

Breast Cancer Survivors' Compliance to Personal Training Versus Group-Based Exercise

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ABSTRACT

Background: This study reports on breast cancer survivors' compliance to the exercise prescription (ExRx) of a personal training (PT) or group-based (GB) exercise intervention.

Methods: Breast cancer survivors who had completed chemotherapy and/or radiation within the previous year were randomly assigned to PT or GB. All participants completed supervised aerobic and resistance training sessions twice per week for 8 weeks. Compliance to aerobic and resistance exercise intensity (i.e., % heart rate reserve, and % 1-repetition maximum [1-RM]) and aerobic exercise duration ExRx is reported, and average aerobic and resistance exercise intensity was calculated. Independent *t* tests compared percent compliance and average intensity between PT and GB. The proportion of participants above or below ExRx was examined using frequencies.

Results: ExRx compliance ranged from 64% to 98%. Compliance to aerobic exercise intensity and duration was higher in PT than GB ($P < 0.05$). Average upper body resistance training exercise intensity was higher in PT (73% 1-RM) vs GB (56% 1-RM) ($P = 0.01$). Noncompliance to aerobic ExRx was more commonly due to intensity or duration below the ExRx. Noncompliance to resistance training ExRx was distributed equally above or below ExRx.

Conclusion: Compliance to aerobic ExRx and average upper body resistance training intensity was higher in PT, suggesting that exercise professionals in GB settings should consider closely monitoring breast cancer survivors' adherence to ExRx. *Journal of Clinical Exercise Physiology*. 2020;9(4):171–176.

Keywords: physical activity, survivorship, intervention, adherence

INTRODUCTION

There are more than three million breast cancer survivors (BCS) in the United States (1). BCS often experience long-lasting side effects that have deleterious effects on fitness (e.g., muscular strength, aerobic capacity) and quality of life (2). Exercise mitigates these side effects (3) and reduces risk of recurrence and mortality (4). Based on the evidence of the

benefits of exercise interventions for BCS, exercise guidelines have been developed (5); however, these guidelines are derived from the exercise prescription (ExRx) participants were *told to complete*, not what was *actually completed* (i.e., ExRx compliance) (6–8).

Previous reviews of exercise interventions for cancer survivors have found that reporting of ExRx compliance is inconsistent and incomplete, leaving practitioners to base

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exercise programming on prescribed exercise rather than the actual exercise dose completed (6,7). In a review by Winters-Stone et al (6), only 2 of 35 studies reported all details regarding compliance to the ExRx with the majority of studies only reporting frequency of exercise and type of exercise completed (6). With this lack of ExRx compliance reporting, the ability to determine whether the ExRx was efficacious for improving outcomes, or if a lower or higher intensity, duration, or volume of exercise is needed cannot be ascertained. Thus, expanding ExRx reporting of attendance rates to include ExRx compliance reporting is needed to aid exercise professionals in prescribing the appropriate exercise frequency, intensity, time, and type (FITT) necessary to improve BCS-related outcomes.

Despite the scarcity of reporting ExRx compliance, exercise interventions and programs for BCS continue to grow in popularity (7,9–11). Supervised exercise interventions elicit positive effects on quality of life and fitness (12) and can be delivered individually (personal training [PT]) or in a group-based (GB) setting. Both delivery modalities have been found to be effective for improving BCS-related outcomes (13,14). Group-based may be less resource-intensive compared to PT (i.e., lower participant-to-instructor ratio costs) (15), but to the best of our knowledge, no studies have examined whether these delivery modalities are comparable in terms of ExRx compliance. In a recent pilot study among BCS, we found that percent compliance to aerobic and resistance ExRx was similar between PT and GB (13); however, analyses were limited to yes/no responses of meeting ExRx guidelines, neglecting further details of compliance to individual components of the ExRx, specifically intensity or duration, or reasons for noncompliance (e.g., above/below ExRx) (13,14). This additional information will allow exercise professionals to evaluate if the ExRx prescribed is sufficient to improve BCS-related outcomes, or if ExRx parameters need to be adjusted to elicit benefits (i.e., higher or lower intensity or volume of exercise).

There is a need to expand ExRx compliance reporting in order to better understand the associations between exercising dosing and BCS-related outcomes and examine if ExRx compliance is similar between BCS completing a PT or GB intervention. This information will contribute to the optimization and tailoring of ExRx in future interventions. However, this information is difficult to collect as it requires increased study staff and/or participant burden.

