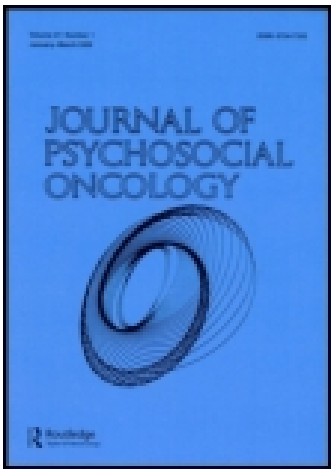

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Stick Together: A Nordic Walking Group Intervention for Breast Cancer Survivors

Maarten J. Fischer PD[a], Elly M. M. Krol-Warmerdam MA[b], Gemma M. C. Ranke MA[b], Henricus M. Vermeulen PD[c], Joke Van der Heijden BHS[d], Johan W. R. Nortier PD[a] & Adrian A. Kaptein PD[e]

[a] Department of Clinical Oncology, Leiden University Medical Center, Leiden, The Netherlands

[b] Department of Surgery, Leiden University Medical Center, Leiden, The Netherlands

[c] Department of Physical Therapy, Leiden University Medical Center, Leiden, The Netherlands

[d] Action4Vitality, Noordwijkerhout, The Netherlands

[e] Unit of Psychology, Leiden University Medical Center, Leiden, The Netherlands

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Stick Together: A Nordic Walking Group Intervention for Breast Cancer Survivors

MAARTEN J. FISCHER, PhD
Department of Clinical Oncology, Leiden University Medical Center, Leiden, The Netherlands

ELLY M. M. KROL-WARMERDAM, MA
Department of Surgery, Leiden University Medical Center, Leiden, The Netherlands

GEMMA M. C. RANKE, MA
Department of Surgery, Leiden University Medical Center, Leiden, The Netherlands

HENRICUS M. VERMEULEN, PhD
Department of Physical Therapy, Leiden University Medical Center, Leiden, The Netherlands

JOKE VAN DER HEIJDEN, BHS
Action4Vitality, Noordwijkerhout, The Netherlands

JOHAN W. R. NORTIER, PhD
Department of Clinical Oncology, Leiden University Medical Center, Leiden, The Netherlands

ADRIAN A. KAPTEIN, PhD
Unit of Psychology, Leiden University Medical Center, Leiden, The Netherlands

Axillary lymph node dissection and axillary radiation as part of breast cancer treatment often result in arm and shoulder morbidity and limitations in daily functioning. Over and above the general benefits for cardiorespiratory fitness, Nordic Walking particularly targets at the muscles of the upper extremities and shoulder. This may increase shoulder range of motion and lead to a reduction in functional limitations. The aim of this study was to offer a Nordic Walking intervention to women after treatment for breast cancer and to investigate changes in subjective well-being and shoulder function. Three supervised Nordic Walking courses were organized (2009–2011). The intervention consisted of ten weekly 1-hour sessions focusing on upper body strength and condition. In total, 28 women participated in one of the cohorts. Results showed that after 10 weeks, patients' vitality had improved, whereas

Address correspondence to Maarten J. Fischer PhD, Leiden University Medical Center, Department of Clinical Oncology, K1-P, P.O. Box 9600, 2300 RC, Leiden, The Netherlands. E-mail: m.j.fischer@lumc.nl

perceived shoulder symptom severity and limitations in daily activities had decreased. Goniometric data indicated that range of motion (forward flexion, abduction, and external rotation) of the affected shoulder improved significantly within 10 weeks of training. Group interviews at 6 months follow-up confirmed that patients had appreciated the physical and psychosocial benefits of the intervention. These benefits outweighed the practical disadvantages. Patient selection, assessment and training should take place under (para-)medical supervision and group instructors should have the knowledge and skills to work with a group of recent cancer survivors. Results from this explorative study suggest that Nordic Walking is a feasible and potentially valuable tool in the rehabilitation of patients with breast cancer.

