Perceived Exercise Barriers Explain Exercise Participation in Australian Women Treated for Breast Cancer Better Than Perceived Exercise Benefits

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Objectives. This study aimed to determine the effect of perceived exercise benefits and barriers on exercise levels among women who have been treated for breast cancer and have not participated in a formal exercise intervention.

Design. This was an anonymous, national, online cross-sectional survey study.

Methods. Four hundred thirty-two women treated for breast cancer completed an online survey covering their treatment and demographic background, current exercise levels, and perceived exercise benefits and barriers. Each perceived benefit and barrier was considered in a binary logistic regression against reported exercise levels to ascertain significant relationships and associative values (odds ratio [OR]).

Results. Agreement with 16 out of 19 exercise barriers was significantly related to being more likely to report insufficient exercise levels, whereas agreement with 6 out of 15 exercise benefits was significantly related to being less likely to report insufficient levels of exercise. Feeling too weak, lacking self-discipline, and not making exercise a priority were the barriers with the largest association to insufficient exercise levels (OR=10.97, 95% confidence interval [CI]=3.90, 30.86; OR=8.12, 95% CI=4.73, 13.93; and OR=7.43, 95% CI=3.72, 14.83, respectively). Conversely, exercise enjoyment, improved feelings of well-being, and decreased feelings of stress and tension were the top 3 benefits associated with being less likely to have insufficient exercise levels (OR=0.21, 95% CI=0.11, 0.39; OR=0.21, 95% CI=0.07, 0.63; and OR=0.31, 95% CI=0.15, 0.63, respectively).

Limitations. Self-reported data measures were used to collect exercise data.

Conclusions. Targeting exercise barriers specific to women treated for breast cancer may improve exercise participation levels in this cohort. Awareness of the impact of exercise barriers identified in the present study will enable physical therapists to better plan exercise interventions that support all women treated for breast cancer.

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Ensuring the prolonged quality of life for patients with breast cancer is a challenge facing cancer care practitioners, particularly because the number of breast cancer cases are rising and cancer survivorship rates are improving.[1] A growing body of research suggests that exercise is beneficial for women after breast cancer treatment.[2–4] In particular, exercise has the potential to address the physical needs of patients through improved strength,[5] improved cardiorespiratory fitness,[6] reduced fatigue,[7] decreased heart and circulatory disease risk through effective weight management,[8] and improved survival with a decreased recurrence risk.[9] Exercise also can improve the emotional and psychological outcomes of patients with cancer through improved self-esteem,[2,10] decreased levels of anxiety and depression,[2,11] overall mood elevation,[11] and improved quality of life.[12] Despite these benefits, exercise participation rates among women who have been treated for breast cancer remain low.[13–15]

Population-based cross-sectional studies comparing patients with breast cancer with age-matched women with no history of cancer have shown that exercise behaviors generally do not differ between patients with breast cancer and cohorts without cancer.[16,17] For example, in a cross-sectional Australian National Health Survey sample, the percentage of respondents with no cancer history who were sufficiently active and the percentage of respondents who were survivors of cancer and who were sufficiently active were not significantly different (26.9% and 27.7%, respectively).[16] Longitudinal studies, however, have shown that exercise participation decreases significantly within the first 12 months following a breast cancer diagnosis.[13–15] Specifically, patients with breast cancer who are not involved in a structured exercise intervention are up to 50% less active within their first year of diagnosis than they were 1 year before diagnosis.[13,14] These low exercise levels begin to approach prediagnosis levels between 13 to 30 months after diagnosis,[13] and at the third year after diagnosis, approximately 32% of patients with breast cancer engage in 150 minutes per week of physical activity of moderate-to-vigorous intensity,[15] a proportion comparable to that of the general population.[16] However, the increased risk of comorbidity among patients with breast cancer supports an urgent need for better strategies to improve exercise adherence in these women, particularly in the early period after treatment.[4]

