# Effects of an Oncologist's Recommendation to Exercise on Self-Reported Exercise Behavior in Newly Diagnosed Breast Cancer Survivors: A Single-Blind, Randomized Controlled Trial

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## ABSTRACT

***Background:*** *Increased attention has focused on exercise as a quality of life intervention for breast cancer survivors during and after adjuvant therapy.* ***Purpose:*** *Our objective was to examine the effects of an oncologist's recommendation to exercise on self-reported exercise behavior in newly diagnosed breast cancer survivors attending their first adjuvant therapy consultation.* ***Methods:*** *Using a single-blind, 3-armed, randomized controlled trial, 450 breast cancer survivors were randomly assigned to receive an oncologist exercise recommendation only, an oncologist exercise recommendation plus referral to an exercise specialist, or usual care. The primary outcome was self-reported total exercise (in metabolic equivalent [MET] hours per week) at 5 weeks postconsultation.* ***Results:*** *The follow-up assessment rate was 73% (329 of 450). Intention-to-treat analysis based on participants with follow-up data indicated a significant difference in total exercise in favor of the recommendation-only group over the usual care group (mean difference, 3.4 MET hr per week; 95% confidence interval [CI], 0.7–6.1 MET hr per week; p = .011). There was no significant difference between the recommendation-plus-referral group and the usual care group (mean difference, 1.5 MET hr per week; 95% CI, –1.0 to 4.0 MET hr per week; p = .244). Ancillary "on-treatment" analyses showed that participants who recalled an exercise recommendation reported significantly more total exercise than participants who did not recall an exercise recommendation (mean difference, 4.1 MET hr per week; 95% CI, 1.9–6.4 MET hr per week; p < .001).* ***Conclusions:*** *Our findings suggest that an oncologist recommendation may increase exercise behavior in newly diagnosed breast cancer survivors, particularly if it is recalled 1 week after the recommendation.*

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## INTRODUCTION

Increased attention has focused on exercise as a quality of life intervention for breast cancer survivors during and after adjuvant therapy (1). Preliminary evidence suggests that exercise training may enhance several physiologic outcomes including functional capacity (2,3) and body composition (4–6) and alleviate a diverse range of debilitating symptoms such as fatigue (7–9) and nausea (10). The entirety of these effects can have profound implications on quality of life (5,11). Unfortunately, rates of exercise decline considerably during adjuvant therapy (12,13) and may not return to prediagnosis levels even after treatment cessation (12). Interventions to increase exercise levels during this time are warranted (14).

Recent studies and national organizations have acknowledged the persuasive role of physicians and primary care providers in promoting exercise (15,16). These observations have been confirmed by several randomized trials demonstrating that physician-based exercise counseling can favorably influence exercise behavior in previously sedentary adults (17–20). It is unknown, however, if oncologists can have similar effects on promoting exercise behavior in breast cancer survivors during adjuvant therapy. Several reports have indicated that breast cancer survivors are highly motivated to initiate lifestyle changes in the period following diagnosis and initial treatments (21–24) and prefer to receive this advice from their oncologist (22).

The ONCOlogist Recommendation to Exercise (ONCORE) trial was a single-blind, randomized controlled trial designed to compare the effects of two oncologist-based interventions (recommendation only and recommendation plus referral) on self-reported exercise behavior and social cognitive mediators of exercise behavior in newly diagnosed breast cancer survivors attending a primary adjuvant treatment consultation. Our primary hypothesis was that both interventions would have significant effects on total exercise compared to usual care. We also hypothesized that both interventions would have significant effects on our secondary outcomes of total exercise frequency, moderate intensity exercise minutes and frequency per week, and the percentage of participants meeting national exercise prescription guidelines (i.e., at least 150 min of moderate intensity exercise per week). No effects were hypothesized for mild intensity exercise minutes or frequency as the recommendation tar-

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geted moderate intensity exercise. Effects on the proposed social cognitive mediators of exercise are reported elsewhere.