KEYWORDS breast cancer, exercise, Nordic Walking, range of motion, rehabilitation, shoulder morbidity

INTRODUCTION

Women with breast cancer who have undergone axillary lymph node dissection or axillary radiation as part of their treatment often suffer from upper extremity morbidity. Symptoms such as numbness, pain, arm weakness, restrictions in shoulder range of motion (ROM), and lymph edema are reported after treatment by up to 60% of the patients (Hack, Cohen, Katz, Robson, & Goss, 1999; Hack et al., 2010; Mansel et al., 2006), and may persist for years (Devoogdt et al., 2010; Levangie & Drouin, 2009). These physical side effects of treatment have a negative impact on patients' mental health and quality of life (QOL). For instance, patients who experience restrictions in ROM report poorer social and psychological well-being compared with patients without restrictions in shoulder ROM (Aerts, de Vries, Van der Steeg, & Roukema, 2011). Furthermore, pain reduces patients' sleeping quality and overall QOL, whereas pain-related disability regarding self-care and sexuality is an important predictor of mental health (Hack et al., 1999; Tasmuth, von Smitten, & Kalso, 1996).

Exercise for cancer survivors has shown to improve exercise capacity, muscle strength, fatigue, mood, and overall QOL (Craft, Van Iterson, Helenowski, Rademaker, & Courneya, 2012; Ferrer, Huedo-Medina, Johnson, Ryan, & Pescatello, 2011). For breast cancer survivors in particular, physical exercise has been associated with improvements in physical strength and aerobic capacity, fatigue, functional capacity, self-esteem, body image, and QOL (Knols, Aaronson, Uebelhart, Fransen, & Aufdemkampe, 2005; McNeely et al., 2006; White, McAuley, Estabrooks, & Courneya, 2009). Walking programs for patients with breast cancer have been organized as a cost-effective

exercise modality to increase physical fitness and to provide social support. Walking programs for breast cancer survivors have shown to increase energy spent walking and total steps a day (Matthews et al., 2007) and to improve, blood pressure, body mass index, percentage body fat, and attitudes towards exercise (Wilson, Porter, Parker, & Kilpatrick, 2005).

More recently, some studies have investigated the effects of Nordic Walking (NW), or adding walking poles to an exercise program for patients with breast cancer. Nordic Walking in general increases caloric expenditure, oxygen uptake, and heart rate, compared with walking without poles (Church, Earnest, & Morss, 2002; Porcari, Hendrickson, Walter, & Walsko, 1997; Schiffer et al., 2006). Nordic Walking for women of all ages may also improve body mass index, waist circumference, total fat mass and cholesterol levels (Hagner, Hagner-Derengowska, Wiacek, & Zubrzycki, 2009). In addition to the general benefits for cardiorespiratory fitness, using walking poles during exercise engages the large muscles of the shoulder girdle (deltoid muscle) and upper extremities (mainly the triceps and biceps brachii and forearm muscles) (Rösner, 2011; Sprod, Drum, Bentz, Carter, & Schneider, 2005). Therefore, it has been hypothesized that NW for breast cancer survivors may improve shoulder range of motion (Sprod et al., 2005).

To date, a limited number of studies have investigated the effects of NW for women with breast cancer. Sprod and colleagues tested the effects of using walking poles during physical exercise (Sprod et al., 2005). The 8-week intervention consisted of sixteen 20-minute aerobic exercise sessions, followed by 30 minutes of resistance training. The sessions ended with stretching exercises. The study showed that muscle endurance had increased in the intervention group, but not in the control group (exercising without poles). Range of motion of the shoulder however did not improve.

Jönsson and Johansson investigated the effects of a pole-walking exercise on breast cancer patients' lymph edema severity (Jönsson & Johansson, 2009). The session consisted of warming-up, pole walking, and cooling down (including slow walking and stretching exercises). Participants were wearing a compression sleeve during training. No increase in arm volume was observed after the end of the training or in the 24 hours following the training session.

Another randomized study investigated the effects of an 8-week NW rehabilitation program for women with breast cancer (Malicka et al., 2011). The program consisted of two sessions of 60 minutes per week comprising warm-up exercises, Nordic Walking, and cooling down. Results showed that after the intervention patients had increased shoulder muscle strength. The study found no evidence that Nordic Walking had caused or aggravated lymph edema.

Finally, a randomized study offered a NW training (12 sessions) to breast cancer survivors (Rösner, 2011). A larger increase in shoulder and elbow strength and shoulder ROM was observed in the intervention group

compared with the control group (rehabilitation without NW). In addition, greater improvements in several dimensions of QOL, including vitality, pain, and role functioning, were found in the intervention group.

