

A PILOT STUDY OF YOGA FOR BREAST CANCER SURVIVORS: PHYSICAL AND PSYCHOLOGICAL BENEFITS

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SUMMARY

Background: Physical activity provides a number of physical and psychological benefits to cancer survivors, including lessening the impact of detrimental cancer-related symptoms and treatment side-effects (e.g. fatigue, nausea), and improving overall well-being and quality of life. The purpose of the present pilot study was to examine the physical and psychological benefits afforded by a 7-week yoga program for cancer survivors.

Method: Eligible participants (per-screened with PAR-Q/PAR-MED-X) were randomly assigned to either the intervention ($n = 20$) or control group ($n = 18$). All participants completed pre- and post-testing assessments immediately before and after the yoga program, respectively.

Results: The yoga program participants (M age = 51.18 (10.33); 92% female) included primarily breast cancer survivors, on average 55.95 (54.39) months post-diagnosis. Significant differences between the intervention and the control group at post-intervention were seen only in psychosocial (i.e. global quality of life, emotional function, and diarrhea) variables (all p 's < 0.05). There were also trends for group differences, in the hypothesized directions, for the psychosocial variables of emotional irritability, gastrointestinal symptoms, cognitive disorganization, mood disturbance, tension, depression, and confusion (all p 's < 0.10). Finally, there were also significant improvements in both the program participants and the controls from pre- to post-intervention on a number of physical fitness variables.

Conclusions: These initial findings suggest that yoga has significant potential and should be further explored as a beneficial physical activity option for cancer survivors. Future research might attempt to include a broader range of participants (e.g. other types of cancer diagnoses, male subjects), a larger sample size, and a longer program duration in an RCT. Copyright © 2005 John Wiley & Sons, Ltd.

KEY WORDS: physical activity; yoga; cancer; psychological; fitness; oncology

INTRODUCTION

Physical activity is an important contributor to health and the related outcome of quality of life (Rejeski *et al.*, 1996). One health condition that appears to benefit from a physically active lifestyle is cancer. Both physical and psychological benefits are associated with activity for cancer survivors

(Courneya, 2003). However, recent reviews of the literature on exercise programs for cancer survivors suggested the need for a number of improvements in this research area (Galvao and Newton, 2005; Pinto *et al.*, 2000). Specifically, an examination of alternative modes of physical activity has consistently been highlighted in reviews of the literature. The purpose of the present investigation was to assess the physical and psychological benefits of yoga for cancer survivors in a pilot study.

Despite the numerous potential benefits from regular engagement in a physical activity program,

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most individuals, whether healthy or living with a chronic disease, do not regularly engage in physical activity (ACSM, 1998). It has been suggested that 'gentler' physical activities, such as yoga or tai chi, may help to promote regular participation, especially in chronic disease populations who face additional barriers to engaging in an active lifestyle (Johnson and Heller, 1998; Brawley *et al.*, 2002). In particular, yoga may offer a number of physical as well as psychological benefits to cancer survivors.

In this study, the style of yoga used was a modified version of hatha yoga called yoga therapy. Influenced by the Iyengar tradition of yoga and the study of kinesiology, the yoga asanas (or postures) are modified for people who are particularly stiff, immobile, injured, ill, or under extreme stress. Yoga therapy enables the student to move slowly and safely into the modified asana concentrating initially on relaxing their body, breathing fully, and developing awareness of the sensations in their body and thoughts in their mind. As the sessions progress, the student moves from the modified version toward the full version of the asanas, building flexibility, strength, and balance while maintaining that initial understanding of being relaxed and aware. As a result, the student is always moving mindfully and in their pain-free range of motion while improving at their optimum speed.

Of primary interest in the present pilot study was change in the key variables over the duration of the yoga program for the intervention versus the control participants. Specifically, it was expected that there would be measurable fitness improvements for the program participants as compared to the wait-list controls. It was also expected that the psychological outcomes of stress symptoms, mood states and quality of life would be improved after participation in the 7-week yoga program.