## MATERIALS AND METHODS

### Setting and Participants

The study was conducted at the Cross Cancer Institute (CCI) and the University of Alberta, Edmonton, Canada. All breast cancer survivors attending a primary adjuvant treatment consultation were screened for eligibility. Survivors were excluded if they (a) had metastatic disease; (b) had known cardiac or pulmonary disease; (c) had obvious significant physical or psychological disabilities (e.g., wheelchair, severe anxiety); (d) were pregnant; or (e) were not able to speak, read, or write English. Oncologist participants comprised six medical and four radiation oncologists who were members of the Northern Alberta Breast Cancer Program at the CCI. Participant recruitment occurred between July 2001 and June 2002. Written informed consent was obtained. The Alberta Cancer Board Research Ethics Committee and the University of Alberta Health Research Ethics Board approved the study.

### Study Design and Procedure

The study was a single-blind, three-armed, randomized controlled trial. Potential participants were screened for eligibility via medical record review before arriving at each breast cancer clinic. On arrival at the clinic, a trained research assistant asked eligible survivors if they were willing to participate in a study, and they obtained written consent. Prior to their treatment consultation, consenting participants were randomly assigned to one of three groups (usual care, exercise recommendation only, exercise recommendation plus referral to an exercise specialist). Following the treatment consultation, oncologists reported whether the group assignment had been delivered successfully, and they provided a written explanation if unsuccessful.

Approximately 1 week following the primary adjuvant treatment consultation, all participants were mailed a questionnaire package that assessed self-reported exercise behavior, Theory of Planned Behavior (TPB) variables, and recall of an oncologist recommendation (manipulation check). Survey methods known to increase response rates were used, including postcard reminders and stamped return envelopes. Participants returning completed questionnaires received a brief (2–3 min) structured telephone call approximately 5 to 6 weeks following the primary adjuvant treatment consultation that assessed self-reported exercise behavior. The completion date of the 1-week mailed questionnaire and 5- to 6-week phone call were verified and documented by study investigators based on the date on the returned consent form.

### Randomization

Participants were assigned to groups using a computer-generated random numbers list (Statmate™, Version 1.01, 1998; GraphPad Software, San Diego, CA) and a random numbers table. A permuted block design was used to generate the allocation sequence. The block sizes were 150 in a specified allocation sequence ratio of 1:1:1. A trained research assistant generated the group assignments in sequentially numbered and sealed envelopes. The envelopes were concealed from the project director who assigned participants to groups.

### Blinding and Study Concealment

Previous physician-based exercise counseling trials have recruited participants to an "exercise trial" (17,19–20). As such, participants were not blinded to the primary purpose of the study. This methodology may create demand characteristics and "primes" participants to the fact that they are in an exercise trial. This situation may be particularly problematic when the primary outcome is self-reported exercise behavior. We felt that such a study design was not scientifically optimal for our trial and did not reflect usual clinical practice for breast cancer consultations (i.e., exercise recommendations would be made without survivors being aware they are in a clinical trial and without completing baseline self-reports of exercise).

To overcome this concern, participants were recruited to a "patient–oncologist communication" study and were blinded to randomized assignment for the duration of the study. To further facilitate this concealment, we did not collect baseline exercise data. Moreover, the 1-week mailed and 5-week telephone questionnaires contained self-reports of eight additional psychosocial behaviors to further disguise the purpose of the study. A research assistant blinded to group assignment was trained to administer the telephone questionnaire using a standardized protocol.

### Training of Oncologists

All oncologists and clinical trial nurses attended three meetings with the principal investigator. The goals of these meetings were to (a) provide an overview of the study protocol, (b) increase oncologists' and nurses' knowledge regarding the benefits of exercise for breast cancer during adjuvant therapy, (c) provide specific details regarding the brief recommendation and referral, and (d) obtain feedback on study design and procedures.

### Interventions

The study intervention was developed based on the TPB (25). The TPB describes key informational and motivational constructs shown to be important determinants of exercise behavior in breast cancer survivors (26,27). Both the recommendation-only and the recommendation-plus-referral groups were given the same exercise targets based on current national guidelines (28). Participants in the recommendation-only group received a brief (approximately 30 sec) exercise recommendation. The exact recommendation was as follows:

> Recent research has shown that some of the side effects you may experience during treatment may be controlled with a modest exercise program. I recommend trying to exercise 20–30 minutes everyday at a moderate intensity. Even less may be beneficial, but try to do something everyday. Exercises such as brisk walking will meet these requirements.

Participants in the recommendation-plus-referral group received the same oncologist recommendation plus contact information (i.e., a business card) where they could receive a free fitness consultation. The consultations were performed by an exercise physiologist and were conducted at the University of Alberta. Participants in the usual care group received the conventional treatment consultation with no exercise recommendation or referral.