Valuable insight has been provided by studies that have examined barriers to exercise for women treated for breast cancer. However, the generalizability of the results from these previous studies to a nonclinical, community-dwelling breast cancer cohort is limited. Specifically, 2 of the 5 previous studies in this field assessed barriers experienced during a supervised exercise intervention.[18,19] Because exercise programs and the support and advice of exercise specialists are not routinely offered to women treated for breast cancer, those participants studied in the context of a supervised exercise intervention do not represent the wider breast cancer population.[20] The third and fourth of these studies were limited by relatively small sample sizes of women treated for breast cancer (N=23[21] and N=74,[22] respectively), which again inhibits the generalizability of the results to the whole population of individuals with breast cancer. The fifth study[20] was a community-based, cross-sectional survey, but included participants with a variety of cancer types in the sample (N=452; 291 [64.4%] breast cancer). Breast cancer data were not reported separately, and given that exercise barriers, correlates, and preferences may vary based on cancer type, research focusing specifically on women treated for breast cancer is warranted to gain a better understanding of any unique barriers to exercise experienced by these women.

It is likely that a range of exercise barriers contribute to the poor exercise participation rates noted among women treated for breast cancer. Similarly, outcome expectations and perceived exercise benefits could potentially influence exercise participation. Despite the potential influence of barriers and benefits, studies that have examined the barriers to and benefits of exercise perceived by women treated for breast cancer who were not part of a structured exercise intervention are sparse, with research design limitations as described above. A better understanding of what these exercise barriers and benefits are, as well as their influence on exercise levels, are likely to assist physical therapists in prescribing exercise to this cohort. Therefore, the primary aim of this study was to determine a comprehensive list of the perceived barriers to and benefits of exercise for women who have been treated for breast cancer and who were not part of any formal exercise intervention. The secondary aim of this study was to determine the effect that these perceived barriers and benefits had on exercise participation among this cohort. Specifically, we hypothesize that women who agree with the benefits of exercise are more likely to achieve a minimal recommended level of exercise (as outlined by the World Health Organization[23]), whereas women who agree with the barriers to exercise are less likely to achieve a minimal recommended level of exercise.

Method

Participants

Women treated for breast cancer who had a registered e-mail address with the Breast Cancer Network Australia (BCNA) Review & Survey Group, Cancer Council Victoria, or Cancer Council Western Australia were invited by e-mail to complete an online survey. Other than being a woman treated for breast cancer, there were no further inclusion or exclusion criteria for the study. The research invitation was written by the research team and sent to potential participants by the BCNA and respective cancer councils. It contained a brief introduction to the investigators and the study and a direct link to the uniform resource locator (URL) containing the Internet-based survey. Due to the anonymity of the data collection procedures and the fact that participants could forward the URL to other women treated for breast cancer who may or may not have completed the survey, the survey's response rate could not be accurately tracked. However, of the 482 women who visited the initial URL, 432 (89.6%) completed the survey. Participant informed consent was obtained; the first page of the survey was a participant information sheet to which participants clicked "I agree" in order to progress with the online survey.

Procedure

Recreational exercise intensity and duration were determined using the Recreational Activities domain of the Global Physical Activity Questionnaire version 2 (GPAQ v2).[23] The GPAQ v2 allows metabolic equivalents (METs; 1 MET=3.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$) to be calculated in order to express intensity of the reported physical activities.[23] To calculate weekly MET-minutes, the total time spent exercising during a typical week, the numbers of days, and the intensity of the exercise were taken into account. Based on GPAQ v2 analysis guidelines, respondents were then classified into those who met the GPAQ v2 threshold for achieving moderate or high levels of exercise and those who achieved low levels or no exercise. These classifications included any combination of moderate- or vigorous-intensity exercise resulting in ≥600 MET-minutes a week, ≥3 days per week of vigorous intensity exercise for ≥20 minutes a day, or ≥5 days per week of moderate-intensity exercise or walking for ≥30 minutes a day, as per GPAQ v2 guidelines.[23] For the purpose of the binary logistic regression analysis, women who achieved moderate or high levels of exercise were classified as "sufficiently active," and women who achieved only low levels or no level of exercise were classified as "insufficiently active" (Tab. 1). Data were missing for 9 participants.

