Predictors of adherence to an Iyengar yoga program in breast cancer survivors

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ABSTRACT

Context: Despite the known health benefits of physical activity, participation rates in cancer survivor groups remain low. Researchers have attempted to identify alternative modes of nontraditional physical activities that may increase participation and adherence rates. This study investigated the determinants of yoga in breast cancer survivors.

Aim: To examine predictors of Iyengar yoga adherence in breast cancer survivors using the theory of planned behaviour. Settings and Design: Classes were held either in Campus Recreation facilities or at the Behavioral Medicine Fitness Center at the University of Alberta in Edmonton, Canada. The study was an evaluation of an existing yoga program.

Materials and Methods: Twenty-three post adjuvant therapy breast cancer survivors participating in a community-based, twice weekly, 12 week Iyengar yoga program were asked to complete baseline measures of the theory of planned behavior, demographic, medical, health/fitness, and psychosocial variables. Adherence was measured by objective attendance to the classes.

Statistical Analysis: We analyzed univariate associations between predictors and yoga adherence with independent *t*-tests.

Results: Adherence to the Iyengar yoga program was 63.9% and was predicted by stronger intention ($P<0.001$), greater self-efficacy ($P=0.003$), more positive instrumental attitude ($P=0.025$), higher disease stage ($P=0.018$), yoga experience in the past year, ($P=0.044$), diagnosis of a second cancer ($P=0.008$), lower fatigue ($P=0.037$), and greater happiness ($P=0.023$).

Conclusions: Adherence to Iyengar yoga in breast cancer survivors was strongly related to motivational variables from the theory of planned behaviour. Researchers attempting to improve yoga adherence in breast cancer survivors may benefit from targeting the key constructs in the theory of planned behaviour.

Key words: Iyengar yoga; breast cancer; survivorship; correlates; adherence, theory of planned behavior.

INTRODUCTION

Recent meta-analyses have reported that physical activity improves health related fitness and some patient reported outcomes in breast cancer survivors.[1,2] Moreover, several prospective observational studies have indicated that higher levels of physical activity post treatment are associated with a significant reduction in breast cancer recurrence and overall mortality.[3-5] Nevertheless, prevalence rates for post treatment physical activity range from 20 to 30% across a wide range of cancer survivor groups, including breast cancer survivors.[6-8] Given the low physical activity participation rates in cancer survivor groups, researchers have attempted to identify alternative modes of nontraditional physical activities that may increase participation and adherence rates. Recent systematic reviews have suggested that yoga is a feasible mode of physical activity for cancer survivors that can lead to important health benefits.[9,10] Thus far, most research has examined the predictors of adherence to aerobic and/or resistance interventions in breast cancer survivors[11-14] with few studies attempting to identify the predictors of adherence to yoga. Moreover, no studies have examined the determinants of adherence to yoga within a theoretical framework.

In a previous paper, we reported that participation in a 12 week Iyengar yoga program improved several indicators of quality of life and psychosocial functioning.[15] The purpose of the present paper was to identify the key predictors of adherence to the supervised Iyengar yoga program. The investigation was guided by Ajzen's theory of planned behavior.[16] The theory of planned behavior is a social cognitive model of human behavior that proposes that intention (i.e. motivation) is the most important determinant of behavior. Intention in turn is influenced by perceived behavioral control (i.e. the perceived ease or difficulty of performing a behavior), attitude (i.e. positive or negative evaluation of behavior), and subjective norm (i.e. perceived approval/support for performing the behavior). The major constructs of the theory have been reconceptualized into a two component model that divides attitudes into instrumental and affective components, norms into injunctive and descriptive components, and perceived behavioral control into perceived control and self-efficacy components.[17-19] The theory of planned behavior has been found to be a useful model for understanding adherence to traditional exercise programs in breast and other cancer survivors.[11,20,21] We hypothesized that adherence to yoga in breast cancer survivors would be predicted by the theory of planned behavior variables. We also examined standard demographic, medical, behavioral, and quality of life variables as potential predictors.

