



Physical problems, functional limitations, and preferences for physical therapist-guided exercise programs among Dutch patients with metastatic breast cancer: a mixed methods study

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Abstract

Purpose In this study we aimed (1) to identify the most prevalent physical symptoms and functional limitations that limit physical activity of patients with palliative treatment for metastatic breast cancer (MBC) and (2) to identify their preferences for exercise-based physical therapy programs, as a first step towards the development of physical therapist (PT)-guided exercise programs for patients with MBC.

Methods We performed a mixed-method study that comprised a cross-sectional survey and two focus group sessions among patients with MBC. Survey results were analyzed using descriptive statistics. The focus groups were audio-taped, transcribed verbatim, and analyzed independently by two researchers, using directed content analysis.

Results A total of 114 women (response rate 61%) completed the survey (mean age 63.5, SD 10.2). Eighty-six percent of the women reported at least some level of physical problems limiting their ability to be physically active, of whom 46% reported substantial problems. The most prevalent problems were fatigue, painful joints, painful muscles, and shortness of breath. Uptake of exercise appeared to be limited. Exercise preferences varied strongly. Fifty-three percent indicated a preference for some form of PT-supervision, and 34% for a prolonged period of time (> 8 weeks). Focus group results clarified that patients' preferences for supervision, by PTs with special qualifications in oncology, were related to feelings of insecurity about their ability to self-manage physical functioning.

Conclusions Patients with MBC experience a broad range of physical health problems that limit their ability to be physically active. While preferences vary strongly, patients with MBC would value the availability of high quality, PT-guided, tailored exercise programs.

Keywords Metastatic breast cancer · Exercise · Physical therapy · Functional limitations · Quality of life

M. R. ten Tusscher and W. G. Groen shared first authorship

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Introduction

Currently, exercise is recognized as a key element in cancer rehabilitation to reduce symptoms and improve physical functioning, mood, and quality of life [1–3]. Few programs are however available specifically for patients with metastatic breast cancer (MBC). Yet, the need for such programs is growing, as survival rates of patient with MBC are increasing; nowadays, median survival is approximately 3 years, with 11% of patients surviving for more than 10 years after diagnosis [4]. The limited availability of exercise programs for patients with MBC is likely due, in part, to reluctance of health care providers to recommend exercise to this population [5] and to the limited evidence available regarding both the feasibility and effectiveness of exercise programs for patients with advanced cancer. Also, patients with MBC may not be aware of the possibility of exercising safely and the potential benefits involved. Findings from systematic reviews suggest that exercise is feasible and safe for patients with advanced cancer and may prevent or delay decline in aerobic fitness, muscle strength, and physical functioning. Also, it may improve physical wellbeing, fatigue, depression, and overall quality of life [6–8].

The exercise interventions for patients with MBC studied, to date, were designed to improve muscle strength and/or aerobic capacity, and all of them have employed generic exercise interventions. Tailoring of these programs consisted of adjusting intensity of the exercises to exercise tolerance or capacity [9, 10]. From a rehabilitation perspective, tailoring of exercise should go beyond adjusting exercise intensity to patients' current fitness. In particular, FITT-factors (frequency, intensity, type, and timing) of exercise should be chosen in relation to the specific activities of daily living, or specific target symptoms that the intervention is intended to improve. The symptoms and limitations MBC patients experience in activities of daily living may be very heterogenous, and may require exercise programs that employ a highly personalized and functional approach.

To our knowledge, no study has yet documented the range of functional limitations experienced by patients with MBC. Additionally, in order to successfully implement any exercise program, it is important that it aligns not only with the needs of patients, but also with their preferences. Studies on preferences for exercise programs have primarily been carried out among early stage cancer patients or in mixed advanced cancer populations [11, 12]. To our knowledge, no study has investigated specifically the preferences of patients with MBC.

In the context of a health innovation program for physical therapy (PT) for MBC patients in the Netherlands, we conducted a study with the objective of (1) identifying the most prevalent physical symptoms and functional limitations among patients with MBC and (2) gaining insight into the preferences of these patients for PT-guided exercise programs.

