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# An exploratory study of associations between illness perceptions and adjustment and changes after psychosocial rehabilitation in survivors of breast cancer

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**Abstract**

*Background*. Although psychosocial interventions have been found to be beneficial for cancer patients, the role of the patients' perceptions of illness in these interventions remains unclear. We examined illness perceptions and psychological adjustment (distress and QoL) among women who had survived breast cancer and attended a psychosocial rehabilitation course. *Material and methods*. From an ongoing longitudinal study, we used data from two sub-studies with a total of 177 survivors (145 from the descriptive study and 32 from the randomised trial). The survivors from the descriptive study and the half of the randomised survivors attended a 1-week rehabilitation course, whereas the other half of the randomised survivors only received standard care (no intervention). All survivors filled out a questionnaire 2.5 weeks before and one and six months after the course. *Results and discussion*. No differences in the change of illness perceptions and the level of psychological adjustment were observed between the three groups of survivors between baseline and one and six months of follow-up. Baseline analyses showed that illness perceptions were associated with distress and QoL. This study indicates that illness perceptions are associated with adjustment; however, illness perceptions did not change after participation in a one-week multi-component rehabilitation course.

**Key Words:** *Adjustment, breast cancer, common-sense model, illness perception, psychosocial rehabilitation*

During the past 20 years, survival from breast cancer has increased in industrialized countries; more than 75% of all Danish women who have had breast cancer now survive five years after the diagnosis [1]. Consequently, it has been argued that cancer, and particularly breast cancer, should be characterized as a chronic illness rather than as a 'soon-to-be-fatal condition' [2]. Despite this change in the life perspectives of women given a diagnosis of breast cancer, many patients in the post-treatment phase suffer from various physical and psychological sequelae [3,4]. One way of alleviating these problems is to offer cancer survivors the possibility of enrolling in rehabilitation programs. Psychosocial programs for cancer patients have been found to have beneficial effects on their levels of anxiety and depression [5,6], although the effect on lifestyle is less certain [2]. In order to make such programs cost-effective, the factors that influence long-term adjustment and coping with these problems should be known.

A number of theories and models have emphasised people's beliefs or perception of their illness as an important factor for adjustment. We used the Common-Sense Model (CSM) proposed by H. Leventhal [7]. It assumes that patients are active problem-solvers, who make sense of their illness by developing their own cognitive representation, which in turn determines how they respond behaviorally and emotionally. The cognitive representation about the illness can, according to the CSM, be categorized into five cognitive components: about the label and the symptoms of their illness (identity), about

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the duration of the illness (timeline), about the effects and outcome of the illness (consequences), about the etiology (causes), and about their own and others' capacity to control and cure the illness (control/cure). Parallel to these cognitive representations, an emotional response to the illness develops, which influences and is influenced by the cognitive representations. The patient's experience of bodily sensations, such as pain, also acts as triggers of both emotions and cognitions connected to the illness in question.

A meta-analysis of 45 studies adopting Leventhal's CSM concluded that illness perceptions were associated with adjustment to chronic illness [8]. Six previous studies have examined illness perceptions in relation to distress or quality of life (QoL) in adults with cancer and found that illness perceptions were associated with QoL and a predictor of distress [9–14] (Table I). To our knowledge, only three studies [15–17] have addressed the effect of psychosocial or behavioral interventions on illness perceptions using the framework of the Leventhal's CSM. The first study with 65 survivors of myocardial infarction (MI) observed that three cognitive 30- to 40-minutes intervention sessions addressing the patient's illness perceptions, changed the MI patients' perceptions of the consequences and timeline of their illness from those of the control group receiving standard care; furthermore, the survivors returned to work faster and reported that they felt better prepared to leave hospital than the control group [16]. The second study found in a sample of 49 patients with chronic fatigue syndrome that a 12-week graded exercise program led to significantly lower fatigue levels in the intervention group than in the control group; however, it did not change illness identity or the perception of control over the illness [15]. Yet, in this intervention illness perceptions were not discussed openly. Nevertheless, the patients whose perception of control over the illness increased had decreased fatigue levels. Finally, a randomised trial with 824 adults with newly diagnosed diabetes found that the participants of a structured group education programme for six hours had greater understanding of the seriousness of their illness, a better (more realistic) perception of the duration of the illness and of their ability to affect the course of their illness at follow-ups compared to patients with usual care [17].