Thus, the aims of this study, using previously collected data, were to (a) examine percent compliance to aerobic and resistance ExRx, and the average aerobic and resistance exercise intensity performed during a PT and GB exercise intervention, and (b) determine whether noncompliance was above or below ExRx.

METHODS

Data were collected during an 8-week, pilot, randomized controlled trial comparing the effects of a PT versus GB intervention on fitness, quality of life, and physical activity (13). Participants were women diagnosed with stage I or

stage II BC who had completed treatment within 1 year of enrollment. All participants received 2 supervised exercise sessions per week. For both PT and GB, the twice weekly exercise sessions were supervised by a research assistant and lasted approximately 1 h including a 5-min warm-up, 20 to 25 min of aerobic exercise (self-selected treadmill, elliptical, stationary bike, or other modality), 20 to 25 min of resistance training (RT) (approximately 4–6 exercises targeting major muscle groups), and a 5-min cool down. Group size ranged from 3 to 5 participants. Informed consent was obtained from all participants, and all procedures performed in this study were in accordance with the ethical standards of Colorado State University's institutional review board.

Baseline Assessments

Participants completed fitness assessments to create individualized ExRx and ensure safety during exercise. Aerobic fitness was measured using a submaximal modified Balke exercise test (16,17) with a stopping point of 85% of heart rate reserve (HRR). Participants performed 1-repetition maximal (1-RM) resistance testing following ACSM Guidelines for Testing and Prescription on plate-loaded chest and leg press machines (17).

ExRx Compliance

To monitor aerobic ExRx compliance, research assistants recorded exercise duration in minutes and heart rate via a wrist worn Polar A300 (Polar Electro, Inc., Bethpage, New York) heart rate monitor with chest strap. Compliance to RT intensity was monitored for chest and leg press exercises, at 1 session per week, by research assistants recording load (pounds) performed. Compliance to ExRx was defined as aerobic duration ≥ 20 min, aerobic intensity between 50% and 80% HRR, and chest and leg press between 50% and 80% 1-RM. Percent compliance was calculated separately for aerobic duration, aerobic intensity, upper body RT intensity (i.e., chest press), and lower body RT intensity (i.e., leg press), by dividing the total number of sessions each participant was compliant, by the total number of sessions attended. Average exercise intensity for aerobic, upper and lower body (i.e., %HRR, and %1-RM) were recorded for each participant at each session, then averaged across all exercise sessions attended. When participants were noncompliant to the ExRx, research assistants documented whether the deviation was above or below ExRx, and any specific reasons reported by the participant.

Statistical Analyses

Baseline descriptive information, percent compliance, and average exercise intensity was summarized using frequencies, or means and standard deviation. Independent *t* tests compared differences between PT and GB in (a) percent compliance to aerobic exercise duration and intensity, upper and lower body RT intensity, and (b) average aerobic and RT exercise intensity. Only participants who completed the intervention were included in analyses. Statistical analyses were conducted using IBM SPSS Statistics version 25.0

(IBM Corporation, Armonk, New York), statistical significance set at $P < 0.05$.

RESULTS

Twenty-seven participants enrolled, and 88.9% (PT $n = 12$, GB $n = 12$) completed the study. On average, participants attended 14.6 ± 1.5 out of 16 total sessions (PT = 15.83 ± 0.99 , GB = 13.33 ± 0.96). Baseline characteristics of the participants ($N = 24$) who completed the study are presented

in Table 1. As previously reported (13), there were no differences in medical factors, demographics, physical activity, or fitness between GB or PT at baseline.

Percent compliance was higher in PT for aerobic duration and aerobic intensity but similar in GB and PT for upper body RT (chest press), and lower body RT (leg press). ExRx compliance results are displayed in Table 2. Average aerobic exercise intensity was similar between PT ($60.6\% \pm 7.4\%$), and GB ($64.5\% \pm 13.4\%$ HRR) ($P = 0.40$). Average upper

TABLE 1. Baseline participant characteristics ($N = 24$).