Methods

Study design

This convergent, parallel, mixed methods study comprised quantitative and qualitative elements. The quantitative substudy consisted of a cross-sectional survey about the physical symptom burden, functional limitations, and exercise programming preferences of patients with MBC. The qualitative substudy employed focus groups to gain insight into the most prevalent themes regarding exercise programming preferences. The institutional review board of The Netherlands Cancer Institute approved the study, and all patients provided written informed consent prior to participation.

Survey

Eligible patients were those who were under treatment for MBC during the study period, in one of these four hospitals in the Netherlands: the Netherlands Cancer Institute (NKI), the Amsterdam University Medical Center (Amsterdam UMC), Amstelland hospital, and Rijnstate hospital. These are a specialized cancer hospital, an academic hospital, and two general community hospitals, respectively. Exclusion criteria were the following: being terminally ill, unable to read and write in Dutch, receiving treatment with intent to cure for oligometastases, and having severe cognitive or psychiatric comorbidities. We approached all eligible patients by mail, after obtaining approval of their treating oncologist. Consenting patients could complete the survey on paper or online, depending on their preference. The survey consisted of 119 questions, most with multiple choice response options. The questions were divided into eight categories relevant to the development of an exercise-based PT program: (1) patient characteristics (e.g., sociodemographics and clinical characteristics); (2) current level of physical activity (PA) and physical fitness; (3) current engagement in professionally supported or supervised exercise programs; (4) perceived social support regarding PA; (5) physical problems (including fatigue) limiting PA; (6) health-related quality of life (HRQOL); (7) personal goals and preferences for PT-guided exercise programs, including preferred frequency, duration and intensity, need for direct supervisions, and willingness to incur costs for participation; and (8) interest in and preferences regarding eHealth.

The survey also included five existing questionnaires. For comorbidity, we used the Charlson Comorbidity Index, which was adapted to this specific patient population based on the advice of an oncologist (GS) [13]. Specifically, we eliminated comorbidities already covered by our in- and exclusion criteria and added a number of comorbidities that might hinder exercise. The Physical Activity Scale for Elderly (PASE) questionnaire was used to measure the level of self-reported

PA. This questionnaire was developed for use in individuals aged 65 years or older and has been used previously in cancer populations [14, 15]. The PASE sum score is computed by multiplying the hours per week spent on occupational, household and leisure activities by empirically derived item weights and summing over all activities. The recall period is 7 days, and higher scores indicate a higher level of PA [16]. Physical fatigue was assessed with the 4-item Short Fatigue Questionnaire, which ranges from 4 to 28, with higher scores representing more severe fatigue [17]. The problem list of the Patient Specifics Complaints Instrument (PSC) [18], was used to identify the activities that respondents had experienced problems with in the past week. The PSC was originally developed to support goal setting for treatment of low back pain but is, in a slightly adapted version, currently widely used in cancer rehabilitation in the Netherlands [19]. HRQOL was assessed with the EORTC QLQ-C30. We used the 5 functional scales (physical, role, emotional, cognitive and social functioning) and the summary score of this questionnaire, as well as the global health status/QoL score. All scales range from 0 to 100, with higher scores indicating better outcomes [20].

Data handling and analysis

The survey data were analyzed with IBM SPSS (version 22.0), using descriptive statistics of the sample, including frequencies and percentages for categorical data and mean/median with standard deviation and ranges for continuous data.

Focus groups

We used two convenience sampling strategies to recruit patients for the focus groups. First, we distributed flyers in the NKI and Amsterdam UMC about the aim, intended content, date, and location of the focus groups. Second, we recruited patients through social media (Facebook and a Dutch website of the breast cancer patient association).

Both focus groups were held in the NKI and lasted 2 h. The focus groups were moderated by the first (MT) and second author (WG). A patient advocate with metastatic breast cancer who was part of the research team was also present. At several points during the focus groups, the patient advocate summarized the findings and asked the participants if they agreed. All patients consented to having the sessions audiotaped.