MATERIALS AND METHODS

We have reported the details of the main study elsewhere.[15] The design of the study was an evaluation of an existing yoga program. Participants were 23 women, taking part in an Iyengar Yoga program for breast cancer survivors offered through the University of Alberta Campus Recreation. Iyengar yoga incorporates the use of props and supports such as blocks, bolsters, straps, and blankets allowing postures to be more accessible to individuals with limited mobility, and or injury and illness. Postures could be modified to be more or less challenging based on the amount of props and supports used. Classes met for 90 minutes once or twice per week for 6 or 12 weeks and cost $240. The IY classes were conducted by a senior IY instructor with selected postures based on recommendations from Geeta Iyengar, and adapted based on the individual needs of participants. The classes consisted of a combination of active and supported poses. Meditation and breath work was incorporated into the supported postures. A complete list of the postures included in the IY classes is detailed in a previous publication.[15] Classes were held either in Campus recreation facilities or the Behavioral Medicine Fitness Center. We obtained ethical approval from the Faculty of Physical Education and Recreation ethics committee and written and informed consent was obtained from all participants. All women were English speaking, had a previous breast cancer diagnosis, and were in the survivorship phase of the cancer experience

(i.e., disease free and post adjuvant therapy). All consenting participants completed a self-administered questionnaire at baseline assessing medical, demographic and health behavior variables along with social cognitive variables from the theory of planned behavior, quality of life, and psychosocial functioning.

We collected demographic data by self-report that consisted of age, marital status, education, annual family income, and employment status. Medical data were likewise collected by self-report and consisted of date of diagnosis, stage of cancer at diagnosis, treatment regime, and current disease status. We collected behavioral variables by self-report that consisted of smoking, drinking and past physical activity. Past physical activity was assessed by a modified version of the Leisure score index (LSI) from the Godin Leisure Time Exercise Questionnaire (GLTEQ).[22] We calculated average weekly minutes of physical activity in the past month separately for moderate and strenuous physical activity and categorized participants as either meeting or not meeting public health exercise guidelines.[23] Two items asked if participants had participated in yoga ever and in the past year. We asked participants to select one of three possible response categories: No not at all, yes but not regularly, or yes regularly (i.e. weekly). In addition, we asked participants to check yes or no to a list of health conditions. Patient-reported outcomes consisted of the SF-36,[24] the Functional Assessment of Cancer Therapy Breast (FACT-B) cancer scale,[25] the happiness scale,[26] the short form center for epidemiological studies depression scale,[27] the short form Spielberger State anxiety inventory,[28] the Fatigue Symptom Inventory (FSI),[29] the Perceived Stress Scale (PSS 10 item version),[30] and the brief body image scale (BIS version 1).[31] We reported details of these measurements' reliability and validity elsewhere.[15]

Single items were used to assess the theory of planned behavior constructs, instrumental and affective attitude, injunctive and descriptive norms, self-efficacy, motivation, and intention. Items were developed based on the guidelines provided by Ajzen[32] and focused on participation in the yoga program. Intention was assessed using one item. We asked participants to write the number of classes they planned to attend over the 12 weeks (range 0 to 22, two statutory holidays). We calculated intention as a percentage by dividing the number of classes participants intended to attend, by the number of classes that could be attended. We assessed adherence by objective attendance collected by the yoga instructor at each class. The total number of classes participants attended was divided by the total number of classes offered and presented as a percentage.

Statistical analyses

To conserve power, we created dichotomous predictors where possible (e.g. marital status, education, employment

status and family income). Likewise, with the exception of intention, we dichotomized the theory of planned behaviour variables into participants endorsing "7" (extremely) on items, and participants endorsing "≤6", with the exception of descriptive norms. As no participants endorsed "7" for this construct, a median split indicated participants reporting "≥3" (slightly) compared to those reporting "≤2" best dichotomized this variable. For ease of interpretation, we also analyzed intention, and patient reported outcomes as categorical variables based on a median split. We analyzed univariate associations between predictors and yoga adherence using independent *t*-tests. All tests were two tailed with significance set at α=0.05.