	PT ($n = 12$)	Group ($n = 12$)	Total ($n = 24$)
Age, (y)	51.9 ± 8.3	51.7 ± 9.1	51.8 ± 8.5
range	42-69	29-62	
BMI, ($\text{kg} \cdot \text{m}^{-2}$)	29.6 ± 8.1	28.3 ± 7.4	28.9 ± 7.6
range	20.4-44.5	19.4-40.3	
Education, (%)	$n = 11$	$n = 12$	$n = 23$
Post high school	83.4	100	62.5
High school diploma or less	9.1	0	8.4
Missing or no response	8.3	0	4.2
Ethnicity, (%)			
White	91.7	83.3	87.5
Other	8.3	16.7	12.5
Income, (%)			
\$50,000 to 99,999	75	58.3	66.7
\$100,000 to 149,999	8.3	33.3	20.8
More than \$150,000	8.3	0	4.2
Missing or no response	8.3	8.3	8.3
Self-reported physical activity ^a , ($\text{MET} \cdot \text{min}^{-1} \cdot \text{wk}^{-1}$)	$1,656 \pm 1,663$	$1,827 \pm 1,867$	$1,741 \pm 1,731.5$
range	0-4,650	297.0-6444	
Chest Press 1-RM, (lbs)	78 ± 14.5 ($n = 10$)	77 ± 2	77 ± 15
range	53-98	48-101	
Leg Press 1-RM, (lbs)	184 ± 38	191 ± 38	188 ± 37
range	136-238	136-255	
Estimated $\text{VO}_{2\text{max}}$ at 85% HRR, ($\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)	26.8 ± 7.8	26.1 ± 8.1	26.4 ± 7.8
range	14.7-44.6	15.7-41.1	
Time since diagnosis, (mo)	14 ± 4.5 (9.8-19) ($n = 11$)	13.2 ± 5.4 ($n = 11$)	13.8 ± 4.9
range		6-22	
Time since surgery, (mo)	10.2 ± 3.8	11.2 ± 4.8	10.7 ± 4.3
range	2.8-16	3.5-18.5	
Cancer Stage, (%)			
I	33	42	38
II	58	58	58
Did not report	8	0	4
Received chemotherapy, (%)	100	100	100
Waist circumference (cm)	89.2 ± 16.1	86.7 ± 18.3	88 ± 16.9
	68-115	65-119	

1-RM = 1-repetition maximum; BMI = body mass index; HRR = heart rate reserve; MET = metabolic equivalents of task; PT = personal training. Values represented as mean \pm SD except where indicated

^aPhysical activity was measured using the International Physical Activity Questionnaire-Short (18)

TABLE 2. ExRx compliance.

	Percent Compliance, mean \pm SD		<i>P</i> -value
	PT	GB	
Aerobic			
Duration (≥ 20 min)	98 \pm 5.4	92 \pm 5.9	0.01
Intensity (50%-80% HRR)	80 \pm 18	64 \pm 21	0.05
Chest press intensity (50%-80% 1-RM)	82 \pm 32	74 \pm 22	0.51
Leg press intensity (50%-80% 1-RM)	79 \pm 23	85 \pm 26	0.54
1-RM = 1-repetition maximum; ExRx = exercise prescription; HRR = heart rate reserve			

body RT intensity was higher in PT (73.3% \pm 20.3% of 1-RM) than GB (56.1% \pm 9.5% of 1-RM) ($P = 0.01$). Average lower body RT intensity was similar between PT (64.7% \pm 9.5% of 1-RM) and GB (63.0% \pm 13.9% of 1-RM) ($P = 0.73$).

The percentage of noncompliance (i.e., instances of noncompliance for all participants/total number of instances for all participants) that was above or below ExRx intensity for aerobic, upper body RT, and lower body RT intensity are displayed in Figure 1. Reasons for noncompliance, specific to those below ExRx, were reported. These included: “not feeling well” (2 reports), orthopedic surgery (3 reports), or musculoskeletal injury/discomfort (knee and low back; 3 reports), all of which were unrelated to the intervention. There were no reasons for being above ExRx parameters documented.

DISCUSSION

This study examined compliance to aerobic, upper and lower body RT ExRx among BCS participating in a PT or GB exercise intervention. Overall, compliance ranged from 64% to 98%, and average exercise intensity was within ExRx parameters. Compliance to aerobic exercise duration and intensity was higher in PT, but when noncompliant, the majority were below ExRx in PT whereas noncompliance to ExRx in GB was more commonly above ExRx. Compliance to upper body RT was similar between groups, but average intensity (% of 1-RM) was higher in PT. The majority of noncompliance to upper body RT intensity in PT was above ExRx parameters whereas the majority of noncompliance to upper body RT intensity in GB was below ExRx parameters.