Prior to the focus groups, we developed a topic list consisting of eight pre-conceived themes regarding the preferences for PT-guided exercise programs: (1) experiences with exercise and relaxation exercises; (2) desired/anticipated outcomes of PT-guided exercise programs; (3) functional limitations prohibiting or restricting exercise; (4) preferences for type(s) of exercise program(s), for

example, group/non group, delivery mode; (5) preferences for supervision during exercise programs; (6) preferences for alternative types of exercise, such as relaxation exercises and yoga; (7) preferences for eHealth applications; and (8) additional topics including the role of the general practitioner/oncologist, willingness to pay for these programs, and willingness to travel to a specialized PT-practice. Directly following the focus groups, patients completed a brief questionnaire assessing sociodemographic and clinical characteristics, and current levels of PA.

Data analysis

MT transcribed the audio-recorded focus groups verbatim. MT and WG independently analyzed and coded the transcripts, using directed content analysis [21]. MT deductively categorized the codes into the preconceived eight themes. If necessary, we added categories to expand the framework. In case of disagreement during the coding process, differences were discussed until consensus was reached. Selected quotes are presented to highlight the findings.

Results

Survey

Clinical and sociodemographic characteristics and level of physical activity

One hundred ninety MBC patients were invited for the survey, of whom 114 (61%) completed the questionnaire. All respondents were female, with a mean age of 63.5 years (SD 10.2) and a third had a college degree or higher. On average, patients had been diagnosed with MBC 4.3 years earlier (SD 4.0). At the time of the survey, 24% were receiving chemotherapy, 56% hormonal therapy, and 14% targeted therapy. Musculoskeletal and cardiovascular conditions were the most prevalent reported comorbidities. The self-reported median PA score on the PASE was 96.7 (IQR 50.7–156.2), and the mean summary score of the EORTC QLQ-C30 was 80.3 (SD: 13.8) (Table 1).

Physical problems and functional limitations

Full details of reported physical problems and functional limitations (PCS) are provided in Figs. 1 and 2. The majority of patients (86%) reported some degree of physical problems that limited their PA. The level of interference with PA was reported as “none” by 13%, “a little” by 40%, “quite some” by 36%, and “severe” by 10% of the patients. The most frequently reported physical barriers to being physically active were fatigue (54%), painful joints

Table 1 Sociodemographic and clinical characteristics of the survey respondents (*N* = 114)

Age in years: mean (SD, range, missing)	63.5 (10.2; 34–91; 5)
Educational level <i>N</i> (%)	
▪ Primary/middle school	42 (37%)
▪ High school	33 (29%)
▪ College/university	37 (32%)
▪ Missing	2 (2%)
Time since diagnosis in years (SD)	12.2 (8.6)
Missing (%)	9 (9%)
Time since metastatic disease in years (SD)	4.3 (4.0)
Missing (%)	8 (7%)
Current treatment	
▪ Hormonal therapy	64 (56%)
▪ Chemotherapy	27 (24%)
▪ Targeted therapy	16 (14%)
▪ Immunotherapy	2 (2%)
▪ Missing	9 (8%)
Location metastases	Number of patients (%)
▪ Bone	76 (67%)
▪ Lung	32 (28%)
▪ Liver	31 (27%)
▪ Brain	8 (7%)
▪ Missing	2 (2%)
Number of comorbidities: median (SD, range)	1.0 (1.4; 0–7)
Missing (%)	1 (1%)
Type of comorbidities*	Frequency (%)
Musculoskeletal	53 (49%)
Cardiovascular	28 (24%)
Gastrointestinal	15 (13%)
Pulmonary	10 (9%)
Metabolic disease	9 (8%)
Migraine/headache	6 (5%)
Mental illness	3 (3%)
Missing	1 (1%)
Quality of life (EORTC QLQ-C30)**	Mean (SD; 95% CI)
Global health status/QoL	69.5 (17.7; 66.1–72.9)
Missing (%)	0 (0%)
Physical functioning	73.4 (19.3; 69.7–77.2)
Missing (%)	3 (3%)
Role functioning	76.1 (28.1; 70.7–81.5)
Missing (%)	3 (3%)
Emotional functioning	79.7 (17.6; 76.3–83.1)
Missing (%)	3 (3%)
Cognitive functioning	83.2 (20.1; 79.3–87.1)
Missing (%)	1 (1%)
Social functioning	82.2 (23.0; 77.8–86.7)
Missing (%)	3 (3%)
Physical fatigue (short fatigue questionnaire)***	Median (IQR)
Summary score	15 (11–19)
Missing (%)	3 (3%)
Physical Activity Scale for the Elderly (PASE)****	Median (IQR)
Summary score	96.7 (50.7–156.2)