These studies suggest that Nordic Walking may be a safe and effective rehabilitation modality for women with breast cancer. However, the published studies have examined only short-term effects, and have mainly focused on physical outcomes. Therefore, the aim of this study was to explore whether a NW course for women treated for breast cancer could result in short-term and long-term improvements in physical and psychological well-being. In order to gain a comprehensive understanding of the potential value of NW for this patient population, both quantitative and qualitative research methods were used. We expected the intervention to increase patients' vitality and shoulder mobility, and reduce limitations in daily activities (Rösner, 2011).

METHODS

Participants

Approval for this study was obtained from our hospital ethics committee. All patients who had undergone primary breast cancer surgery with axillary node dissection or axillary radiation in the previous year ($N = 77$) were invited by mail to participate in a NW program. Patients were who were considered unable to engage in physical exercise were excluded. Patients received a response form allowing them to state whether they wished to participate. If patients were not interested they were asked to state the reason(s) why.

Intervention

The NW program was offered in 3 consecutive years (2009–2011). The training sessions were supervised by an International Nordic Walking Federation (INWA)/Royal Dutch Athletics Union (KNAU) certified instructor (JvdH). The program consisted of 10 weekly 1-hour training sessions. The training sessions took place in Noordwijkerhout, close to the North Sea dunes. The NW course was standardized as follows. The first six training sessions were used primarily to teach participants the correct NW technique (e.g., body posture, stride length, grip and release of the walking poles, upper body rotation, applying force to the poles). The last four lessons focused on advancing the acquired technique, improving endurance, and muscle strength. An additional aim was to increase the group cohesion and to reinforce participants' weekly exercise routine. In these last sessions increasingly more time was spent on endurance training (from 10 to 20 minutes) at the expense of

time spent on NW technique. The last sessions also included uphill/downhill walking and walking on different surface types (e.g., sand, asphalt). Each 60-minute training session consisted of five elements: (1) warm-up exercises, 10 minutes; (2) introducing and/or reinforcing NW techniques, 10–20 minutes; (3) total body strength training exercises with or without walking poles, 10 minutes; (4) Nordic Walking in different tempos focusing on endurance, 10–20 minutes; (5) stretching and cooling down, 10 minutes.

Measures

Patients received a questionnaire before the start of the NW program (T1), after the 10th training session (T2), and 6 months after the end of the course (T3). The questionnaire assessed the following concepts:

Shoulder Morbidity

The shoulder pain and disability index (SPADI) (Roach, Budiman-Mak, Songsiridej, & Lertratanakul, 1991) is a 13-item questionnaire measuring symptoms of pain and disability in the previous week on a 0–10 scale. Higher scores indicate more pain and disability. Items are summed and transformed into a 0–100% score for each subscale separately. In the present study the pain and disability subscales demonstrated good internal consistency (Cronbach's $\alpha = 0.92$ and 0.79, respectively).

Subjective Well-Being

Subjective well-being was assessed by two subdomains of the medical outcomes study 36-item short form survey instrument (SF-36) (Ware, Jr. & Sherbourne, 1992): general mental health and vitality. Questions concern the past 4 weeks and are answered on a 6-point Likert scale ("always"–"never"). Scores are transformed into a 0–100 range with higher scores indicating better functioning. Both scales showed high internal consistency (Cronbach's $\alpha = 0.90$ and 0.83, respectively for mental health and vitality).

Limitations in activities of daily living (ADL) and social activities were assessed with two single questions indicating the level of limitation on a 5-point scale ranging from "not at all" to "very much." Higher scores indicate greater limitations with regard to ADL or social activities.

Perceptions of Arm and Shoulder Morbidity

Patients' perceptions of their arm and shoulder morbidity were assessed with the Brief Illness Perception Questionnaire (BIPQ; Broadbent, Petrie, Main, & Weinman, 2006). This questionnaire consists of eight single-item

subscales and assesses patients' cognitive and emotional representations of their condition. The subscales are scored on a 0–10 scale and include: (1) the experienced consequences of their arm and shoulder problems, (2) the degree to which patients experience physical arm and shoulder symptoms, (3) the expected timeline of the symptoms, (4) perceived personal control over symptoms, (5) treatment control (expected benefits of Nordic Walking on their arm or shoulder symptoms), (6) concerns about the symptoms, (7) the degree to which the condition affects patients' emotional well-being, and (8) patients' sense of understanding about their symptoms. The BIPQ has shown good test-retest reliability and validity (Broadbent et al., 2009).