METHODS

Participants

Participants included cancer survivors (18 years and older) who were not currently undergoing active treatment and had no additional health concerns. Participants were a minimum of 3 months post-treatment. Once the participants

declared interest in the program, they were asked to complete the Physical Activity Readiness Questionnaire (PAR-Q; Thomas *et al.*, 1992). The PAR-Q assesses whether participants have barriers to participation in physical activity including heart conditions, high blood pressure or heart drugs, bone and joint problems, chest pain during activity, chest pain at rest, loss of balance or dizziness. Patients who endorsed any of these conditions were then asked to have the Physical Activity Readiness-Medical Examination (PAR-Med-X; Thomas *et al.*, 1992) form completed by their physician. The physician indicated which conditions applied to the patient, and either gave approval for participation in the yoga program or indicated they would not approve such activity. Only two participants were excluded from participation at the level of the PAR-Q or PAR-Med-X. Those who passed this screening were included in the protocol and provided informed consent. The research protocol received ethics approval from the Conjoint Health Research Ethics Board of the Faculties of Medicine, Kinesiology and Nursing at the University of Calgary (CHREB).

Design and procedure

Eligible participants who had provided informed consent were randomly assigned to either the intervention or the wait-list control condition once 20 had been accrued. Only 10 participants were involved in the intervention program per wave, thus ensuring personal attention and proper technical execution. Two waves of participants underwent the protocol (20 intervention, 18 control). The data from the crossover wherein the control groups participated in the yoga program is not included in this report. The data was then collapsed, as each wave followed the identical yoga protocol. Both intervention and control groups completed assessments at two time-points: Pre-intervention, prior to the start of the yoga program, and post-intervention, immediately following the conclusion of the 7-week program for the intervention group.

The yoga program. The program instructor has a BSc in Kinesiology, and was certified as a yoga instructor in 1998. The class was held over a period of 75 min in a quiet and dimly lit yoga studio,

according to the following schedule: 0–10 min—gentle breathing, laying supine, with legs flexed at the hip and supported by a wall. The pelvis is in a neutral position, and arms are abducted with palms facing toward the ceiling; 10–60 min—a series of 6–10 modified Yoga asanas which are comprised of gentle stretching and strengthening exercises of specific groups of muscle, tendons and ligaments inside of the participant's pain free zone (these asanas changed over the course of 7 weeks as participants' flexibility and strength improved); 60–75 min—shevasana or relaxation (corpse pose). As a distinct entity from the previous 60 min, the body is in a supine position with legs slightly abducted or with knees in flexion with the plantar side of the feet placed on the floor, arms slightly abducted, palms up. The student focuses attention on breathing and on the internal sensations of the body.

Measures

Psychological questionnaires Individuals were asked to complete a battery of psychological instruments in a self-report questionnaire-based format. The questionnaires included the following information:

Demographics: Age, gender, marital, financial and disease status/diagnosis were assessed to describe the participants.

Profile of mood states (POMS; McNair et al., 1971): The POMS is a 65-item scale which assesses six affective dimensions: Tension–anxiety, depression–dejection, anger–hostility, vigor–activity, fatigue inertia, and confusion–bewilderment. It has been widely used in the assessment of mood changes resulting from a variety of interventions due to its responsiveness, and has been used extensively with cancer populations (Cassileth et al., 1985). The POMS measures state (vs trait) attributes and therefore previous administrations do not influence subsequent administrations, which makes it very good for repeated-measures. Kuder-Richardson internal consistency of the six subscales ranged from 0.84 (confusion) to 0.95 (depression) in two studies, with test–retest stability of 0.65 (vigor) to 0.74 (depression) over a period of 20 days on average. This is consistent with the POMS as a measure of mood states, which are expected to vary over time and thus supports its construct validity.