*Self-reported comorbidities measured with a modified Charlson Index. **Values are 0–100 with higher scores representing better functioning or quality of life. ***Scores range from 4 to 28 with higher scores representing more severe fatigue ****PASE sum score which can range from 0 to 793, with higher scores indicating greater physical activity

(42%), painful muscles (29%), and dyspnea (25%). Almost half of the patients reported problems with running and standing upright for a longer period of time (58% and 55%, respectively). Among less frequently reported activities, lifting and carrying heavy objects (35% and 24%), playing sports (33%), performing domestic work (32%), and picking something up from the ground (24%) were also reported as being problematic.

Preferences for exercise programs and PT-guidance

Preferences for PT-guided exercise programs were heterogeneous (see Fig. 3 and Table 2 for full details). For two items, responses were unavailable for 1/5 of patients because of a technical error (Table 2).

One-third of the patients indicated a preference for exercising in a group. Patients who wanted to exercise in a group

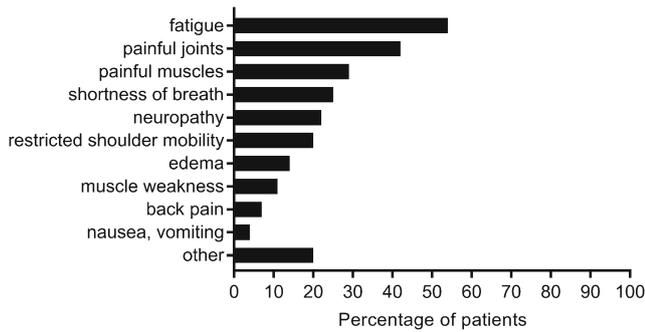


Fig. 1 Physical symptoms limiting physical activity

preferred exercising with other patients with MBC or other patients with cancer over exercising with partners, friends, or patients with other diseases.

The majority of patients reported an intention to exercise once (22%) or twice (29%) a week and to do this at a low (40%) or moderate (49%) intensity level.

The majority of patients (68%) preferred regular contact with and supervision by a PT rather than exercising on their own at home. One-quarter of the patients indicated that they only wanted to exercise under supervision; 25% wanted at least weekly supervision and 22% percent wanted less frequent supervision. Eighteen percent indicated no need for direct PT supervision. Regarding program duration, 34% preferred an exercise program > 8 weeks, 18% < 8 weeks, while 42% had no preference or did not know. Nearly all patients were willing to travel an extra distance to be supervised by a PT with additional training in oncology. Finally, 18% of patients indicated that they would be willing to incur some costs for participating in such a program, 57% reported that they might be willing to do so, and 19% stated that they would not be willing to participate if there were costs involved. A third of the patients expressed an interest in e-Health support.

Focus groups

In total, ten patients participated in the two focus groups (4 and 6 patients, respectively). All participants were female, and

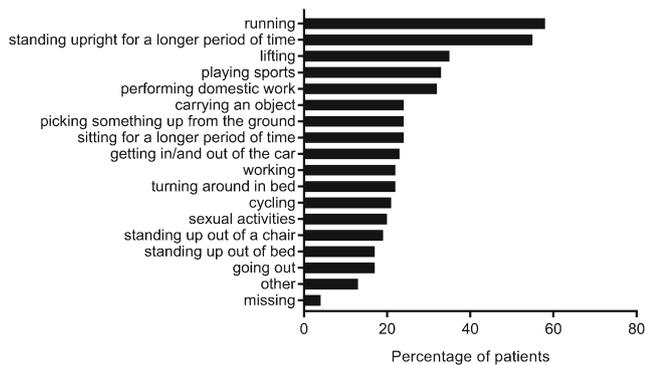


Fig. 2 Problematic activities and movements in the past week (patient-specific complaints results)