RESULTS

Recruitment of participants has been reported elsewhere[15] but we provide a detailed summary here. We had 23 women from four different sessions (spring, fall, and winter 2007/2008) completed the baseline questionnaire. All women were caucasian, and the mean age of the sample was 54.8 years (range 45 to 67). The 23 study participants were unmarried (56.5%), earned ≥60,000 per annum, reported some College or University education (86.9%), worked part time or less (65.2%), and had a mean age of 54.8 years (range 45 to 67). Fifty two percent of participants reported some yoga experience (52.2%); however, only 21.7% reported any yoga experience in the past year. In terms of the medical profile, mean years since diagnosis was 3.5 years (range 2 months to 19.5 years), 73.9% were diagnosed with early stage breast cancer (stage I/II) and 26.1% with advanced stage disease (≥stage III), 69.6% were treated with both chemotherapy and radiation therapy, and 47.8% received hormone replacement therapy.

In terms of theory of planned behavior variables, our sample of breast cancer survivors felt that participating in yoga over the next 12 weeks would be quite-to-extremely beneficial, quite-to-extremely enjoyable, and they were quite-to-extremely confident that they could complete the exercises in the yoga classes. They also felt that people important to them would be extremely supportive, but would not at all-to-slightly be likely to participate in yoga classes themselves. Associations between the predictors and yoga adherence are presented in Tables 1 (theory of planned behavior), 2 (demographic), 3 (medical), 4 (health and fitness), and 5 (participant reported outcomes).

For theory of planned behavior variables, we found statistically significant univariate associations between yoga adherence and intention (*P*<0.001), self-efficacy (*P*=0.003), and instrumental attitude (*P*=0.025). Higher yoga adherence was associated with participants who intended to attend more yoga classes at baseline, had greater confidence that they would be able to do the yoga exercises

Table 1: Associations between motivational variables and Iyengar yoga adherence in breast cancer survivors

Variable	M (SD) (%)	Mean difference [95% CI]	P value t-test
Intention			<0.001
≥88% (*n*=12)	87.7 (9.8)	+49.7 [+30.2 to +67.6]	
<88% (*n*=11)	38.0 (28.1)		
Motivation			0.828
=7 (*n*=10)	65.6 (34.2)	+3.1 [−25.9 to +32.1]	
≤6 (*n*=13)	62.6 (32.2)		
Self-efficacy			0.003
=7 (*n*=3)	88.3 (6.4)	+28.0 [+10.6 to +45.4]	
≤6 (*n*=20)	60.3 (33.2)		
Instrumental attitude			0.025
=7 (*n*=9)	79.9 (10.0)	+26.3 [+3.7 to +48.9]	
≤6 (*n*=14)	53.6 (37.6)		
Affective attitude			0.377
=7 (*n*=7)	73.2 (28.7)	+13.3 [−17.4 to +43.9]	
≤6 (*n*=16)	59.9 (34.0)		
Injunctive norm			0.235
=7 (*n*=10)	56.7 (33.4)	−16.5 [−44.5 to +11.5]	
≤6 (*n*=13)	73.2 (30.2)		
Descriptive norm			0.427
=3 (*n*=11)	63.1 (33.6)	+10.9 [−17.2 to +39.0]	
≤2 (*n*=12)	72.7 (19.3)		

in class, and anticipated more benefits from participation in the yoga classes [Table 1]. For demographic and medical variables, we found significant associations between yoga adherence and disease stage at diagnosis (*P*=0.004) with adherence being greater for participants with more advanced stage disease (stage II/III vs. stage I). We found significant associations between yoga adherence and yoga experience in the past year (*P*=0.044) and diagnosis of a second cancer (*P*=0.008). Participants with previous yoga experience in the same year and participants diagnosed with another type of cancer had greater adherence [Tables 2-4]. For participant reported outcomes, significant differences in adherence were observed for fatigue (*P*=0.037) and happiness (*P*=0.023). Participants reporting lower levels of fatigue and feeling happier had greater adherence to the yoga program [Table 5].