Evaluation of the Intervention

In the second questionnaire (T2) participants were asked to evaluate the program. On a 5-point answering scale [answering format: far too few(little)/too few(little)/just about right/too many(much)/far too many(much)] respondents were asked to rate several aspects of the training, including the number of training sessions, the frequency of training sessions (weekly), the intensity of the physical exertion during training and the variation in exercises. Participants were also asked to indicate how satisfied they were with the program by giving a school mark. Two anchors were provided (1 = very poor–10 = excellent). Finally, patients were asked whether they would recommend a NW course to other breast cancer survivors.

Shoulder Range of Motion

After the first NW course in 2009 had been completed it was decided to continue offering the intervention for 2 more years. It was then also decided to include an assessment of the ROM of participants' shoulder joint for the next cohorts. At the start of the 1st and 10th training day the ROM of both shoulders were measured by a physiotherapist (HMV) using a goniometer. A goniometer is a portable device used to measure joint and body position angles. Assessment included forward flexion (palm of the hand facing in toward the body, raising arms in a forward motion), abduction (palm of the hand facing forward, bringing the arm out to the side as close to the head as possible), external rotation (elbows close to the body in 90 degrees of flexion, thumbs up, turning the hands outwards), and internal rotation (bringing the thumb up behind the back). Active and passive ROM were assessed while patients were sitting in an upright position. With the exception of internal rotation, patients performed the movements with both arms simultaneously.

Medical charts were reviewed to gather socio-demographic characteristics, breast cancer details (affected side, tumor stage), and treatment

characteristics (time since surgery, surgical procedure, number of lymph nodes extirpated, additional treatment).

Focus Groups

In addition to the quantitative information, two focus groups were held with participants of the first two NW interventions, 6 months after the end of the program. The focus groups were organized to examine participants' experiences with the NW intervention into further detail and to gain an in-depth understanding of the perceived benefits and drawbacks of such an intervention. The discussions were led by a psychologist (MJF) and two nurse practitioners (EKW and GR). Discussions were recorded on audiotape and transcribed. As no previous studies on this topic had used a qualitative research method, an inductive content analysis was considered appropriate (Elo & Kyngäs, 2008). After familiarizing with the qualitative data, statements of participants about their positive and negative experiences were coded and categorized. For both groups a separate matrix was created summarizing the perceived benefits disadvantages of Nordic Walking to examine similarities and differences between both groups.

Statistical Analyses

Descriptive analyses were used to describe participants' baseline characteristics and their participation rates in Nordic Walking. Changes over time in patients' questionnaire data were analyzed with repeated measures analysis of variance (ANOVA). For significant within-subject effects, planned contrasts were calculated to investigate whether outcome variables at baseline differed from assessments at T2 and T3. Longitudinal data on shoulder ROM were analyzed by means of paired samples *t* tests. All data were analyzed using SPSS for windows (version 20.0).

RESULTS

Of the 77 patients who were invited 31 patients expressed an interest to participate. Thirty-four patients gave a reason for nonparticipation and 12 women did not respond. Reasons for declining participation were mainly because patients did not feel the need to participate (53%), were already engaged in some other type of exercise (32%), or felt physically unable to participate in Nordic Walking (29%). Women who were interested were somewhat younger than those who chose not to participate (53.2 vs. 58.1 years, respectively), although this difference did not reach statistical significance.

TABLE 1 Patients' Characteristics ($N = 28$)

	Mean	SD	*n*	%
Age	53.8	10.0		
Tumor stage				
T0 (in situ)			1	4%
1			9	32%
2			11	39%
3			6	21%
4			1	4%
Surgery				
Mastectomy			20	71%
Breast conserving surgery + ALND			8	29%
Number of extirpated lymph nodes				
1–10			6	21%
11–20			17	61%
>20			5	18%
Time since surgery (days)	357	98		
Adjuvant treatment				
None			1	4%
HT			3	11%
RT + CT			6	21%
RT + HT			1	4%
CT + HT			4	14%
RT + CT + HT			13	46%

ALND = axillary lymph node dissection; CT = chemotherapy; HT = hormone therapy; RT = radiotherapy.