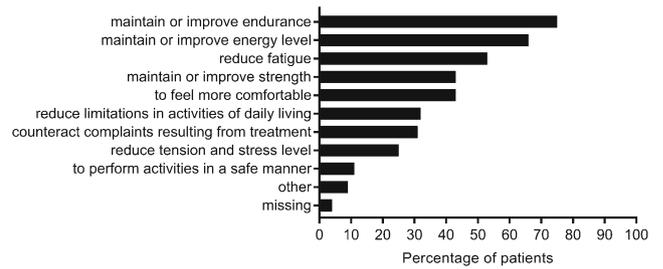


Fig. 3 Goals with physical therapy

the majority had a college education and considered themselves to be “fairly fit.” Other patient characteristics are reported in Table 3. The main themes that were discussed during the focus groups were barriers to and facilitators of exercise interventions (e.g., costs and level of oncology-qualification of a PT) and preferences for exercise interventions (e.g., duration and frequency).

Barriers and facilitators for a physical therapy programs

Only one of the focus group participants reported having received a referral from their treating physician to an exercise program. Participants wished that they had been better informed about the possibilities of exercise and physical therapy, in general. Other barriers mentioned to starting or continuing an exercise program were costs and lack of expertise and/or experience of their PT in working with patients with MBC. In addition, most participants indicated they would be willing to travel an extra distance for a PT with special training in oncology.

Reasons for pursuing a PT-guided exercise program were the possibility to maintain and gain insight into their own fitness, to achieve goals concerning activities of daily living, to stay motivated to be physically active, and to be able to consult someone about physical complaints. As one participant put it:

“...if you have someone who sees you weekly, a permanent coach (...) who sees - by the way you walk and move - how you feel, if you are all right (...) that makes me feel like there is also someone else (...) who keeps an eye on your body.”

Preferences for the content of PT-guided exercise programs

The majority of participants reported that support should be individually tailored with regard to the exercise content, intensity, and duration. Some participants preferred exercising with peers, while others did not. Participants expressed a wish for a long period of PT-guidance, a “lifetime coach.” One of the primary reasons for this was that they felt insecure about their future perspective and their physical well-being. Because of

Table 2 Preferences for an exercise based physical therapy program (*N* = 114)

Variable	<i>N</i>	%
Preferences for type of exercises		
Being active in own environment (walking, cycling, swimming, etc.)	60	53
Fitness training (endurance)	51	45
Yoga	43	38
Fitness training (strength)	21	18
Aerobics/steps	11	10
Games	8	7
Bootcamp activities (easy to follow, but intensive endurance and strength work-out)	7	6
I do not know	15	13
Other	9	8
Missing	3	3
Preferences for the composition to be physically active in		
A group	33	29
Individually	31	27
With one other person	16	14
No preference/missing	34	30
Preferences for the composition of the group to be physically active with*		
Peers	34	30
With other cancer patients, including patients without metastatic breast cancer	29	25
With friends or acquaintances	14	12
With other patients (e.g., patients with diabetes, pulmonary complaints)	13	11
With sport ‘buddies,’ or as part of a sports club	13	11
With partner	8	7
Missing	7	6
Preference for frequency of exercise during the week		
Once a week	25	22
Twice a week	33	29
Three times a week	5	4
More than 3 times a week	2	2
I do not know	23	20
Missing (due to technical error in the survey)	26	23
Preference for intensity of exercise		
Mild intensity (no increase in heart rate or breathing frequency)	45	40
Moderate intensity (increased heart rate and breathing frequency)	56	49
High intensity (sweating and shortness of breath)	2	2
Missing	11	10
Preference for the duration of the exercise program		
Maximum of 4 weeks	3	3
4–6 weeks	6	5
6–8 weeks	9	8
More than 8 weeks	39	34
I do not know	48	42
Missing	9	8
Preference for exercise under supervision of a physical therapist		
Only under the supervision of a physical therapist	28	25
Weekly supervision of a physical therapist	28	25
Every 2 weeks contact with a physical therapist	16	14
Every 3 weeks contact with a physical therapist	5	4
Maximum of 3 contacts with a physical therapist	4	4

Table 2 (continued)