DISCUSSION

The primary goal of this study was to examine predictors of adherence to Iyengar yoga classes for breast cancer survivors. Overall, adherence to Iyengar yoga classes in this study was modest (63.9%) but comparable to other studies of yoga in breast cancer survivors.[33-35] In a randomized controlled trial, Moadel *et al*.[33] reported participants attended on average 7 out of 12 classes (58.3%). Similarly, Danhauer *et al*.[34] reported a 58% adherence rate from a pilot randomized study of women with breast cancer

Table 2: Associations between demographic variables and lyengar yoga adherence in breast cancer survivors

Variable	M (SD) (%)	Mean difference [95% CI]	P value t-test
Age			0.834
<50 (n=14)	65.1 (30.4)	+3.0 [−26.4 to +32.5]	
≥50 (n=9)	62.1 (37.2)		
Employment status			0.185
Not full–time (n=15)	70.6 (28.1)	+19.1 [−9.9 to +48.0]	
Full–time (n=8)	51.5 (38.1)		
Marital status			0.710
Married (n=10)	66.9 (10.0)	+5.2 [+13.9 to −23.7]	
Unmarried (n=13)	61.6 (33.5)		
Family income			0.792
≥$60,000 (n=14)	65.4% (7.7)	+3.8 [−25.6 to +33.2]	
<$60,000 (n=9)	61.6% (13.1)		
Education			0.867
Some college/university (n=20)	63.5 (37.5)	−3.5 [−46.2 to +39.2]	
Some high school (n=3)	66.9 (30.5)		

Table 4: Associations between health/fitness variables and lyengar yoga adherence in breast cancer survivors

Variable	M (SD) (%)	Mean difference [95% CI]	P value t-test
Past exercise			0.874
Meeting guidelines (n=6)	62.0 (35.6)	−2.5 [−35.3 to +30.2]	
Not meeting guidelines (n=17)	64.6 (32.4)		
Yoga experience ever			0.366
Yes (n=12)	69.9 (34.8)	+12.6 [−15.7 to +40.8]	
No (n=11)	57.4 (29.8)		
Yoga experience past year			0.044
Yes (n=5)	81.1 (13.5)	+22.0 [−11.4 to +55.4]	
No (n=18)	59.1 (34.7)		
Other cancer			0.008
Yes (n=4)	89.8 (13.1)	−31.3 [−66.5 to +3.9]	
No (n=19)	58.5 (32.8)		
Arthritis			0.753
No (n=13)	65.8 (32.5)	+4.5 [−24.5 to +33.4]	
Yes (n=10)	61.4 (10.7)		

Table 3: Associations between medical variables and lyengar yoga adherence in breast cancer survivors

Variable	M (SD) (%)	Mean difference [95% CI]	P value t-test
Disease stage at diagnosis			0.004
Advanced (n=6)	85.4 (8.3)	+29.1 [+10.3 to +47.9]	
Early (n=17)	56.3 (34.5)		
Past chemotherapy and radiation			0.115
Yes (n=16)	70.9 (29.2)	+23.3 [−6.2 to +52.7]	
No (n=7)*	47.7 (35.8)		
Past Hormone therapy			0.630
Yes (n=11)	67.4 (30.0)	+6.7 [−21.9 to +35.4]	
No (n=12)	60.7 (35.5)		

Note: *Participants received only chemotherapy (n=3), only radiation (n=3) or surgery only (n=1)

Table 5: Associations between patient-rated outcomes and lyengar yoga adherence in breast cancer survivors