Of the 31 women who were interested in Nordic Walking, 28 actually took part in the intervention. For two women the training schedule was inconvenient and one woman suffered from hand problems interfering with pole walking. Participants' age ranged from 36 to 75 years. On average, women had undergone surgery 1 year ago with a range of 181–567 days since surgery (see also Table 1).

At baseline, most patients (81%) indicated that they exercised regularly. Among the women who indicated to exercise, walking ($n = 8$) was the most frequently reported exercise modality, followed by going to the gym ($n = 6$), cycling ($n = 4$), swimming ($n = 3$), and yoga ($n = 3$). Four women currently received treatment by a physical therapist. Of the women who exercised, 67% indicated to exercise more than 3 hours per week on average.

Twenty-three of the 28 (82%) women who started the training completed the 10-week course (no permanent discontinuation of attendance). Two women in one group had presented with progression of their breast cancer early during the program and were unable to continue. Three other women dropped out due to medical reasons unrelated to breast cancer.

Overall, attendance was high. The women who completed the course attended 8.8 sessions on average (range 6–10). Absence was related to health problems (e.g., flu) and other activities (education, holiday, employment).

TABLE 2 Repeated Measures Analyses of Patients' Well-Being ($N = 19$)

	T1 Mean (SD)	T2 Mean (SD)	T3 Mean (SD)	Within Subjects F	Contrast T1–T2 F	Contrast T1–T3 F
SPADI						
Pain	33.7(20.9)	29.9(23.7)	22.7(17.5)	5.24**	1.20	11.78**
Disability	20.1(14.0)	18.1(17.6)	12.4(11.8)	5.98**	.68	11.83**
SF-36						
Vitality	61.6(17.8)	67.1(17.2)	66.3(17.4)	3.14#	6.16*	3.30#
Mental health	74.1(15.0)	77.9(14.3)	76.8(17.9)	1.77		
Limitations						
ADL	2.3(1.1)	1.8(1.0)	1.7(0.9)	6.27**	9.38**	11.12**
Social functioning	1.5(0.8)	1.1(0.3)	1.2(0.4)	2.58#		
BIPQ						
Consequences	3.7(2.5)	2.9(2.6)	2.7(2.4)	3.79*	5.44*	6.84*
Timeline	6.5(2.8)	6.0(3.7)	6.6(3.2)	0.40		
Personal control	6.1(2.6)	6.8(2.4)	6.6(2.1)	2.30		
Treatment control	6.1(2.3)	6.1(2.5)	6.0(2.4)	0.08		
Symptoms	4.7(2.3)	3.9(2.7)	3.5(2.7)	3.38*	6.36*	6.88*
Concern	3.1(2.4)	3.2(2.8)	2.4(2.7)	1.35		
Understanding	8.3(2.2)	8.2(2.5)	8.2(2.5)	0.04		
Emotional Representations	3.1(2.7)	2.9(2.6)	2.6(2.5)	0.65		

ADL: Activities of daily living; BIPQ: Brief Illness Perception Questionnaire; SF-36: short form 36; SPADI: shoulder pain and disability index. T1 = baseline; T2 = after 10 training sessions; T3 = 6 months after the end of training. #$p < 0.10$. *$p < 0.05$. **$p < 0.01$.

Subjective Well-Being

Of the 23 women who competed the course, 19 (83%) returned all three questionnaires (T1–T3). Results of subjective well-being revealed significant immediate improvements in vitality ($p = .02$) and activities of daily living ($p = .007$) after 10 weeks of exercise training (Table 2). Similarly, there were significant reductions in perceived symptom severity ($p = .02$) and perceived consequences of these symptoms ($p = .03$) after 10 weeks of training that were maintained at 6 months follow-up.

Although there was no significant change in shoulder pain and disability after 10 weeks, significant reductions were observed between T1 and T3 for shoulder disability ($p = .003$) and shoulder pain ($p = .003$). Mean scores for general mental health and limitations in social functioning did not change across the three assessment points.