Perceived exercise benefits and barriers were determined using a researcher-developed, 4-point, Likert-style benefits and barriers scale, which contained commonly expressed exercise benefits (n=15) and barriers (n=19). Participants were required to respond on the 4-point Likert scale (from "strong agreement" [4] to "strong disagreement" [1]), to each closed-ended question, and there was a fifth ("not applicable") option. Participants also were given the option of an "other" benefit or barrier to exercise. A paper-based version of the survey instrument had been previously developed and validated following a 3-stage process: literature review (stage 1),[19,21] consultation with experts (stage 2), and focus group sessions with women treated for breast cancer (stage 3).[22] This paper-based instrument was converted to an online version. In order to validate the online version, 7 focus groups with women treated for breast cancer (n=20) were conducted at community centers around the greater Sydney area. During these focus groups, the "think-aloud" technique was used,[24] and participants were queried about their understanding of each question, as well as the relevance and sensitivity of each question. This approach led to changes to facilitate the participants' understanding and ease in navigating the electronic version of the scale. Participants also were invited to discuss any other benefits or barriers to exercise that they encountered; however, nothing substantially new was discussed, and no further items were added to the online instrument. Test-retest reliability over 7 days was confirmed through administering the instrument to 12 survivors of breast cancer (twice, 7 days apart), and the instrument was deemed reliable with an intraclass correlation coefficient (ICC) of .82 (95% CI=.78, .85). Finally, the benefits and barriers scale items were presented in a randomly generated list in the online survey to remove potential ordering bias.

Answers to the closed-ended benefits and barriers items were coded and counted to determine the response frequency for each item. The mean of responses for each question also was calculated to show where most participants responded on the continuum of strong agreement to strong disagreement. The closer the mean score was to 4, the more participants agreed with the benefit or barrier. The standard deviation for each question also was calculated to show the variance of the responses.

Data Analysis

For the purpose of binary logistic regression analysis, each benefit and barrier was placed in binary categories of overall agreement (scores 3 and 4) or disagreement (scores 1 and 2). Agreement with each benefit or

Table 1.
Respondents' Demographic and Treatment Information With Comparisons With Australian Population Data

Demographics	Present Study		Comparison Data (%)
	n	% of Total Sample (N=432)	
Age (y)	432	100	Australian breast cancer prevalence[1]
<39	39	9.0	1.9
40–59	268	62.0	33.5
60–79	125	28.9	48.9
80+	0	0.0	15.7
Surgery	429	99.3	
Lumpectomy	188	43.5	
Mastectomy	241	55.8	
Missing	3	0.7	
Treatment received	431	99.8	
Radiotherapy alone	1	0.2	
Surgery alone	58	13.4	
Surgery+chemotherapy+radiotherapy	229	53.0	
Surgery+chemotherapy only	75	17.4	
Surgery+radiotherapy only	67	15.5	
Chemotherapy+radiotherapy only	0	0.0	
No treatment	1	0.2	
Missing data	1	0.2	
Treatment status	387	89.6	
On treatment	239[a]	55.3	
Currently receiving chemotherapy	14	3.2	
Currently receiving radiotherapy	3	0.7	
Currently receiving hormonal therapies	226	52.3	
Off treatment	148	34.3	
<1 y	20	4.6	
1–2 y	50	11.6	
3–4 y	23	5.3	
5–7 y	29	6.7	
8–10 y	9	2.1	
>10 y	17	3.9	
Missing data	45	10.4	
Time since first diagnosis	381	88.2	
<1 y	8	1.9	
1–2 y	134	31.0	
3–4 y	100	23.1	
5–7 y	66	15.3	
8–10 y	31	7.2	
>10 y	42	9.7	
Missing data	51	11.8	

(Continued)