### Outcomes

The primary outcome was self-reported total exercise in metabolic equivalent (MET) hours per week at 5 weeks postprimary adjuvant treatment consultation. Secondary exercise outcomes were total exercise frequency per week (MET times per week), moderate intensity exercise minutes and frequency per week, mild intensity exercise minutes and frequency per week, and the percentage of participants meeting national exercise prescription guidelines (i.e., at least 150 min of moderate intensity exercise per week).

### Assessments

*Exercise behavior.* Exercise behavior was assessed by the leisure score index (LSI) of the Godin Leisure-Time Exercise Questionnaire (29–30). The LSI contains three questions that assess the average frequency of mild, moderate, and strenuous intensity exercise during free time in a typical week. In this study, participants reported their average weekly exercise since their primary adjuvant treatment consultation. We also asked for average duration within each exercise intensity. To calculate our primary outcome of total exercise, the frequency of exercise sessions per week within each intensity category was multiplied by the average reported duration, weighted by an estimate of the MET, summed across all intensities, and expressed as average MET hours per week. The standard MET weightings and examples for each exercise intensity are as follows: mild (3 METs, e.g., easy walking, yoga), moderate (5 METs, e.g., brisk walking, tennis), and strenuous (9 METs, e.g., running, vigorous swimming). For example, a participant reporting one mild intensity exercise session for 60 min and three moderate intensity exercise sessions for an average duration of 30 min per week would receive a score of 10.5 MET hr per week (i.e., $[1 \times 60 \times 3 \times 30 \times 5] / 60$). Separate scores were also calculated for total exercise frequency (MET times per week); mild, moderate, and strenuous intensity exercise minutes and frequency; and the percentage of participants meeting current national exercise guidelines (i.e., at least 150 min of moderate intensity exercise per week).

*Manipulation check.* Participants were asked to recall if exercise was recommended during their primary adjuvant treatment consultation in the 1-week questionnaire. If survivors responded that exercise was recommended, they were asked if they had received an exercise referral.

*Demographic and medical information.* Demographic characteristics were collected using self-report measures. Medical and treatment characteristics were abstracted from medical records.

### Statistical Analyses

Sample size calculation was based on the primary outcome. Presently, it is not clear what constitutes a clinically important difference between groups in exercise behavior. Based on previous physician-based counseling trials (18–20), we estimated a small-to-medium effect of the intervention ($d = .35$). To detect such an effect with a power of .80 and a two-tailed $\alpha < .05$ significance level, we needed approximately 130 participants in each group (31). Based on previous trials, we expected approximately 15% loss to follow up; therefore, we randomized 150 per group. Our intention-to-treat analysis was performed on all participants who were randomly assigned and for whom we had at least one follow-up measure of exercise behavior (i.e., either the 1-week or 5-week assessment) (32).

Our initial analysis compared groups across demographic and medical characteristics using a one-way analysis of variance for continuous variables and chi-square analyses for categorical data. Chi-square analyses were used to evaluate differences in follow-up assessment rates between experimental groups and oncologist adherence to randomized assignment. Based on the lack of empirical evidence, no hypothesis was offered regarding the effectiveness of the two interventions. Accordingly, the primary analysis compared each intervention with usual care on primary and secondary outcomes using independent samples $t$ tests. Data are presented as the mean (standard deviation) with 95% confidence intervals (CIs).

## RESULTS

Participant flow through the study is described in Figure 1 In brief, 675 survivors attended a primary adjuvant treatment consultation during the 11-month study period. Of these, 71% (481/675) met inclusion criteria; 94% (450/481) were randomized to groups.

### Baseline Characteristics

The baseline characteristics are presented in Table 1. The groups were balanced, except survivors assigned to the recommendation-plus-referral group were more likely to be premenopausal ($p = .027$). We also compared survivors assessed at 5 weeks with those lost to follow up and found no significant differences on any medical or demographic characteristic, except those assessed at 5 weeks were more likely to be undergoing radiation therapy (analyses not presented).

### Oncologist Adherence

Oncologists reported providing the group assignment to 94% of participants; with rates of 99% (148/150), 93% (140/150), and 90% (135/150) in the usual care group, recommendation-only, and recommendation-plus-referral groups, respectively ($p = .548$).