Range of Motion

Baseline assessments of the ROM of the shoulder joint indicated a significant difference between the mobility of the affected and contralateral shoulder

TABLE 3 Shoulder Range of Motion at Baseline and at the End of the Course ($N = 17$)

	Non-Affected Shoulder T1 Mean (SD)	Affected Shoulder		Paired Sample t Value (Affected Shoulder)
		T1 Mean (SD)	T2 Mean (SD)	
Forward flexion				
Active	155.0 (11.2)	144.4 (14.6)	150.3 (14.1)	2.91**
Passive	162.4 (12.4)	150.5 (14.7)	155.0 (15.0)	2.17*
Abduction				
Active	167.9 (13.6)	152.9 (20.5)	162.4 (16.0)	3.05**
Passive	174.1 (12.1)	157.6 (20.5)	166.2 (16.5)	2.20*
External rotation				
Active	64.1 (21.4)	54.7 (19.3)	61.5 (19.4)	3.63**
Passive	71.2 (21.7)	61.2 (21.6)	66.5 (20.4)	2.28*

*$p < 0.05$. **$p < 0.01$.

(Table 3). On average, baseline results for forward flexion, abduction, and external rotation were approximately 10–15 degrees better for the non-affected side (all $p < .01$). No significant correlation was found between ROM (active and passive abduction, forward flexion and external rotation) of the affected arm and days since surgery, nor with the total number of lymph nodes that had been extirpated (all $r < 0.2$).

Repeated measures demonstrated that the mobility of the affected shoulder had improved significantly during the NW course (Table 3). All results for forward flexion, abduction, and external rotation showed significant improvements over the 10-week period. The improvements appeared to be somewhat stronger for the active movements than for the passive movements. With regard to internal rotation, results showed that the majority (76%) of the participants had improved (reaching at least one vertebra higher on the spine), 18% had no change, and one patient (6%) performed poorer than at baseline. The non-affected shoulder was assessed only at baseline as no improvement was expected as a result of training. However, comparison of ROM of the affected shoulder at T2 (posttreatment) with ROM of the non-affected shoulder at baseline showed no significant differences.

Evaluation of the Intervention

The program was highly valued by the participants. Patients' average rating of the program was 9 on a 10-point scale (range 7–10). Furthermore, all participants would recommend the NW course to other breast cancer patients. Satisfaction was 90% or greater across all domains measured (data not shown).

Focus Group Results

In the focus groups patients were asked to elaborate on the perceived benefits and drawbacks of the NW course. These can be grouped under four headings: physical, psychological, social, and practical.

Physical Benefits

Overall, patients felt more energetic after the end of training. Patients in both groups also indicated they had experienced an increase in shoulder mobility, reducing their ADL limitations. In addition, some patients indicated they had experienced less shoulder pain by the end of the course, but also a slight increase in pain in the period after the end of the program for those who had not continued their NW exercise routine.

Psychological Benefits

Patients reported that the intervention served as an opportunity to reinitiate a physical exercise routine and to work on their physical recovery. Patients appreciated the fact the hospital offered this type of after care, and supported them during their process of recovery.

Both groups agreed that the Nordic Walking groups consisting only of breast cancer patients created a safe and supportive atmosphere focusing on life after treatment. Participating was found enjoyable and participants indicated that the intervention allowed them to interact during the exercises. Women felt free to discuss their illness and treatment-related experiences, but there was no obligation to do so. Several patients indicated they would not participate in a supervised social support group, but mentioned that during the informal interaction with fellow patients they had learned about how others coped with the practical and emotional consequences of their illness. Additionally, the homogeneous group composition allowed participants to feel recognized in their experience of physical and emotional difficulties.

> At home, everyone wants to pick up the pieces and act as if everything is OK. This group provides an opportunity, if you feel like it . . . so we don't have to burden our partners or children . . . to talk about it once in a while. Because, I have noticed in my family that everybody reacts like: "Wow, you've got your hair back, you've recovered." And nobody talks about it anymore.

Social Benefits

Participants also appreciated the fact that the group provided a new informal network. Some patients had lost contact with colleagues because they had stopped working and this group filled this gap. In both groups participants indicated that after the end of the 10-week training, they had continued to keep in touch to exercise together or to call each other for support.

In the group where two women had dropped out due to their disease progression, one woman indicated that these unfortunate events underscored the potentially deadly nature of breast cancer. She had felt that her friends and family tended to underestimate the severity of breast cancer.