Table 1.
Continued

Demographics	Present Study		Comparison Data (%)
	n	% of Total Sample (N=432)	
Exercise	423	97.9	Age-matched Australian women[27]
Sufficiently active[b]	158	37.4	37.6%[c]
Insufficiently active	265	61.3	
Missing data	9	2.1	

[a] Two respondents were simultaneously undergoing chemotherapy and hormonal therapies, and another 2 respondents were simultaneously undergoing radiotherapy and hormonal therapies.
[b] Any combination of moderate- or vigorous-intensity exercise resulting in ≥600 metabolic equivalents (MET)-minutes a week, or ≥3 days per week of vigorous intensity exercise for ≥20 minutes per day, or ≥5 days per week of moderate intensity exercise or walking for ≥30 minutes per day, as per Global Physical Activity Questionnaire version 2 (GPAQ v2) guidelines.[23]
[c] Any combination of moderate- or vigorous-intensity exercise for 30 minutes on at least 5 days of the week, resulting in 150 minutes per week.[35] When converting to MET-minutes, GPAQ v2 assigns 4 METs to moderate-intensity activity and 8 METs to vigorous-intensity activity. Therefore, 150 minutes of moderate-intensity activity=600 MET-minutes per week, which is equivalent to the minimum assignment of activity in GPAQ v2.

barrier was then considered in a binary logistic regression against the respondents' exercise levels to ascertain any significant relationships. Whether a respondent agreed with a benefit or barrier (agreement versus disagreement) was inserted as a dependent variable against the independent variable of exercise (sufficiently active versus insufficiently active). The combination of categories was necessary due to the poor representation of the "strongly agree" and "strongly disagree" coding groups in some variables. This method of analysis has been previously used in a cross-sectional survey data analysis with this population,[25,26] and results were interpreted based on statistical significance ($P<.05$) and odds ratios (ORs). All statistical analyses were completed using IBM SPSS Statistics for Windows software (version 19.0, IBM Inc, Armonk, New York).

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Results
Table 1 provides a summary of the respondents' demographic and treatment information and comparisons with relevant Australian population data. In brief, participants were 432 women who had been treated for breast cancer, between the ages of 23 and 77 years (mean age=53.25, SD=9.83). The present sample was slightly younger than the entire population of individuals with breast cancer in Australia[1] and had a similar proportion of women sufficiently active compared with the general Australian female population.[27] Similar to other nonclinical community-dwelling cancer populations studied,[18,20] most of the present sample had undergone surgery for their breast cancer (99.5%), along with combinations of chemotherapy and radiotherapy (86%). Also similar to previous research,[20] most respondents (86%) were less than 5 years posttreatment, with the largest group (68%) being within 1 year of treatment or still taking medication for their breast cancer.

Displayed in Table 2, the top 3 benefits (ranked according to mean score) were: exercising improves physical health, exercising improves heart and lung functioning, and exercising improves feelings of well-being. Six of the 15 benefits were significantly associated with exercise levels ($P<.05$), with ORs indicating that a respondent who agreed with that benefit were less likely to be insufficiently active. Based on ORs, the top 3 benefits with strongest associations were exercise enjoyment (odds ratio [OR]=0.21, 95% CI=0.11, 0.39), improved feelings of well-being (OR=0.21, 95% CI=0.07, 0.63), and decreased feelings of stress and tension (OR=0.31, 95% CI=0.15, 0.63).

Displayed in Table 3, the top 3 barriers ranked according to mean score were: procrastination, being fatigued by exercise, and not being able to find a comfortable bra to wear during exercise. Sixteen of the 19 perceived barriers were significantly associated with exercise levels ($P<.05$), with ORs indicating that a respondent who agreed with that barrier was significantly more likely to be insufficiently active. The top 3 barriers, based on ORs, were: feeling too weak to exercise (OR=10.97, 95% CI=3.90, 30.86), a lack of self-discipline (OR=8.12, 95% CI=4.73, 13.93), and exercise not being a priority (OR=7.43, 95% CI=3.72, 14.83).