In this paper, we present the first exploratory data regarding the development in illness perceptions in survivors of breast cancer who attended a psychosocial rehabilitation course. Our primary aim was to look for patterns of change in the way breast cancer survivors perceive their illness after participation in a rehabilitation course. If we found considerable

Table I. Previous studies of adult cancer patients' illness perceptions in relation to distress and quality of life.

| Reference | Study design | Sample size | Type of cancer | Disease severity | Illness perceptions (No. of components) | Measure of illness perceptions | Outcomes | Max. follow-up time (months) | Result[a] |
|---|---|---|---|---|---|---|---|---|---|
| [9] | Longitudinal/ cross-sectional | 344 (144+202) | Breast | Stages I and II | Control and timeline | Ad-hoc measure | Distress | 12 | Illness perceptions → distress |
| [13] | Longitudinal | 69 | Breast | Mainly stage II | Timeline | Ad-hoc measure | Anxiety and depression | 3 | Illness perceptions → distress |
| [12] | Longitudinal | 371 | Breast | Indirect indicators (e.g. length of hospital stay) | All | IPQ | Distress | 12 | Illness perceptions → distress |
| [14] | Cross-sectional | 68 | Head and neck | Mainly III and IV | All | IPQ-R | QoL | | Illness perceptions ↔ QoL |
| [10] | Cross-sectional | 55 | Head and neck | Stages I–IV | All | IPQ-R | QoL | | Illness perceptions ↔ QoL |
| [11] | Longitudinal/ cross-sectional | 50 | Head and neck | Stages I–IV | All | IPQ-R | QoL, anxiety, and depression | 6–8 | Illness perceptions → depression, but not QoL and anxiety |

Note: IPQ: illness perception questionnaire; IPQ-R: revised IPQ.
a ↔, relation between two factors applied in correlational data; →, prospective studies in which one factor predicted another.

changes in illness perceptions simultaneously with changes in adjustment (measured by distress and QoL in this paper); further investigation of the associations between illness perceptions and adjustment over time could be justified in future research. As a secondary aim, we would conduct the first cross-sectional examination of the association between illness perceptions and adjustment in a Scandinavian cancer population.

## Materials and methods

### *Design and procedure*

This paper used a combination of data from two sub-studies (a randomised trial and a descriptive study), which were both part of a longitudinal large-scale rehabilitation study, 'FOCARE', being conducted over 10 years to examine the effect of a 1-week psychosocial rehabilitation course offered to cancer patients [18]. The descriptive study consisted of breast cancer survivors from 11 of the 14 Danish counties, covering almost 85% of the population. Brochures were distributed to all hospitals and clinics in these 11 counties, encouraging patients to apply for the rehabilitation course by seeking referral from a general practitioner or an oncologist. Hence, all survivors from the descriptive study participated in the rehabilitation course and the study on own initiative. In this paper they are labelled standard participants.

In order to examine the impact of the rehabilitation course on the survivors' illness perceptions and emotional adjustment, we chose to include survivors from the randomised trial. It gave us the opportunity to include a control group as well as to compare the standard participants from the descriptive study with patients, who had been actively recruited rather than applied for the rehabilitation themselves. The patients from the randomised trial were recruited within the same time-period as the data collection for descriptive study by an oncological nurse at hospitals situated in two counties (Århus and Fredensborg) that were not a part of the descriptive study. If agreeing to participate they were thereafter randomly assigned either to attend the rehabilitation or to receive no further intervention, but standard care. Hence, we actually had two different groups from the randomised trial: patients attending the rehabilitation after recruitments, who we labelled randomised participants and those not attending, simply labelled controls (Appendix 1).