> The fact that in this small group there are two women who have died . . . I often hear: "Ah breast cancer, that's treatable. The prognosis is usually good." And I regularly feel I have to defend myself and say: "Yes, but it is cancer nonetheless." People often don't want to accept that breast cancer is a potentially deadly disease.

Physical Disadvantages

Although most patients were satisfied with their physical recovery, the Nordic Walking intervention sometimes had led to specific unpleasant bodily sensations, usually related to the more intensive use of their muscles and joints. Respondents indicated that pain sometimes was interpreted as a signal of advancing disease.

> I had a specific complaint as a result of Nordic Walking. After a while I got a painful hip. And I thought: "Bone metastases!" I started gathering information on the Internet and thought I was done for. But now I know it was caused by Nordic Walking, because you take these big steps. I even had an X-ray made of my hip but this showed no abnormalities.

One patient had completed her chemotherapy treatment 1 month before the start of the Nordic Walking course. She admitted that the intervention had come a little too soon after treatment and the training had been too intense at that stage. During the program exercises were adjusted to enable her to complete the course.

Psychological Disadvantages

One important aspect of the homogeneous group composition was that participants could easily identify with each other. In the group where two women had dropped out due to progression of their breast cancer this had a huge emotional impact on the remaining participants. The fact that

fellow patients, who were deemed healthy enough to commence a Nordic Walking program, dropped out was very confronting and had a negative influence on participants' confidence in their own health. Nevertheless, for none of the participants these events were a reason to discontinue their participation.

> Since I had gotten to know her quite well, it was difficult for me. Very difficult. At the same time you know it's a vulnerable group. You know you're all at risk. So, it grieved me deeply and it still hurts sometimes when I think of her, but at the same time I can accept that things are the way they are.

Practical Disadvantages

Participants in both groups mentioned that since the training sessions started at 9:30 a.m. they often got stuck in the rush hour and some participants had to get up earlier than usual to arrive on time. Similarly, some participants mentioned the travel distance as an obstacle for participation. Most respondents indicated that NW being an outdoor activity was an important reason for participation and many considered the North Sea Dunes to be an attractive area for exercise. However, they disliked the fact that there had been no opportunity to arrive at the training location by means of public transport.

DISCUSSION

This study explored the feasibility of a Nordic Walking intervention for breast cancer survivors and investigated the longitudinal changes in participants' well-being and shoulder mobility. This type of exercise intervention was chosen as walking has been shown to be the preferred type of exercise among cancer survivors (Gjerset et al., 2011; Jones & Courneya, 2002) and the addition of poles to a walking program might be particularly helpful in improving shoulder mobility (Sprod et al., 2005). In line with our expectations, participants showed a significant increase in vitality and shoulder mobility and a decrease in ADL-limitations by the end of the 10-week intervention. Although data from the Brief Illness Perception Questionnaire showed a significant reduction in shoulder symptom severity and perceived consequences of shoulder problems immediately after the intervention, improvements in shoulder disability were not significant until 6 months after the intervention.

Improvements in subjective well-being after participation in NW for breast cancer survivors have only been studied once (Rösner, 2011). Results

from the present study correspond with this previous investigation by showing that NW for breast cancer survivors improves vitality and role functioning but not mental health. Our results also confirm the Rösner study (Rösner, 2011) by demonstrating that Nordic Walking for women with breast cancer leads to an improvement in shoulder ROM. In contrast to the present study, Sprod and co-workers (Sprod et al., 2005) did not find an effect of pole walking on patients' shoulder ROM. Limited statistical power due to the small sample size in that study ($N = 12$) may explain this nonsignificant result.