Table 2.
Self-Reported Benefits of Exercise Ranked by Mean Score, Including Agreement With, and Binary Logistic Regression Values (With Odds Ratio [OR] and 95% Confidence Interval [95% CI]) of, Each Perceived Benefit Against Exercise Levels

Benefits of Exercise	n	$\bar{X}$	SD	Agree (%)[a]	Insufficiently Active vs Sufficiently Active	
					OR[b]	95% CI
Exercise improves my physical health	411	3.43	0.64	98	0.74	0.22, 2.44
Exercise improves functioning of my heart and lungs	406	3.42	0.65	99	2.10	0.56, 7.94
I have improved feelings of well-being from exercise	405	3.30	0.75	94	0.21[c]	0.07, 0.63
Exercise improves my mental health	398	3.28	0.81	95	0.31[d]	0.12, 0.83
My muscle tone is improved with exercise	404	3.28	0.74	95	0.44	0.17, 1.11
Exercise increases my muscular strength	402	3.28	0.78	95	0.40[d]	0.16, 0.99
Exercise decreases feelings of stress and tension for me	398	3.11	0.87	89	0.31[c]	0.15, 0.63
Exercise improves my self-esteem	395	3.09	0.92	89	0.73	0.41, 1.30
Exercise improves the way my body looks and makes me feel more attractive	395	3.05	0.92	85	0.80	0.47, 1.36
I enjoy exercise	405	2.96	0.86	79	0.21[c]	0.11, 0.39
Exercising helps me lose weight	387	2.91	0.99	85	1.22	0.75, 1.99
Exercising makes me feel less tired	400	2.75	0.82	72	0.49[c]	0.31, 0.78
Exercising lets me have contact with friends and people I enjoy	349	2.43	1.25	67	0.74	0.49, 1.11
Exercising improves my job performance	323	2.25	1.34	74	0.90	0.60, 1.35
Exercising helps me feel less nausea	169	0.94	1.21	35	0.85	0.49, 1.50

[a] The number of responses to different questions may vary because respondents were given the option to skip questions to minimize participant burden, and in some cases, the "not applicable" option was selected. Any percentages given are therefore calculated as a percentage of the number of women who answered that question with a response other than "not applicable."
[b] Binary logistic regression of each benefit statement against achieving a minimal recommended level of exercise ($P<.05$). OR=1: agreement with that benefit is equally likely in both groups; OR>1: agreement with that benefit more likely in first group (insufficiently active); OR<1: agreement with that benefit more likely in second group (sufficiently active).
[c] $P\leq.01$.
[d] $P\leq.05$.

Discussion

This study provides a comprehensive list of the perceived barriers to and benefits of exercise that physical therapists need to be aware of when developing evidence-based strategies to encourage exercise among women treated for breast cancer. This is the largest study to date consulting women treated for breast cancer who were not part of any formal exercise intervention. The results provide insight into barriers that prevent exercise uptake and maintenance for these women. More than three-quarters of the perceived barriers to participating in exercise were significantly related to being insufficiently active, whereas less than half of the perceived benefits of exercise were significantly associated with being sufficiently active. These results suggest that perceived barriers to exercise are associated with insufficient exercise behaviors among women treated for breast cancer and warrant further consideration by physical therapists. In particular, future research should determine whether addressing these barriers to exercise and promoting these benefits improves exercise behaviors.