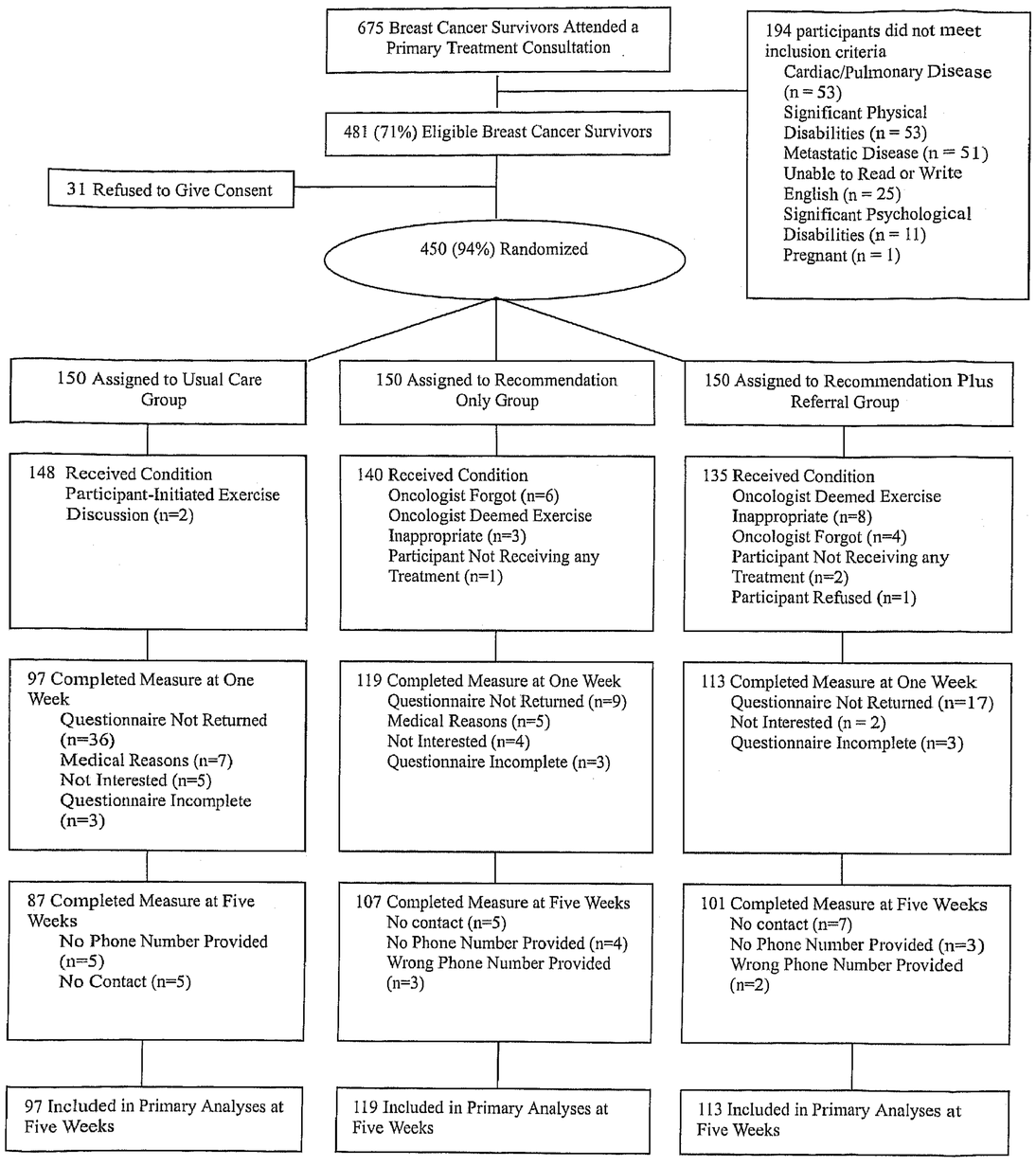


FIGURE 1 Flow of participants through the trial.

### Follow-Up Assessment Rates

The follow-up assessment rate was 73% (329/450) at 1 week and 66% (295/450) at 5 weeks. This rate differed significantly between groups with 65% (97/150), 79% (119/150), and 75% (113/150) for usual care, recommendation-only, and the recommendation-plus-referral groups, respectively ($p < .001$). Seven percent (10/150) of participants in the recommendation-plus-referral group attended a fitness consultation.

