathic physician and Yoga Institute certified yoga therapist	- NR - NR - NR

Author, year	- Name/Style of yoga - Intervention components ¹	- Duration, Frequency - Delivery - Home Practice	- Instructor Qualifications - Cancer-Specific Yoga Training	- Specific class sequence - Modifications available? - Progression - Treatment fidelity assessed?
2008b, 2008c, 2015 [48-55]	- Movements, breathing, meditation, relaxation with imagery, chanting	- Individual - Audio recordings	- NR	- NR
Sohl et al., 2012 [29]	- Key skills from multiple traditions (e.g., Integral Yoga, Urban Zen Integrative Therapy) - Seated movements, breathing/relaxation, meditation, theme of self-compassion	- 3 15-minute sessions - Individual, during chemotherapy infusions - Printed materials	- NR - Integral Yoga Therapy in Cancer and Chronic Illness	- NR - Yes - NR - NR
Taso et al., 2014 [57]	- Anusara - Movements, breathing, meditation	- Twice weekly 60-minute sessions for 8 weeks - NR - NR	- "Experienced instructor" - NR	- NR - NR - NR - NR
Vadiraia et al., 2009a, 2009b, 2009c [54-56]	- VYASA - Movements, breathing, meditation, relaxation with imagery	- 60-minute sessions, 3-6 sessions per week over 6 weeks - NR - On days not attending yoga sessions, with audio recordings	- NR - NR	- Available - NR - NR - NR

¹ English and Sanskrit terms are used interchangeably (i.e., breathing/pranayama, movements/asana), according to the terminology used in the original reports
NR = not reported, TY = Tibetan Yoga, VYASA = Vivekananda Yoga Anusandhana Samsthana