Women in the present study had a high level of agreement with exercise benefits (85%–99% agreement with the top 10 benefits; see Tab. 2). This finding aligns with those of previous research investigating a breast cancer cohort.[21,28] When ranked according to mean score, the top 3 perceived benefits of exercise in the present study were: exercising improves physical health, exercising improves heart and lung functioning, and exercising improves feelings of well-being. However, this high overall agreement with exercise benefits did not translate into exercise behaviors. Only 6 out of 15 benefits had a significant association with exercise behavior. This lack of statistical association between perceived benefits to exercise and exercise behavior could be attributed to the uniformity of the data; nearly all women agreed

Table 3.
Self-Reported Barriers to Exercise Ranked by Mean Score, Including Agreement With, and Binary Logistic Regression Values (With Odds Ratio [OR] and 95% Confidence Interval [95% CI]) of, Each Perceived Barrier Against Exercise Levels

Barriers to Exercise	n	$\bar{X}$	SD	Agree (%)[a]	Insufficiently Active vs Sufficiently Active	
					OR[b]	95% CI
I procrastinate when it comes to exercise	384	2.37	1.02	55	4.68[c]	3.02, 7.25
I am fatigued by exercise	397	2.35	0.91	49	2.31[c]	1.52, 3.49
I cannot find a bra that is comfortable to exercise in	392	2.33	1.01	47	2.02[c]	1.34, 3.05
I lack the self-discipline to exercise	388	2.18	1.01	40	8.12[c]	4.73, 13.93
I feel too tired to exercise	391	2.11	0.92	36	6.94[c]	4.01, 12.01
I find exercise boring	392	2.04	0.90	30	3.20[c]	1.94, 5.30
I would not use the communal changing facilities at exercise venues	358	2.03	1.14	40	1.31	0.86, 2.00
I feel uncomfortable in exercise clothing	380	2.03	0.97	33	3.32[c]	2.03, 5.46
I do not enjoy exercise	393	1.92	0.85	23	5.16[c]	2.70, 9.84
Exercise is not a priority for me	387	1.89	0.92	25	7.43[c]	3.72, 14.83
I have no time to exercise	388	1.82	0.78	17	6.22[c]	2.76, 14.00
Exercising takes too much time from family relationships	379	1.77	0.80	14	2.02[d]	1.05, 3.92
I need to consult a fitness expert before I begin exercising	358	1.76	0.98	22	1.68	0.98, 2.88
Exercise facilities do not have convenient schedules for me	316	1.73	1.17	34	2.17[c]	1.33, 3.55
I feel too weak to exercise	380	1.73	0.90	16	10.97[c]	3.90, 30.86
I do not have access to exercise equipment	362	1.72	0.96	20	2.08[d]	1.18, 3.71
I am not interested in exercise	382	1.66	0.88	14	3.98[c]	1.82, 8.68
I do not know how to exercise	376	1.60	0.80	9	3.53[c]	1.33, 9.37
I feel too much nausea to exercise	275	1.16	0.94	4	1.64	0.43, 6.28

[a] The number of responses to different questions may vary because respondents were given the option to skip questions to minimize participant burden, and in some cases, the "not applicable" option was selected. Any percentages given, therefore, are calculated as a percentage of the number of women who answered that question with a response other than "not applicable."
[b] Binary logistic regression of each barrier statement against achieving a minimal recommended level of exercise ($P<.05$). OR=1: agreement with that barrier is equally likely in both groups; OR>1: agreement with that barrier more likely in first group (insufficiently active); OR<1: agreement with that barrier more likely in second group (sufficiently active).
[c] $P \leq .01$.
[d] $P \leq .05$.

with the functional benefits of exercise (eg, improved physical health, heart and lung functioning). This finding also was reflected by the fact that the only notable relationships between exercise benefits and exercise behavior were of a more subjective, personal aspect, with exercise enjoyment (OR=0.21, 95% CI=0.11, 0.39) and improved feelings of well-being (OR=0.21, 95% CI=0.07, 0.63) displaying the strongest association with being less likely to be insufficiently active. Despite these findings, the associations observed are consistent with previous research, which showed that survivors of cancer identified fun as being the top factor that would facilitate their exercise participation[20] and that exercise enjoyment is significantly related to self-reported exercise levels among patients with breast cancer during treatment.[29]