### Manipulation Check

Recall of an exercise recommendation is detailed in Table 2. In brief, 59% (57/97), 77% (92/119), and 41% (46/113) of participants in usual care, recommendation-only, and recommendation-plus-referral groups, respectively, recalled their correct assignment ($p < .001$).



TABLE 1
Demographic and Medical Characteristics

| *Characteristic* | *Overall*[a] | *Usual Care*[b] | *Recommendation Only*[c] | *Recommendation Plus Referral*[d] | *p*[e] |
|---|---|---|---|---|---|
| Demographic | | | | | |
| Age (years) | 56 (12) | 55 (12) | 57 (12) | 55 (12) | .560 |
| Married | 221 (69%) | 66 (70%) | 78 (66%) | 77 (71%) | .657 |
| Completed university | 144 (46%) | 35 (39%) | 59 (52%) | 50 (47%) | .167 |
| Family income over $60,000/year | 95 (32%) | 22 (25%) | 47 (45%) | 31 (31%) | .061 |
| Employed full time | 108 (34%) | 33 (36%) | 39 (33%) | 36 (33%) | .905 |
| Medical | | | | | |
| Weight (kg) | 72 (15) | 73 (15) | 72 (14) | 72 (15) | .717 |
| Body mass index (kg/m$^2$) | 28 (6) | 29 (8) | 28 (6) | 27 (5) | .506 |
| Menopausal status | | | | | |
| Premenopausal | 97 (30%) | 28 (29%) | 26 (22%) | 43 (38%) | .027 |
| Perimenopausal | 23 (7%) | 5 (5%) | 11 (9%) | 7 (6%) | .443 |
| Postmenopausal | 206 (63%) | 64 (66%) | 80 (68%) | 62 (55%) | .099 |
| Stage | | | | | |
| I (T1N0) | 167 (53%) | 48 (51%) | 59 (52%) | 60 (55%) | .840 |
| IIa (T1N1, T2N0) | 91 (29%) | 26 (28%) | 34 (31%) | 31 (29%) | .882 |
| IIb (T2N1, T3N0) | 37 (12%) | 13 (14%) | 12 (11%) | 12 (11%) | .754 |
| IIIa (T1N2,T2N2,T3N1–2) | 15 (5%) | 4 (4%) | 6 (6%) | 5 (5%) | .922 |
| Surgery | | | | | |
| Mastectomy | 174 (54%) | 50 (52%) | 67 (58%) | 57 (51%) | .573 |
| Lumpectomy | 149 (46%) | 46 (48%) | 49 (42%) | 54 (49%) | .573 |
| Hormone therapy | 187 (57%) | 50 (52%) | 72 (62%) | 65 (58%) | .333 |
| Radiation therapy | 205 (63%) | 62 (64%) | 70 (60%) | 73 (65%) | .682 |
| Chemotherapy | 143 (44%) | 43 (45%) | 51 (44%) | 49 (44%) | .985 |

*Note.* Numbers may not equal 329 due to missing data. Data are presented as the mean (standard deviation) for continuous variables and frequency (percentage) for categorical variables.
[a]$n = 329$. [b]$n = 97$. [c]$n = 119$. [d]$n = 113$. [e]Differences between groups.

TABLE 2
Recall of an Exercise Recommendation 1 Week Following the Primary Adjuvant Treatment Consultation

| | *Participant Recall* | | |
|---|---|---|---|
| *Randomized Assignment* | *Exercise Not Discussed*[a] | *Exercise Recommended With No Referral*[b] | *Exercise Recommended With Referral*[c] |
| Usual care[d] | 57 (59%)[e] | 36 (37%) | 4 (4%) |
| Recommendation only[f] | 25 (21%) | 92 (77%)[e] | 2 (2%) |
| Recommendation plus referral[g] | 26 (23%) | 41 (36%) | 46 (41%)[e] |

[a]$n = 108$. [b]$n = 169$. [c]$n = 52$. [d]$n = 97$. [e]Correct recall of randomized assignment. [f]$n = 119$. [g]$n = 113$.