The pre- and post-assessments were identical for all three groups. Two weeks or more before the course, patients from all three groups were asked to fill out a baseline questionnaire. All who completed this questionnaire received follow-up questionnaires one and six months after finishing the course. The study was approved by the Danish Data Protection Agency.

### *Intervention*

Approximately 20 cancer survivors participated each week in a six-day rehabilitation course at the Dallund rehabilitation center, situated in the countryside. The course consisted of a combination of moderate physical activity, lectures and group work on themes, such as the side-effects of the cancer treatment, physical symptoms in the post-treatment phase, psychological reactions often experienced by cancer patients, and the concerns about returning to work, led by a multidisciplinary team. Individual consultations could be held with a doctor or psychologist. At the end of the course, each participant produced a personal 'action plan', focusing on an area (e.g. "being more positive in my everyday life" or "increase daily exercise") that she had chosen for her rehabilitation after the course. For a more detailed description of the rehabilitation, see [18].

From the perspective of the CSM, it was expected that participation in the rehabilitation course would "activate" the survivors' cognitions about their illness by providing updated information on the "typical" course of the illness (including the psychological and social consequences) and what to expect for the years coming. It sought to facilitate an open dialog about myths of cancer among the participants, as it was expected that the participants would be beyond the first period of shock over the illness and thus would be able to reflect their own and others experiences. Consequently, a number of patients might alternate their beliefs into more adaptive (more realistic) perceptions of their illness during or after the rehabilitation, which in turn also would affect their behaviour and emotions related to the illness and thus eventually lead to better functioning and an experience of higher quality of life.

### *Patient characteristics*

The survivors in all three groups were women recovering from breast cancer who were included in either the descriptive study or the randomised trial between June 1, 2005 and May 31, 2006. The inclusion criteria were: a diagnosis of breast cancer within the past five years, completed primary

treatment, and ability to participate physically in the activities offered.

A flow-chart showing number of drop-outs and excluded survivors from both sub-studies is presented in Appendix 1. A total of 68% (N = 145) of those signing up for the rehabilitation intervention from the descriptive study and 46% (N = 32) from the randomised trial were included in the analysis.

### *Measures*

*Demographic and clinical data.* Age, marital status, educational level, and work affiliation were assessed as single items on the baseline questionnaire. We classified all the breast cancer survivors as married/cohabiting or living alone (divorced, widowed or single). Educational level was classified according to the International Standard of Education, into basic education (basic school), youth education (high-school and vocational training) and higher education (college and university). Work affiliations prior to the rehabilitation were categorized as working, on sick leave/unemployed or any kind of pension. Data on prognosis (high-risk vs. low-risk) and time since surgery at baseline were obtained from Danish Breast Cancer Cooperative Group, which since 1977 has registered information on 95% of all Danish women under 75 years of age in whom breast cancer was diagnosed [19]. In accordance to Dalton et al. definition [19], we defined low-risk breast cancer as a tumour $\leq$20 mm, no positive axillary lymph nodes, grade I or unknown malignancy or nonductal tumor, and receptor-positive or unknown.

*Illness perceptions.* To assess illness perceptions, six subscales and four single items from the Revised Illness Perception Questionnaire (IPQ-R) [20] were used, representing those parts of the questionnaire that reflected the components originally proposed in Leventhal's CSM. The questionnaire was shown to be highly reliable and valid when tested on a sample of more than 700 patients with eight different groups of illness [20].