Unlike perceived benefits, agreement with perceived barriers to exercise was only moderate (25%–55% agreement with the top 10 barriers; see Tab. 3). This finding possibly was due to the more personalized nature of exercise barriers rather than the factual understanding associated with exercise benefits. When ranked according to mean score, the top 3 barriers to exercise were: procrastination, being fatigued by exercise, and not being able to

find a comfortable bra to wear during exercise. Procrastination and fatigue have previously been identified as major barriers to exercise for women treated for breast cancer.[18–20] One other study that identified bra discomfort as a potential barrier to exercise[22] also noted results similar to those of the present study. That study showed that procrastination, a lack of self-discipline, being fatigued by exercise, and not being able to find a comfortable bra to wear during exercise were the top 4 barriers to exercise.[22] Bra discomfort is an exercise barrier with unique implications for women who have undergone breast cancer treatment due to the substantial physical changes to the breast and surrounding tissue as a result of this treatment. Although further research is warranted to determine the requirements of bras worn during exercise by women treated for breast cancer, physical therapists should be aware of this potential barrier and should educate women so they can independently and correctly fit themselves into a well supportive sports bra. Physical therapists are in an ideal position to provide this education[30] and should familiarize themselves with professional bra fit criteria[31] in order to provide evidence-based patient education.

More than three-quarters of the perceived barriers examined in this study significantly influenced exercise behaviors. The most significant correlations were: feeling too weak to exercise, a lack of self-discipline, and exercise not being a priority. Each was linked to being more likely to be insufficiently active. Research exploring exercise adherence and motivation issues among women treated for breast cancer is sparse and has produced mixed outcomes.[18–20] For example, some research suggests that the strongest correlates of exercise adherence among women treated for breast cancer are not demographic, socioeconomic, or medical variables but rather social and cognitive variables such as attitudes, perceptions of control, and subjective norms.[18,32] In contrast, other research has indicated that treatment or disease variables account for most exercise barriers among these women.[19,20] It is likely, however, that the social and cognitive variables are themselves influenced by the disease state. Therefore, although barriers such as "a lack of self-discipline" and "exercise is not a priority" are not disease specific, they may still present a greater challenge for women treated for breast cancer than for the general population.[21] Similarly, although only 16% of respondents agreed with the barrier "I feel too weak to exercise," this barrier had a large and significant negative impact on the ability of these women to achieve a minimal recommended level of exercise. This physical weakness poses as a disease-specific barrier to exercise, likely attributed to the side effects of breast cancer treatment, and physical therapists must be made aware of the significant impact this perceived barrier has on a patients' ability to exercise, accounting for it accordingly when encouraging these women to exercise.

Other barriers with a substantial effect on exercise (OR>5.0) included: feeling too tired to exercise (OR=6.94, 95% CI=4.01, 12.01), having no time to exercise (OR=6.22, 95% CI=2.76, 14.00), and a lack of exercise enjoyment (OR=5.16, 95% CI=2.70, 9.84). Four of the 6 barriers presented here with an OR >5.0 may be classified as being of a motivational/psychological aspect rather than disease- or treatment-related. Conversely, Courneya et al[33] reported motivational variables, such as intention, attitude, perceived behavioral control, and subjective norm, were not predictors of adherence to exercise during a supervised exercise intervention trial. These authors suggested it is likely that women who enroll in exercise interventions are already motivated to engage in exercise,[33] an observation reflected by the fact that although adherence to exercise trials is high, uptake into these trials is generally low.[33,34] Therefore, consulting women who are not involved in a supervised exercise intervention, such as in the present study, may provide insight into barriers that prevent exercise uptake and maintenance, and, based on present findings, these barriers are likely to be of a motivational and psychological aspect, with physical weakness and tiredness also playing an important role. Understanding barriers that prevent exercise uptake is important in the development of strategies aimed at encouraging sedentary women and women currently not meeting exercise guideline levels to begin exercising. This encouragement to exercise should stem from the integration of accurate exercise prescription and theory-based behavior techniques that result in initial exercise uptake and a shift toward long-term exercise adherence.