### Intention-to-Treat Analysis

Table 3 presents the exercise behavior outcomes. At 5 weeks, participants reported 10.1 ± 10.7 and 8.2 ± 9.5 MET hr per week in the recommendation-only and the recommendation-plus-referral groups, respectively; compared with 6.7 ± 8.9 MET hr per week in the usual care group. The comparison between the recommendation-only and usual care group was significant (mean difference, 3.4 MET hr per week; 95% CI, 0.7 to 6.1 MET hr per week; $p = .011$). The comparison between the recommendation-plus-referral group and the usual care group was not significant (mean difference, 1.5 MET hr per week; 95% CI, −1.0 to 4.0 MET hr per week; $p = .244$).

Comparison of the recommendation-only group to the usual care group on the secondary outcomes revealed significant differences or trends toward differences in favor of the recommendation-only group for total exercise frequency (MET frequency per week; mean difference, 4.5 MET frequency per week; 95% CI, 1.3 to 7.8 MET frequency per week; $p = .007$), moderate intensity exercise minutes (mean difference, 27.8;

TABLE 3
Between Group Comparisons on Exercise Behavior Outcomes (Intention-to-Treat Analyses)

| Variable | Usual Care[a] | Recommendation Only[b] | Recommendation Plus Referral[c] | Usual Care Versus Recommendation Only: Between Group Difference (95% CI) | Usual Care Versus Recommendation Only: p | Usual Care Versus Recommendation Plus Referral: Between Group Difference (95% CI) | Usual Care Versus Recommendation Plus Referral: p |
|---|---|---|---|---|---|---|---|
| Primary | | | | | | | |
| Total exercise (MET hr/week) | 6.7 ± 8.9 | 10.1 ± 10.7 | 8.2 ± 9.5 | 3.4 (0.7 to 6.1) | .011 | 1.5 (–1.0 to 4.0) | .244 |
| Secondary | | | | | | | |
| Total frequency (MET times/week) | 2.0 ± 11.2 | 16.5 ± 12.7 | 13.8 ± 11.0 | 4.5 (1.3 to 7.8) | .007 | 1.8 (–1.1 to 4.9) | .222 |
| Moderate minutes | 46.7 ± 98.9 | 74.6 ± 117.3 | 56.9 ± 102.5 | 27.8 (–1.7 to 57.3) | .060 | 10.2 (–17.3 to 37.7) | .466 |
| Moderate frequency | 1.3 ± 2.1 | 1.9 ± 2.5 | 1.4 ± 2.2 | 0.7 (0.3 to 1.3) | .035 | 0.1 (–0.4 to 0.8) | .555 |
| Mild minutes | 57.1 ± 98.1 | 62.9 ± 120.3 | 70.0 ± 128.4 | 5.8 (–24.1 to 35.7) | .703 | 12.9 (–18.7 to 44.3) | .423 |
| Mild frequency | 1.9 ± 2.7 | 1.9 ± 2.7 | 2.2 ± 3.0 | 0.0 (–0.7 to 0.7) | .986 | 0.3 (–0.5 to 1.1) | .450 |
| ACSM (% ≥ 150 min) | 10.3 ± 30.1 | 21.0 ± 41.0 | 5.4 ± 36.0 | 10.7 (0.8 to 20.3) | .029 | 5.2 (–4.0 to 13.9) | .303 |

*Note.* Data are presented as mean ± standard deviation for continuous variables and frequency percentage for categorical variables. CI = confidence interval; MET = metabolic equivalent; ACSM = American College of Sports Medicine.
[a]$n = 97$. [b]$n = 119$. [c]$n = 113$.

95% CI, –1.7 to 57.3 min; $p = .064$), moderate intensity exercise frequency (mean difference, 0.7; 95% CI, 0.3 to 1.3 MET frequency per week; $p = .035$), and the percentage of participants meeting current national guidelines (mean difference, 10.7%; 95% CI, 0.8% to 20.3%; $p = .029$). Comparisons between the recommendation-plus-referral and usual care groups revealed no significant differences on any outcome. Only 1 participant reported strenuous exercise; therefore, this outcome was not analyzed separately.