The illness identity subscale is the number of symptoms from a 14-item checklist that the patient attributes to the illness, with a 'yes/no' response format. For the remaining five subscales, the response format is a five-point Likert-scale from 'strongly disagree' (1) to 'strongly agree' (5). The timeline subscale contains six items (e.g. "My illness will last for a long time."), with higher scores representing a belief that the illness is going to last longer. The consequence subscale contains six items (e.g. "My illness has major consequences on my life."), with higher scores representing a stronger belief that the illness will have severe consequences. The personal control subscale and the treatment control subscale contain respectively six and five items. For these two subscales higher scores represent stronger perceptions of control (e.g. "What I do can determine whether my illness gets better or worse." and "My treatment will be effective in curing my illness."). The patients rated their distress in relation to the illness on an emotional representation subscale consisting of six items (e.g. "Having this illness makes me feel anxious."). Three items with a five-point Likert scale response format about the causes of the illness (i.e. 'stress or worries', "Heredity-it runs in my family.", and 'chance or bad luck') were also included after a preliminary analysis showed that these three causes of the illness were most frequently listed as the prime cause of breast cancer in the sample. The revised form of the IPQ has not previously been used on a Danish cancer population. Consequently, it was translated into Danish prior to the study following a thorough translation procedure using forward and backward translations and independent translators. After a pilot test of the Danish version of the questionnaire on 18 ovarian cancer patients, minor changes were made to adapt the instructions to a cancer population.

*Quality of life.* The global QoL scale from the EORTC Quality of Life C30 [21] was used to assess QoL. The global QoL scale is a brief and general measure of QoL, with high internal reliability and good predictive validity when tested in a sample of 305 lung cancer patients [21]. It has two items: "How would you rate your overall quality of life during the past week?" and "How would you rate your overall health during the past week?", with a response format going from 'very poor' (1) to 'excellent' (7). The score is standardized and ranges from 0 to 100, with a higher score indicating a higher QoL. The Danish version of the scale was validated in an earlier study [22].

*Emotional distress.* General emotional distress was assessed as total mood disturbance (TMD) scale from the shortened form of Profile of Mood States (POMS-SF) [23]. Use of TMD scale has been shown to result in high internal reliability and convergent validity when compared with other established measures of distress [24]. It is the sum of the scores from the POMS-SF' six sub-scales, containing a total of 37 items, with higher scores indicating a higher level of distress. Each item on the scale (an adjective) reflects a mood state (e.g. sad or angry), and the respondent rates the degree to which

the mood describes him or her within the past week on a five-point scale, ranging from 'not at all' (1) to 'extremely' (5). The Danish version of the scale was validated in an earlier study [25].

*Data analyses.* All analyses were performed with SAS version 9.0. Chi-square tests and t-tests were run to examine whether the standard participants were significantly different from the survivors from the randomised trial at baseline on demographic and clinical factors as well as illness perception scores, level of distress and overall QoL. Since the survivors from the randomised trial had been randomly assigned to one of the two groups (either randomised participants or controls), they were treated as one group in the baseline analysis and compared with the standard participants. Chi-square and t-tests were also used to examine whether those who completed the study were different on clinical and demographic factors from those who dropped out. The analyses were done separately for survivors from the descriptive study and the randomised trial.

To examine changes in illness perceptions and the two measures of adjustment between the standard participants, randomised participants, and controls, ANCOVAs were applied. They tested whether the change in illness perceptions, distress, and QoL were significantly different between baseline and one month follow-up and between baseline and six months follow-up in the three groups.

We finally examined whether illness perception scores were associated with the level of general distress and QoL at baseline controlling for demographic and clinical factors (i.e. age, work affiliation, marital status, educational level, prognosis, and time since surgery). For this purpose, separate ANCOVAs were conducted. Yet, only the group of standard participants was used in this analysis due to the size of the group.

## Results

*Patient characteristics*

Table II shows the demographic and clinical characteristics of the two samples. Similar to a nationwide study including all Danish women diagnosed with breast cancer between 1983 and 1999, 80% of our survivors were diagnosed with a high-risk breast cancer. No significant demographic and clinical differences were found between the standard participants and the survivors from the randomised trial at baseline. Neither were the level of general distress and QoL significantly different between standard participants and survivors from the randomised trial at baseline. The only illness perception component found to be significantly different between the standard participants and the survivors from the randomised trial at baseline was the perception of control over the illness (Table III); the survivors from the randomised trial had a significantly higher perception of personal control over the illness as well as a significantly stronger belief that the treatment could control their illness compared to the standard participants.