Variable	<i>N</i>	%
I do not need supervision of a physical therapist	20	18
Other:		
Depends on type of activities	2	2
Can also be supervised by a fitness instructor	1	< 1
Do not know	1	< 1
Missing	9	8
Acceptable travel time to a physical therapist with additional oncology training		
0–15 min	54	47
15–30 min	35	31
30–45 min	9	8
Other:		
n/a, treatment at home	2	2
No traveling time accepted	3	3
In own town	1	< 1
Do not know	1	< 1
Missing	9	8
Interest in additional relaxation exercises		
Yes	48	42
No	37	33
No preference	5	4
Missing (due to a technical error in the survey)	24	21
Interest in eHealth support		
Very attractive	4	4
Attractive	34	30
Not attractive	14	12
No opinion	58	51
Missing	4	4
Willingness to pay for possible costs		
No participation in case of costs	22	19
Possible participation in case of costs	65	57
Willing to participate despite costs	20	18
Missing	7	6

*Response options are not mutually exclusive

their declining physical fitness, they would rather be supervised by a PT and considered themselves unable to exercise by themselves in, for example, a fitness center. Preferences for the frequency and intensity of PT sessions differed between patients, depending on their physical fitness and priority setting. Patients prioritized exercise in comparison with social activities in different ways, depending on their health status and feelings of enjoyment and reward they got from exercising. One woman, who considered herself quite fit and was still working, expressed this as follows:

“... when I have walked 5 kilometers, I am completely broken, exhausted, super proud, and I can’t do anything else that day. So that means, for example, that I can’t

visit a friend later that day – but I don’t mind. My achievement matters more to me.”

Another participant, with a poorer health status, prioritized her social life as more important than exercise;

“I tend to consider my social life as more important, and I feel that by being socially involved I become more active and get more energy.”

The majority of participants believed that eHealth could be a useful addition to supervised exercise, as it could reduce the burden of traveling and facilitated scheduling the exercises at times that would suit them. However, they

Table 3 Characteristics of focus group participants ($N = 9$)

Age in years: mean (SD, range)	52 (SD 8.0, range 41–64)
Educational level ($n=$)	
▪ Primary/middle school	2
▪ High school	1
▪ College/university	6
Current treatment ($n=$)	
▪ Hormonal therapy	5
▪ Targeted therapy (herceptin)	1
▪ Both targeted therapy and hormone therapy	1
▪ Both chemotherapy and targeted therapy	1
▪ Missing	1
Self-perceived fitness ($n=$)	
▪ Fairly unfit	2
▪ Fairly fit	6
▪ Very fit	1
Currently active in a supervised exercise program ($n=$)	3
Internet use ($n=$)	
▪ (almost) Every day	7
▪ About 1 day per week	1
▪ Missing	1

Background information for one participant is missing

also stressed that eHealth should not fully replace face-to-face contact with the PT.

The participants reported several physical complaints that might interfere with an exercise program, including fatigue and neuropathy. They stressed the importance of proper adjustment of the exercise intervention to these physical complaints and to their overall health condition.

Finally, the majority of the participants was interested in relaxation exercises. They reported elevated levels of stress and insomnia, which they thought could be reduced with such exercises.

Discussion

In this study, our goal was to gain insight into the physical symptoms and functional limitations of patients with MBC, and into their preferences regarding PT-guided exercise programs. We found that the large majority of MBC patients experiences physical problems that are barriers to PA or exercise. Preferences with regard to PT-guided exercise programs varied but, in general, patients seem to favor group-based exercise and frequent contact with a PT. Also, many patients indicated a preference for programs of longer duration (> 8 weeks).

Many of the physical problems reported by patients in this study (fatigue, painful joints and muscles, shortness of breath) have also been reported in previous studies among patients

with MBC [22–28]. While these symptoms are perceived as barriers to PA, they have also been demonstrated to respond well to exercise [29–31]. Yet, patients in the focus groups reported lack of referral to exercise programs, and only 20% of the survey respondents were currently participating in an exercise program. Clearly, there is a need for increased awareness among patients with MBC and their health care providers about the feasibility and potential benefits of exercise, despite the presence of advanced disease.