### Ancillary Analyses

Given that 41% of participants incorrectly recalled the exercise recommendation given during the consultation, we performed an ancillary analyses that compared participants who recalled an exercise recommendation with those who did not recall a recommendation. Table 4 presents the exercise behavior outcomes for the ancillary analysis. Participants who recalled an exercise recommendation reported 9.9 ± 10.5 MET hr per week of total exercise compared with 5.7 ± 7.6 MET hr per week for participants who did not recall an exercise recommendation (mean difference, 4.1 MET hr per week; 95% CI, 1.9 to 6.4 MET hr per week; $p < .001$). Group comparisons also revealed differences for total exercise frequency (mean difference, 5.6 MET times per week; 95% CI, 3.0 to 8.3 MET times per week; $p < .001$), moderate exercise minutes (mean difference, 47.0 min; 95% CI, 22.5 to 71.2 min; $p < .001$), moderate exercise frequency (mean difference, 1.1 MET times per week; 95% CI, 0.6 to 1.6 MET times per week; $p < .001$), and the percentage of participants meeting current national guidelines (mean difference, 13.9%; 95% CI, 5.6% to 22.2%; $p < .001$). All differences favored participants who recalled an exercise recommendation.

## DISCUSSION

This single-blind, randomized controlled trial indicated that an oncologist's recommendation to exercise had modest effects on exercise behavior in newly diagnosed breast cancer survivors attending a primary adjuvant treatment consultation. The intention-to-treat analysis indicated that participants in the recommendation-only group reported 3.4 more MET hr of total exercise per week and approximately 30 min more moderate intensity exercise per week compared to the usual care group. The magnitude of the differences in this trial are similar to those reported in a recent comprehensive review that identified six controlled trials examining the effect of physician-based counseling on physical activity outcomes in general primary care populations over the short term (< 6 months) (33). In Project Provider-Based Assessment and Counseling for Exercise (20), participants receiving 3 to 5 min of physical activity counseling from their physician followed by a brief booster phone call by a health educator increased walking by 37 min per week compared with control participants 4 to 6 weeks after their initial office visit. Although the mode of exercise performed by breast cancer survivors in this study was not known, it is highly probable that the majority performed walking as their preferred mode of exercise (23).

There are several methodological differences between previous physician-based exercise counseling trials and the ONCORE trial that may preclude direct comparisons. First, previous trials have examined the effects of physician-based exercise counseling plus additional behavior change techniques (e.g., booster phone calls, written persuasive materials) on promoting exercise (17–19). Therefore, the effectiveness of physician-based exercise counseling alone has never been determined (17,26). ONCORE trial results suggest that a very brief recommendation to exercise in breast cancer survivors may be as influential as more intensive intervention protocols in healthy individuals. Second, previous trials have generally examined the effectiveness of physician-based counseling in asymptomatic individuals. Our results indicate that breast cancer survivors undergoing intensive medical treatments may be equally responsive to oncologist-based exercise interventions as asymptomatic individuals attending routine medical checkups (34). The clinical significance of our findings in terms of breast cancer outcomes is difficult to estimate. Current evidence suggests that exercise is a beneficial adjunct therapeutic intervention during and following adjuvant therapy (5,11). It is currently unknown, however, if an additional 3.4 MET hr of total exercise or approximately 30 min of additional moderate intensity exercise per week is sufficient to produce any differences in outcomes.

Our hypotheses for secondary outcomes were partially supported in this study. Results indicated no differences between the recommendation-plus-referral group and the usual care group on any secondary outcome. The comparison of the recommendation-only group with usual care, however, indicated significant differences for a number of secondary outcomes. Notably, only 10% of participants in the usual care group met national guidelines compared with 21% in the recommendation-only group. Again, although it is difficult to determine the clinical significance of these findings, an 11% absolute increase in the percentage of breast cancer survivors meeting these guidelines may have implications for both cancer-specific and general cardiovascular health (35–37).

Although comparison of the recommendation-only group with the usual care group revealed a statistically significant difference on the primary outcome, the magnitude of this difference was small. There may be several possible explanations for the lack of strong effects. First, to increase the feasibility and acceptability of the intervention in clinical practice, oncologists were asked to recommend rather than counsel on exercise. An exercise recommendation alone may not have been powerful enough to exert strong effects on exercise behavior. Second, oncologists were asked to recommend exercise at an appropriate time during the consultation; with the average treatment consultation lasting up to 60 min, participants may have forgotten or become unsure of issues discussed early in the consultation. Finally, the main focus of a primary breast cancer consultation is the selection of an appropriate adjuvant regimen. Consequently, many survivors may have regarded an exercise recommendation as relatively unimportant in comparison to critical information on prognosis and treatment.