In contrast to our expectations, shoulder pain and disability decreased more strongly from post-intervention to follow-up (T2–T3) than from pre- to post-intervention (T1–T2). One explanation for this fact is that the time interval between posttreatment and follow-up was larger than the interval between baseline and posttreatment (26 vs. 10 weeks, respectively). This longer time interval between T2 and T3 provides the body with more time to recover after treatment. However, our data also suggest that perceived shoulder symptom severity and limitations in ADL have decreased during the first 10 weeks of training and level off after this point, which does not correspond with the hypothesis of natural recovery. An alternative explanation may be that some patients tend to limit the use of their affected arm after treatment to prevent the experience of unpleasant sensations, the fear of causing arm edema, or as a result of uncertainty about which level of arm use is appropriate (Kärki, Simonen, Mälkiä, & Selfe, 2004; Lee, Kilbreath, Sullivan, Refshauge, & Beith, 2010; Sander, Wilson, Izzo, Mountford, & Hayes, 2012). As the NW exercises explicitly pertain to the upper extremities, this may cause unpleasant sensations at first. Moreover, data from our interviews suggest that physical discomfort resulting from the training for some patients may increase attention to somatic sensations. This attentional process may be responsible for an initial increase in pain sensations (van Laarhoven, Kraaimaat, Wilder-Smith, & Evers, 2010). Supervised exercise has been shown to reduce breast cancer patients' concerns about arm use over time (Karadibak, Yavuzsen, & Saydam, 2008; Velthuis et al., 2012). If participants slowly regain confidence in using their affected arms, desensitization to pain is likely to occur, leading to a further decrease in disability over time.

This study has been the first to use qualitative methods to explore breast cancer patients' experiences with Nordic Walking. Our interviews revealed some outcomes that were not captured by the questionnaires. Most importantly, the interviews demonstrated that the intervention had provided participants with a welcome source of social support that was continued after the end of the program. Participants often had been confronted with similar physical and psychosocial consequences of the illness and treatment. This usually made participants feel recognized, especially in a time when social support by family and friends tends to wane (Power & Hegarty, 2010). The

homogenous group composition had the advantage that the participants could easily relate to each other's experiences, but on the downside this identification also caused them to feel vulnerable when one of them had to leave the program as a result of advancing disease.

Several limitations to this study must be acknowledged. Firstly, our study did not include a control group. It can be speculated to which degree improvements in physical functioning may have occurred as a result of natural recovery. However, research has suggested that physical and emotional recovery generally occurs within the first 6 months after surgery and stabilizes after that point (Box, Reul-Hirche, Bullock-Saxton, & Furnival, 2002; Tasmuth et al., 1996). As our patients on average had undergone surgery 1 year ago, it is less likely that the improvements found in our study occurred spontaneously. A second limitation is that the study sample was relatively small limiting the generalizability of our findings. Thirdly, no data were collected on the change in ROM of the healthy shoulder, as we were primarily interested in ROM of the affected shoulder and it was expected that the unaffected shoulder would not improve as a result of NW.

This explorative study has several research implications. First of all, adequately powered studies are needed to determine whether improvements in ROM and well-being are attributable to the NW intervention or to natural recovery, and to what degree the affected and contralateral arm will benefit from training. It also remains to be determined to what degree improvements in ROM are enduring and to what extent these improvements in shoulder mobility relate to improvements in pain and disability. Finally, an interesting area of research would be to investigate the role of patients' perceptions about arm exercise in relation to program outcomes such as pain, perceived disability and arm use.

IMPLICATIONS FOR CLINICAL PRACTICE

Results from the present study suggest that training location and training times should be optimized to facilitate participation. Furthermore, supervising a group of cancer patients requires that the NW instructor has sufficient knowledge about the disease and treatment modalities of the participants, and has the social skills to discuss emotional events that may occur during the program. It may be helpful to prepare participants for common side effects of training such as myalgia and to help participants distinguish normal from abnormal symptoms. Before starting, individuals should be cleared for Nordic Walking (or any other exercise program) by their physician. Alternatively, patients may receive a specific baseline assessment by a (para-)medical health care provider, who can also be consulted in case of any unexpected events during the program.

CONCLUSION

In conclusion, this study suggests that Nordic Walking is a feasible and enjoyable type of rehabilitation for breast cancer survivors of all ages. Although our findings call for further research, they support the growing body of literature regarding the value of Nordic Walking for the well-being of various patient populations (Breyer et al., 2010; Collins et al., 2005; Langbein et al., 2002; Mannerkorpi, Nordeman, Cider, & Jonsson, 2010; Suija et al., 2009). Regular exercise for breast cancer survivors has been associated with improvements in physical fitness and mental well-being and may serve as a welcome source of peer support. In addition to these general effects of group exercise, Nordic Walking may increase patients' functional abilities by improving shoulder ROM and shoulder muscle strength. Therefore, NW can be considered as a valuable intervention during the rehabilitation after breast cancer treatment, in particular for those who have undergone axillary surgery or radiation.

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