Despite their reported physical limitations and low uptake of exercise, the median (IQR) PASE score of respondents to the survey was relatively high (96.7 [50.7–156.2]). To put this in perspective: the median PASE score was 65.7 in a heterogeneous sample of lung cancer patients [15], and 86 and 97, respectively, in two measurements of a group with mixed cancer diagnoses and a younger mean age (50 years) compared to our respondents [14].

Median EORTC QLQ-C30 global health status/QOL and cognitive and social functioning scale scores were comparable to reference values available for patients with MBC [32]. However, median EORTC QLQ-C30 scores of our sample were lower for physical functioning (73.4 vs. 86.7) and higher for emotional (79.7 vs. 66.7) and role functioning (76.1 vs. 66.7) as compared to reference values [32]. This suggests that our study participants were less physically fit, but had better psychosocial functioning than oncology peers.

Many of the patients, both in the survey and the focus groups, expressed a preference for exercise supervision by a

qualified PT. From the focus groups, we learned that this was related to feelings of uncertainty about their future, in general, and the anticipated decline in their physical fitness and health state in particular. The majority of patients in our sample (67%) had bone metastases. Bone metastases can cause pain and anxiety and represent a risk for fractures. Supervision by a qualified PT may decrease feelings of uncertainty with regard to the safety of exercising. Several recent studies have proposed ways of tailoring resistance exercise based on the location of the metastases in patients with prostate or breast cancer, with promising results [33–35].

Although they valued supervision, only 8% of the survey respondents was prepared to travel more than 30 min to a physical therapist. Although there undoubtedly are sociocultural and geographical differences with regard to what is considered acceptable, travel time has been recognized as an important barrier to uptake of physical exercise by cancer patients [36, 37].

e-Health could be an interesting addition to home-based exercise, reducing the practical barrier of travel while maintaining the benefits of supervision. One-third of the survey respondents indicated an interest in e-Health, while half of the patients did not have an opinion on e-Health, which may be due to unfamiliarity with the concept. Further feasibility studies are needed to explore the acceptability, feasibility, and uptake of such interventions for exercise supervision of patients with advanced cancer. e-Health could potentially also reduce the costs associated with exercise programs. This could be important not only from a societal perspective, but also because many patients indicated that they were unwilling to pay for taking part in an exercise program, or would only accept a limited amount of out-of-pocket expenses.

Although our study provides useful insights that can help to shape exercise-based PT interventions for patients with MBC, some limitations should be noted. There is a potential risk for selective response of patients who are relatively exercise-minded. This risk may be higher for the focus groups than for the survey sample, due to our sampling strategy. Focus group participants were also relatively highly educated, and only one was currently under active chemotherapy treatment, which may have been reflected in their views and preferences. Overall, participants also reported relatively high levels of PA, and they had a relatively good prognosis, as reflected in their time since diagnosis. We collected data on physical symptoms and functional limitations by self-report. Performance-based measures would have strengthened the study, but for feasibility reasons, this would likely have resulted in a much smaller sample size. The focus groups were led by a physical therapist. This may have introduced some social desirability bias, in particular with regard to the discussion of topics directly related to physical therapy, although this did not withhold participants to express their concerns about lack of expertise of PTs. For two questions, there were missing data due to a technical error. However, these missing responses can be

considered “missing completely at random,” and therefore, it is unlikely that this resulted in bias [38]. The study also has some notable strengths, which include rich data resulting from collecting both quantitative and qualitative data.

In conclusion, patients with MBC experience a range of physical problems that limit their daily activities, and that represent a barrier to exercise. Uptake of exercise in this population appears to be limited, which is due, in part, to lack of referral by their health care providers. Our results also suggest that increased availability of high-quality, easily accessible, supervised and personalized programs would be welcomed by many women with MBC, and could improve exercise uptake in this population.

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Compliance with ethical standards

Conflict of interest Dr. Aaronson, Dr. Stuiver, and E. Geleijn report a grant from the Dutch Cancer Foundation KWF/Pink Ribbon supporting this study. Dr. Sonke reports unrelated grants from Astra-Zeneca, Novartis, Roche, and Merck.

We have full control of all primary data and agree to allow the journal to review the data if requested.

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