Variable	M (SD) (%)	Mean difference [95% CI]	P value t-test
Depression			0.365
<31 (n=12)	69.9 (34.7)	+12.6 [−15.7 to +40.8]	
≥31 (n=11)	57.4 (30.0)		
Fatigue			0.037
<48 (n=12)	77.2 (28.9)	+27.7 [+1.8 to −53.6]	
≥48 (n=11)	49.5 (30.9)		
Happiness			0.023
<61 (n=12)	49.7 (31.9)	+29.7 [−3.9 to +66.5]	
≥61 (n=11)	79.4 (26.2)		
Anxiety			0.707
<49 (n=12)	61.4 (33.7)	+5.3 [−23.5 to +34.0]	
≥49 (n=11)	66.7 (32.3)		
Body image			0.731
<24 (n=12)	66.2 (30.9)	+4.8 [−23.9 to +33.5]	
≥24 (n=11)	61.4 (35.4)		
Stress			0.474
<30 (n=11)	69.1 (31.4)	+9.9 [−18.5 to +38.4]	
≥30 (n=12)	59.1 (34.0)		
Physical component score SF-36			0.346
≤47.5 (n=11)	70.7 (27.9)	+13.1 [−15.1 to +41.2]	
≥47.6 (n=12)	57.6 (36.1)		
Mental component score SF-36			0.397
≥45.9 (n=11)	69.5 (30.1)	+11.8	
≤45.8 (n=12)	57.8 (35.1)	[−16.5 to +40.1]	
FACT-B			0.407
≤112.5 (n=11)	69.9 (27.3)	+11.5 [−16.8 to +39.8]	
≥112.6 (n=12)	58.4 (36.5)		

participating in 10 weekly, restorative yoga classes. Vadiraja *et al.*[35] compared the impact of an integrative yoga program to brief supportive therapy among breast cancer patients receiving adjuvant radiation therapy and reported that, out of a possible 36 sessions, 29.7% of participants' attended 10 to 20, 56.7% attended 20 to 25 sessions, and 13.7% attended >25 over 6 weeks.

A major difference between the studies discussed and our

own is the treatment status of participants. A portion of participants in the Moadel *et al.*,[33] and Danhauer *et al.*[34]

studies were concurrently undergoing treatment for breast cancer (48% and 34% respectively), which may account for their lower adherence rates. Adherence in our study is also comparable to studies in healthy populations.[36]

Although several studies have examined medical, demographic and psychosocial predictors of adherence to yoga.[33,34,36] to the best of our knowledge, this is the first study to examine predictors of yoga adherence within a theory of planned behavior framework. Key findings from our study are that several motivational variables predicted adherence to the Iyengar yoga program. We found that women intending to attend more classes had significantly greater adherence than women intending to attend fewer classes. Similarly, Courneya et al.[11] found intention to be an independent predictor of adherence in breast cancer survivors training for a dragon race competition.

We also found that self-efficacy and instrumental attitude (benefits) were significant predictors of adherence. Women who selected 7 "extremely" to indicate their confidence that they could complete the exercises in the classes and for the perceived benefits from participation achieved significantly greater adherence than women selecting ≤6. Likewise, in a home-based exercise trial for breast cancer survivors, Pinto et al.[14] found that baseline self-efficacy significantly predicted adherence. Moreover, in a study by Duncan et al.,[37] cancer patients participating in Iyengar yoga classes reported that the individual level instruction and use of props in the classes allowed them to perform the exercise and thus increased their confidence. These preliminary data suggest that future interventions should consider strategies to improve intention, confidence, and the perceived benefits of yoga to maximize adherence and potentially improve outcomes.

In our study, no participant demographic variables were significant predictors of adherence. Likewise, Pinto et al.[14] reported that demographic and medical variables were not significant predictors of adherence for breast cancer survivors participating in their home-based trial. A possible explanation for the lack of prediction from the demographic variables in our study is that our sample was a small, relatively homogenous sample of non-Hispanic Caucasian middle age women. In their larger multi-ethnic sample, Moadel et al.[33] reported that younger age predicted lower adherence. Moreover, a larger proportion of Hispanic women, as compared to African American and white women did not attend classes suggesting the potential importance of considering ethnicity. Future research with a larger more representative sample of breast cancer survivors is needed to substantiate our findings.