These suspicions were confirmed by the recall of randomized assignment. Results indicated that 41% of participants in correctly recalled the randomized assignment. These findings are consistent with numerous studies examining patient recall of treatment and diagnostic information following adjuvant treatment consultations (38–40) and several studies documenting poor recall of physician-based exercise information in primary care settings (18,41). Based on this evidence, it may be beneficial to reinforce the exercise recommendation in subsequent appointments to improve the likelihood of prolonged behavior change. Finally, the low percentage of participants failing to report a referral in the recommendation-plus-referral group is intriguing. It is possible that the distribution of a business card was incongruent with participants' perceptions of a referral. Oncologist-based referrals to other specialists (e.g., dieticians, physiotherapists) tend to be more structured (i.e., appointment system). The ancillary analyses indicated significant differences for multiple outcomes. Specifically, participants who recalled an exercise recommendation reported 4.2 more MET hr of total exercise per week and approximately 50 min more moderate intensity exercise per week in comparison with participants who did not recall an exercise recommendation. From an applied perspective, these findings again highlight the importance of methods to improve survivor–oncologist communication during a consultation (42–44) and the retention of information following a consultation (38–40).

There are several important limitations that need to be acknowledged when interpreting the results of this trial. First, baseline exercise data was not obtained. Although we cannot, therefore, exclude meaningful differences among the groups in



TABLE 4
Between Group Comparisons on Exercise Behavior Outcomes (Ancillary Analyses)

| Variable | Exercise Recommendation Not Recalled[a] | Exercise Recommendation Recalled[b] | Between Group Difference (95% CI) | p |
|---|---|---|---|---|
| Primary | | | | |
| Total exercise (MET hr/week) | 5.7 ± 7.6 | 9.9 ± 10.5 | 4.1 (1.9 to 6.4) | < .001 |
| Secondary | | | | |
| Total frequency (MET times/week) | 10.4 ± 10.1 | 16.1 ± 12.2 | 5.6 (3.0 to 8.3) | < .001 |
| Moderate minutes | 28.8 ± 67.7 | 75.7 ± 119.3 | 47.0 (22.5 to 71.2) | < .001 |
| Moderate frequency | 0.8 ± 1.8 | 1.8 ± 2.5 | 1.1 (0.6 to 1.6) | < .001 |
| Mild minutes | 65.9 ± 108.4 | 62.5 ± 121.1 | 3.4 (–30.4 to 24.0) | .805 |
| Mild frequency | 2.1 ± 2.7 | 2.0 ± 2.9 | 0.2 (–0.8 to 0.5) | .404 |
| ACSM (% ≥ 150 min) | 6.5 ± 24.7 | 20.4 ± 40.4 | 13.9 (5.6 to 22.2) | < .001 |

*Note.* Data are presented as the mean ± standard deviation for continuous variables and frequency % for categorical variables. CI = confidence interval; MET = metabolic equivalent; ACSM = American College of Sports Medicine.
[a]$n = 108$. [b]$n = 221$.

baseline exercise behavior, the large sample size and random allocation of participants should equally distribute previous exercisers across the study groups enabling postintervention differences to be attributed to the intervention. Partial evidence for this assumption is provided by the fact that the groups were balanced on virtually all demographic and medical variables. Nevertheless, future trials should strive to obtain baseline exercise data while ensuring concealment of the study purpose. Second, the relatively large loss to follow up (27%) is higher than conventionally accepted levels (i.e., 5%–20%) (32,45). However, loss to follow up depends on several factors (e.g., topic examined, the outcomes, length of follow up) and may have been influenced in our trial by the 94% recruitment rate. A third limitation is the differential loss to follow up between groups. The reasons for differential loss to follow up in this trial are unclear and may represent a statistical rather than a clinical difference between the groups. Fourth, the reliance on self-report rather than objective measures of exercise behavior (e.g., pedometers, $VO_{2max}$) may be imprecise. Future studies should strive to use objective measures to verify exercise levels.

In summary, this is the first report of a randomized controlled trial attempting to increase exercise behavior in newly diagnosed breast cancer survivors. Overall, the results of this trial suggest that an oncologist recommendation may be a promising method to promote exercise in breast cancer survivors. Further research is warranted to clarify the role of the oncologist in promoting exercise in breast cancer survivors.

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