A primary limitation of this study is that the data were based on self-reported measures. In an attempt to mitigate this limitation, the benefits and barriers scale was systematically developed based on previous literature[22] and validated through focus group discussions with the target population. Seven-day test-retest reliability (ICC=.82) also was confirmed. Similarly, although a valid and reliable physical activity questionnaire was used (GPAQ v2), exercise was self-reported rather than objectively gathered. Furthermore, although the sample was community-based, most respondents were still part of a support network for their breast cancer. Nearly all women agreed with the factual benefits of exercise; therefore, uniformity of the data may inhibit a mean-

ingful finding of an association between these benefits and exercise levels. Due to the sensitive nature of the research topic, disseminating the URL invitation through advisory bodies such as the BCNA and cancer councils was deemed the most professional way to respectfully approach potential participants. However, the BCNA does not have accurate data regarding the number of women on their mailing list at the time of survey dissemination; therefore, these data cannot be reported. Furthermore, 32% of the women in the study reported experiencing other medical conditions that may affect their ability to exercise. However, when this finding was analyzed in a binary logistic regression against exercise levels, the outcome was not significant, indicating no significant impact of other medical conditions on exercise in this sample. Finally, information regarding the stage of cancer was not collected. However, these data may be useful for clinicians and should be collected in future studies of a similar nature.

Despite these limitations, the online survey completion rate was high (89.6%), and the study was solely focused on women treated for breast cancer, providing valuable new knowledge and insight into the effect of motivational barriers on exercise participation among women treated for breast cancer who were not part of any formal exercise intervention. A distinct strength of the study is that the list of benefits and barriers developed in the study were generated by women treated for breast cancer. The validity and reliability of this list were established through focus groups and test-retest methods. This approach provided insight into barriers unique to this cohort, which may not commonly occur in other clinical populations, such as issues with bra discomfort or feeling uncomfortable in exercise clothing. It is important that physical therapists be mindful of the commonly perceived barriers to and benefits of exercise identified in this study. Exploring these topics with their patients will enable them to optimally design individualized programs that meet the patients' goals.

In summary, with a rising number of breast cancer cases predicted, as well as increasing survival rates, focus must shift toward long-term care of women following breast cancer treatment. Exercise is important for long-term survivorship. The results of this study provide a comprehensive list of the most common benefits of and barriers to exercise perceived by women treated for breast cancer, as well as the association of these items with their exercise behavior. Motivational issues of self-discipline, exercise not being a priority, having no time, and a lack of enjoyment had a large negative association with exercise behavior. Physical issues, such as feeling too weak to exercise and too tired to exercise, also displayed large and significant associations with insufficient exercise levels and must be accounted for when attempting to promote exercise to these women. Agreement with exercise benefits, such as exercise enjoyment, improved feelings of well-being, and decreased feelings of stress and tension, were significantly associated with being less likely to report insufficient levels of exercise. Creating exercise enjoyment is likely to be a key factor in promoting exercise with this cohort. Improving exercise enjoyment is likely to be a key step in encouraging sedentary women and women not currently meeting recommended guidelines to undertake exercise. Accounting for physical weakness and tiredness, as well as acknowledging that even motivational barriers may be influenced by the disease state, is imperative for physical therapists when encouraging exercise in this population. Barriers identified in the present study will enable physical therapists to better plan behavior theory–based exercise interventions to support all women treated for breast cancer, particularly those who are not currently part of any formal exercise intervention.

All authors provided concept/idea/research design and writing. Dr Gho provided data collection and analysis and project management. Associate Professor Munro and Professor Steele provided facilities/equipment and institutional liaisons. Associate Professor Munro, Professor Steele, and Professor Jones provided consultation (including review of manuscript before submission).

An oral presentation of some data was given at the European Multidisciplinary Cancer Congress; September 23–27, 2011; Stockholm, Sweden. An abstract of the study was published in the *European Journal of Cancer*. Some methodological and demographic data have been presented in the following publications: *Ergonomics*, *Supportive Care in Cancer*, and *Cancer Causes and Control*.

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