With respect to medical variables and health behaviors, stage of disease at diagnosis, diagnosis of a second cancer, and yoga experience in the past year significantly predicted adherence. Participants diagnosed with more advanced disease had greater adherence compared to those diagnosed with earlier stage disease. Concomitantly, participants reporting diagnosis of a second cancer attended significantly more classes than participants with a sole diagnosis of breast cancer. A possible explanation is that participants diagnosed with more advanced disease and or another type of cancer may be more concerned about their disease and overall health and therefore more motivated to adhere to methods to improve their health. In other studies, the role of disease stage has been mixed. Irwin et al.[7] reported a positive association between disease stage and exercise levels, and likewise in the START trial, Courneya et al.[12] found that breast cancer patients with more advanced disease had better adherence. In contrast, Hong et al.[38] reported a negative association, and Milne et al.[39] reported no association.

In our study, treatment regime was not predictive of adherence. In contrast, in their randomized controlled trial of yoga in breast cancer patients, Moadel et al.[33] reported significant associations between radiation therapy, non anti-estrogen therapy, and lower adherence. A possible reason for the difference in our findings is that a proportion of participants in the Moadel et al.[33] study were receiving radiation at the time of the study, and this may have made adherence more challenging than for participants post treatment. The small number of women receiving anti-estrogen therapy in our study ($n=10$) may have obscured any meaningful findings in relation to adherence and warrants further investigation with a larger sample.

It is well established that past exercise is one of the best predictors of future exercise,[40] and therefore it seems intuitive that participants who had previous yoga experience would adhere better to the yoga program. In support of this, we found that participants who reported participating in yoga within the last year attended significantly more classes than those who reported no prior yoga experience. A possible explanation for this finding is that previous experience with yoga led to greater self-efficacy that they would be able to complete the exercises in the yoga classes. The possible mediating effect of self-efficacy on adherence warrants investigation in future research.

With respect to participant-reported outcomes, less fatigue and greater happiness significantly predicted greater adherence. Similarly, Moadel et al.[33] reported that lower adherence was associated with increased fatigue. Danhauer et al.[34] reported that participants with greater health related QoL and lower fatigue attended more classes. It is apparent that breast cancer survivors reporting higher levels of fatigue are at risk for lower levels of adherence to exercise programs and therefore are important targets for intervention.

The overall strengths and limitations of our trial have been reported elsewhere.[15] Briefly, limitations include the small, homogenous convenience sample, and the use of multiple comparisons. Because of the small sample size, it is not clear whether some of the findings were truly non significant or due to inadequate power to detect a difference. Conversely, the issue of multiple comparisons is another limitation; it is possible that some of the significant findings were due to chance. In this study, participants were already enrolled in the yoga class and were therefore a selected group that could limit the generalizability of the findings. Moreover, limited variability in several of the theory of planned behavior variables at baseline is likely attributable to the selected and highly motivated sample of participants already participating in the Iyengar yoga program. We focused on predictors of adherence to supervised Iyengar yoga among women post treatment, and it is likely that predictors of adherence will be different for participants concurrently undergoing treatment for breast cancer. Likewise, we were not able to examine other potential predictors of adherence to the IY classes that may have been important such as transportation, distance to the facility, and work and/or family obligations.

Several important strengths warrant discussion. To the best of our knowledge, no study to date has conducted a comprehensive examination of the medical, demographic, and social cognitive correlates of adherence to an Iyengar yoga program in this population. The findings suggest that several motivational variables are important predictors of yoga adherence with this population providing support for the model in future research. The theory of planned behaviour appears to be useful for examining predictors of adherence to a yoga program in this population and appears to be an appropriate theoretical model for future research and interventions.

CONCLUSIONS

There is growing evidence for the potential benefits of yoga, in particular for breast cancer survivors, therefore maximizing adherence to such programs is of importance. The role of predictors of adherence can inform interventionists working with breast cancer survivors. In addition, such data can be useful in identifying participants who would benefit most from such programs and can help inform researchers of participants at risk for low adherence during a yoga program. Future studies should consider expanding the preliminary results to investigate the reasons for poor adherence in the identified subgroups, particularly women with more fatigue, and poor psychological health. Strategies to facilitate adherence in this population could be developed and tested.

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