Symptoms of stress inventory (SOSI; Leckie and Thompson, 1979): The SOSI was designed to measure physical, psychological, and behavioral responses to stressful situations. The respondent is instructed to rate the frequency with which they experience various stress related symptoms on a 5-point scale ranging from never to frequently, during a designated time frame selected by the investigator (in this case, the past week). Ten subscale scores are derived from the 95 individual items: (1) peripheral manifestations; (2) cardiopulmonary symptoms; (2a) symptoms of arousal, (2b) upper respiratory symptoms; (3) central neurological symptoms; (4) gastrointestinal symptoms; (5) muscle tension; (6) habitual patterns (e.g. smoking, drinking, nail biting); (7) depression; (8) anxiety/fear; (9) emotional irritability; (10) cognitive disorganization. It overcomes the limitations of checklist measures which assume universally valid weightings of stressful events based on normative data by focusing on manifest symptoms of stress, eliminating the necessity of subjects identifying and rating all relevant stressful events occurring in their lives. Predictive and concurrent validity has been demonstrated and in a mixed chronic-illness sample of malignant melanoma and myocardial infarction patients, manifest symptom distress as measured by the SOSI was directly related to functional alterations due to disease and inversely related to cognitive adaptation and perceived quality of life (Cowan et al., 1992). Cronbach's alpha for the SOSI total score was 0.97, with subscale coefficients ranging from 0.62 (neurological) to 0.91 (emotional irritability). Test–retest correlations ranged from 0.47 (respiratory) to 0.86 (muscle tension). Again, one would not want these values to be too high, as the measure is meant as an indicator of the current state of stress symptoms, not as a measure of a stable trait.

EORTC QLQ-C30 (Aaronson et al., 1993): This 30-item questionnaire includes five functional domains of quality of life: Physical function (5 items), emotional function (4 items), cognitive function (2 items), social function (2 items) and role function (2 items). There are also several symptom scales: fatigue (3 items), pain (2 items), nausea and vomiting (2 items), and one item each for dyspnea, sleep disturbance, appetite, constipation, diarrhea and financial difficulties. Finally, two items assess global quality of life. Seven items are answered in a 'Yes–No' format, 21 items are evaluated on a four point Likert type scale rating the presence of problems on a range from 'not at

all' (1) to 'very much' (4), and the two global items are assessed on a seven point scale with the anchors of 'very poor' (1) to 'excellent' (7). Item scores are added together to calculate the subscale scores. The questionnaire shows high internal consistency (Cronbach's alpha ranged from 0.59 to 0.85 across subscales), and overall reliability and validity of the survey has been demonstrated in international clinical trials with cancer patients of heterogeneous diagnoses including lung cancer (Aaronson *et al.*, 1993). It has become the gold standard of QL assessment in clinical trials both in Europe and North America, with much normative data available for comparison.

Physical activity. The Leisure Score Index (LSI) of the Godin Leisure-Time Activity Index (Godin and Shephard, 1985) was used to assess previous physical activity levels. The LSI contains three questions that assess the frequency of mild, moderate, and strenuous physical activity performed for at least 15 min duration during free time in a typical week within the past month. This measure has been found to be reliable and valid comparable to other self-reports of activity levels (Jacobs *et al.*, 1993).

Physiological and fitness indices. Canadian physical activity, fitness and lifestyle appraisal (CPA-FLA) protocol was followed for all of the fitness testing. Physiological measures included height (to the nearest 0.5 cm) and weight (to the nearest 0.1 kg), which are used to calculate body mass index (BMI), and girth assessments (waist and hip, used to calculate the waist-to-hip ratio, an indicator of subcutaneous or interstitial fat distribution). Fitness measures included:

1. Grip strength, measured with a dynamometer (to the nearest 1.0 kg).
2. Flexibility measured by sit and reach measurements (to the nearest 0.5 cm).
3. Rockport Walking Test was used as a measure of functional capacity via distance traveled in 6 min. Participants measured exertion via heart rate values both pre- and post-6-min walk test, while measuring perceived exertion using the Borg rate of perceived exertion (RPE) scale.

Data analyses. All data was analyzed using the Statistical Package for the Social Sciences (SPSS) Version 11.01. Data analyses include descriptive

statistics followed by repeated-measures general linear modeling procedures to investigate the 2×2 interactions between group and time. This analysis takes into account the pre-scores when comparing the post-scores between groups, and also determines the main effect of time across groups.

RESULTS

Demographics: There were no significant differences between the control and intervention participants on any of the demographic variables. The sample was predominantly female (95%), married (80%), approximately 50 years old, mostly breast cancer survivors (85%) and were approximately 56 months from time of diagnosis.