Aerobic and RT exercise improves common symptom sequelae associated with breast conservation/reconstructive surgeries and systemic treatment that often contribute to diminished fitness and quality of life (10,19–21). For RT, the majority of participants in this study were able to exercise within the ExRx intensity, with some participants exceeding the parameters. This may be due to an underestimation of 1-RM at baseline, suggesting a need for retesting strength parameters at midintervention, particularly for those who are RT naïve at baseline.

Strengths of this study were the additional details (i.e., average %HRR, %1-RM, and duration) beyond the adherence/attendance reported in previous studies (6,9), and comparison of ExRx compliance between PT and GB delivery modalities. We were also able to provide additional

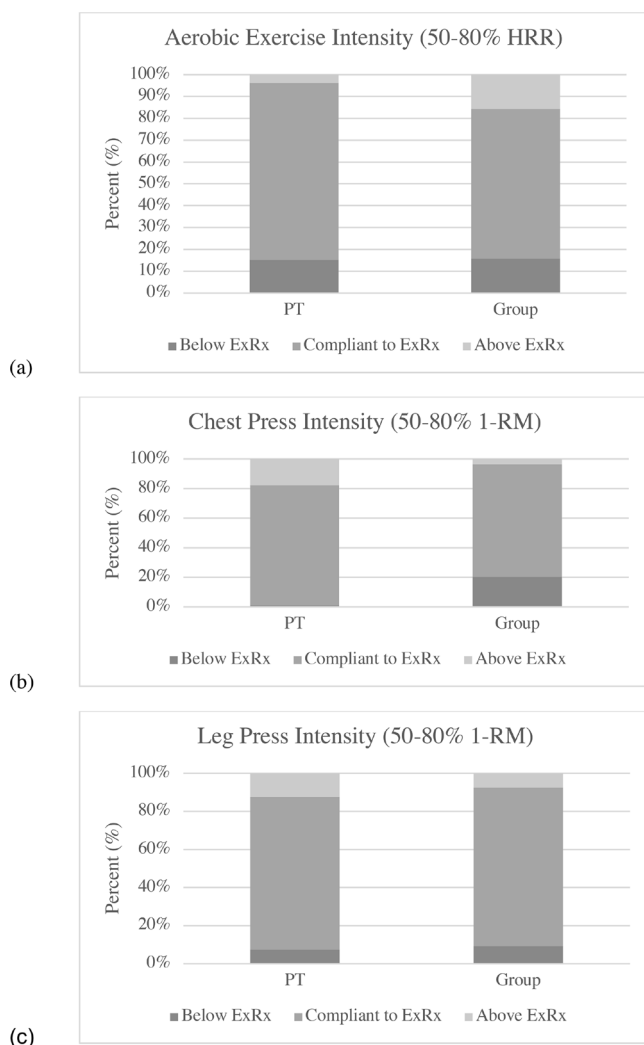


FIGURE 1. Percent of recorded instances of ExRx compliance that were within ExRx parameters, or above or below ExRx parameters. ExRx = exercise prescription; PT = personal training; HRR = heart rate reserve; 1-RM = 1-repetition maximum.

information about whether participants were unable to achieve the ExRx or were exceeding ExRx. Limitations of this study include small sample size and limited generalizability due to the small, homogenous sample. ExRx compliance was not a predetermined outcome of this study, therefore, more ExRx compliance information regarding exercises other than chest and leg press for RT were not recorded. Additionally, sets and reps for RT was not well-documented, and therefore compliance to RT volume could not be fully reported.

Findings from this study provide novel information regarding the exercise completed by BCS during a supervised PT or GB exercise intervention. Overall, BCS were able to comply with the ExRx of the intervention, at an intensity consistent with exercise guidelines for cancer survivors (5). When comparing delivery modality, compliance to aerobic exercise ExRx for duration and intensity was lower in the GB versus PT setting, suggesting that trainers may need to be more attentive in monitoring aerobic ExRx compliance in

a GB setting. There is a significant burden on research staff associated with documenting ExRx compliance during exercise interventions, thus future studies should plan to collect and analyze compliance data a priori to account for the additional staff training and time needed to ensure detailed reporting of ExRx compliance.

Clinical Implications

BCS were able to comply with the ExRx in both a PT and GB exercise intervention. However, findings from this study suggest that exercise professionals may consider closely monitoring participants' aerobic exercise duration and intensity in GB settings. Additionally, planning for how to document ExRx compliance and reasons for noncompliance during exercise interventions for BCS can help inform exercise professionals as to what extent BCS are able to achieve recommendations for aerobic and resistance exercise.

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