Quality of life: Results from the repeated-measures ANOVA for the EORTC indicated main effects for group in global quality of life ($F = 7.36$, $p < 0.01$), emotional function ($F = 6.90$, $p < 0.05$) and decreased diarrhea ($F = 12.20$, $p < 0.01$). The effects for global QL and emotional function reflect decreases in the yoga group accompanied by few changes in the controls. The group effect on diarrhea can be seen by examining the pre- and post-scores of each group to be due to some greater problems in the control group that failed to resolve over the waiting period, rather than significant improvements in the yoga group. All significant results can be seen in Table 1.

Symptoms of stress: The SOSI questionnaire results (Table 1) revealed trends toward group main effects for emotional irritability ($F = 3.24$, $p < 0.10$), gastrointestinal symptoms ($F = 3.09$, $p < 0.10$) and cognitive disorganization ($F = 3.27$, $p < 0.10$), indicating more improvement in the yoga group, and a main effect for time on cardiopulmonary symptoms ($F = 6.99$, $p < 0.05$), such that both groups improved pre- to post-intervention.

Mood: A number of the POMS subscales and the total mood disturbance score showed trends toward main effects for group membership (Table 1). Specifically, the yoga participants showed more improvements than the controls on the POMS total mood disturbance ($F = 3.43$, $p < 0.10$), and within the subscales of tension ($F = 5.00$, $p < 0.10$), depression ($F = 3.45$, $p < 0.10$), and confusion ($F = 3.29$, $p < 0.10$). Thus, the overall picture shows that in the areas of tension, depression, confusion and the overall mood disturbance, there

Table 1. Significant psychological changes and trends in EORTC, POMS and SOSI scores

	Yoga pre N = 20		Yoga post N = 18		Control pre N = 18		Control post N = 18	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
<i>EORTC</i>								
Emotional functioning**	79.58	20.14	83.80	14.14	75.00	14.85	70.83	16.97
Quality of life**	64.58	25.63	78.24	20.24	62.04	12.85	62.50	15.46
Dyspnea*	3.51	15.29	3.70	15.71	16.67	23.57	11.11	16.17
Diarrhea***	5.00	12.21	0.00	0.00	20.37	25.92	27.78	32.84
Finances*	11.67	19.57	7.41	24.40	20.37	23.26	24.07	29.83
<i>SOSI</i>								
Gastrointestinal†	4.00	3.54	2.89	2.52	4.83	4.46	5.00	3.48
Emotional irritability†	3.10	3.28	1.83	1.72	4.22	4.01	4.22	4.89
Cognitive disorganization†	2.95	3.19	2.22	1.99	3.56	2.90	3.89	3.82
<i>POMS</i>								
Tension*	1.95	3.95	1.39	3.29	4.83	5.28	4.56	5.72
Depression†	4.70	7.86	2.22	2.65	5.44	5.10	5.50	6.03
Concentration†	0.65	4.37	-0.39	1.82	1.24	3.35	2.11	4.06
Total mood disturbance†	3.20	28.57	-6.78	16.75	6.67	19.65	7.67	22.09

Improvements pre- to post-intervention: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; † $p < 0.10$.

Table 2. Significant changes in physical indices

	Yoga pre N = 20		Yoga post N = 18		Control pre N = 18		Control post N = 18	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Weight*	73.77	14.19	76.62	13.48	68.35	12.42	69.27	12.46
Systolic blood pressure	126.65	15.74	124.59	18.80	124.60	19.38	117.67	15.35
Diastolic blood pressure	83.65	13.26	80.53	11.61	76.13	13.18	74.33	14.5
Left-handed grip*	30.75	5.32	27.37	8.56	30.47	7.65	27.82	8.67
Right-handed grip	32.46	4.86	30.84	5.28	29.50	7.26	30.00	7.49
Distance walked**	582.13	51.13	810.06	238.25	663.07	167.79	809.33	354.96
Sit and reach*	27.50	10.51	30.76	9.92	29.59	10.44	30.35	9.69
Heart rate pre	84.35	17.68	76.29	10.48	80.44	14.67	78.81	12.93
Heart rate post	116.24	19.61	110.82	17.73	126.88	23.84	126.94	43.11
Perceived exertion pre**	0.84	0.94	1.69	1.65	1.38	1.01	2.44	2.03
Perceived exertion post**	2.65	1.50	4.09	2.44	3.63	1.47	4.63	2.30

Main effects for TIME, * $p < 0.05$, ** $p < 0.01$ (no group main effects or interactions).

were improvements in the yoga group, but not significant changes in the control participants.

Physical activity and fitness: There were no main effects for group membership on any of the physical indices (Table 2). However, there were time effects on a number of measures, indicating that both the control and yoga groups had changed significantly over time, but not to differ-

ing degrees. Specifically, both groups had higher weights at time two ($F = 5.37$, $p < 0.05$), had a weaker left-handed grip ($F = 5.93$, $p < 0.05$), walked much further ($F = 10.85$, $p < 0.01$), had longer reach on the sit and reach test ($F = 5.37$, $p < 0.05$), and had higher perceived exertion both pre- ($F = 14.54$, $p < 0.01$) and post- ($F = 7.54$, $p < 0.01$) testing.

DISCUSSION

The results of this study provide preliminary evidence that yoga practice has a positive psychological impact on cancer survivors. Specifically, the goal of the pilot project, to examine the benefits of yoga as a non-traditional physical activity for cancer survivors, revealed psychological improvements in the participants. However, contrary to our hypotheses, there were no significant physical improvements in the yoga vs the control participants. Rather, participants in both conditions showed some physical fitness improvements over time.

Overall, the results indicate that the yoga practice had a positive impact on mood, quality of life and stress within the intervention group compared to the control group. Global quality of life, measured with the EORTC, was higher for yoga participants than control at post-intervention. The EORTC subscales of emotional function and diarrhea were also lower in the yoga participants. Other results, while not statistically significant ($p < 0.10$) are reported as trends in the direction hypothesized. The lack of significance is perhaps due to the small sample size in this pilot project. Specifically, total mood disturbance, although not significant, was lower in the yoga vs control group. This was reflected in improvements in tension, depression, and confusion. Within the SOSI, results indicated a trend towards improvement in a number of subscales, including less emotional irritability, gastrointestinal symptoms and cognitive disorganization.

To get a sense of how these patients were coping in general, pre-intervention scores of the participants in terms of total mood disturbance, quality of life and stress symptoms were compared to other published oncology norms. In MBSR studies from the same centre (the Tom Baker Cancer Centre in Calgary, Canada), patients' scored much higher pre-intervention than in this sample. However, the QL scores reported by this group represent quite high initial QL levels. Compared to a Swedish normative sample of the same age range whose average global QL score was 77 (Michelson *et al.*, 2000), these patients scored an average global QL pre-intervention of 65. This is higher than other patient groups that have reported scores in the 50s (Aaronson *et al.*, 1993). This may indicate that our participants had relatively good QL prior to participation in the intervention, making it more difficult to incite enhancement of these already quite healthy levels.

There were no differences between the groups on physical assessment measures at the post-test. However, both groups (participants and controls) showed significant changes over time, including increased distance walked, higher body weight, increased flexibility, higher perceived exertion, and weaker grip strength. The lack of group differences may be due to the small sample size, the short duration of the program, or the possibility of contamination between the groups. Specifically, control participants were waiting for the program, and many reported to us that they began to engage in their own physical activity program because they had not been randomized to the yoga participant group. Despite the lack of significant findings, future research should continue to examine the physical changes associated with a yoga program, and attempt to employ a longer program duration, assess a greater number of participants, and track the activities of the control group to determine the extent of their involvement in active living behaviours.

While promising, a number of limitations in the present pilot study warrant comment. Specifically, the participants included a self-selected group of primarily women with breast cancer, who, given the transparent nature of the study, were interested in exploring yoga as a physical activity option. There is a need to target additional cancer survivor populations to determine the viability of yoga across cancer types and with men. A second limitation was the relatively short program duration (7 weeks). However, differences were detectable from the pre- to post-assessment, suggesting the impact of yoga is immediate. Finally, the relatively small sample size precluded the use of more powerful statistics to detect changes.

Despite these limitations, it appears that yoga offers a promising alternative choice as a physical activity for cancer survivors, promoting a number of similar psychological benefits that have been previously highlighted in the physical activity and cancer literature (Demark-Wahnefried *et al.*, 2003). Future research should continue to explore alternatives to traditional aerobic-based activities, in the hopes of promoting increased exercise participation, and thus achieving QL benefits, for cancer survivors.

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