The drop-out analysis showed that those who completed one of the two sub-studies were not significantly different on any of the four demographic variables from those who dropped out. We had clinical data on 86% of the survivors and no significant differences in cancer risk and time since surgery were found (data not shown).

*Changes over time*

Table III shows the development of illness perception scores, level of general distress and QoL in the three groups of survivors over time. Generally, the illness perceptions scores were very stable over time in all groups. The ANCOVAs showed no significant group differences in change from baseline to one month follow-up and from baseline and six month follow-up between the three groups, even when controlling for the baseline scores.

*Baseline relations between illness perceptions adjustment*

The baseline ANCOVAs showed that illness perceptions explained 26% of the variance in global QoL at baseline, consequences and treatment control being the significant factors (explaining alone 23% of the variance) $F(9, 117) = 4.54$, $p < 0.01$. Higher QoL was associated with a perception of less severe consequences ($\beta = -1.37$) and higher treatment control beliefs ($\beta = 1.41$). After control for the effect of clinical and demographic variables, however, only the consequence component remained significant (data not shown).

A total of 26% of the variance in general distress was explained by illness perceptions at baseline, with the emotional response to the illness and the belief that the illness was caused by stress or worries being significant (explaining alone 22% of the variance) $F(9, 116) = 4.57$, $p < 0.01$. Higher levels of general distress were associated with a more negative emotional response ($\beta = 1.22$) and a stronger belief that stress or worry had caused the illness ($\beta = 4.11$). Controlling for demographic and clinical factors did not alter the result (data not shown).

Table II. Demographic and medical data at baseline for 177 Danish survivors of breast cancer participating in the FOCARE study between 2005–2006.

| | Standard participants (n = 145) | | Survivors from the randomised trial (n = 32) | | |
|---|---|---|---|---|---|
| Variable | n | % | n | % | P-value |
| Mean age in years | 53.7 (range = 25–74) | | 51.3 (range 29–67) | | .19 |
| Education | | | | | |
| Basic education (ISCED 1–2) | 13 | 9 | 2 | 6 | .56 |
| Youth education (ISCED 3) | 58 | 40 | 10 | 31 | |
| Higher education (ISCED 3) | 74 | 51 | 20 | 63 | |
| Marital status | | | | | |
| Married or cohabiting | 104 | 72 | 25 | 78 | .46 |
| Living without a partner | 41 | 28 | 7 | 22 | |
| Work affiliation | | | | | |
| Working | 35 | 24 | 10 | 31 | .46 |
| Sick leave or unemployed | 74 | 51 | 15 | 47 | |
| Retired | 31 | 21 | 4 | 13 | |
| Unknown | 5 | 3 | 3 | 9 | |
| Breast cancer prognosis | | | | | |
| High risk | 128 | 88 | 26 | 81 | .28 |
| Low risk | 17 | 12 | 6 | 19 | |
| Mean time since surgery in months | 12.9 (range = 2.3–58.0) | | 12.5 (range = 6.2–25.6) | | .80 |

## Discussion

Our exploratory study shows that illness perceptions were considerable stable over time in all three groups of breast cancer survivors. There were no patterns in the illness perception scores when comparing controls with standard participants and randomised participants, which give reason to suggest that participation in the rehabilitation course led to a particular change in illness perceptions. Nor did the results show that the rehabilitation course led to a considerable change in how the survivors rate their psychological adjustment. Moreover, there were no significant results or non-significant patterns in the data suggesting that the standard participants' change in illness perceptions were any different from those of the randomised participants, which could indicate that the different recruitment procedure had an impact on the result.

One may argue that the survivors' illness perceptions remained stable due to the fact that the rehabilitation course did not exclusively focus on changing illness perceptions, such as in the cognitive intervention for MI-patients [16]. However, most of components in the rehabilitation course aimed at expanding the survivors' knowledge and understanding of cancer and the physical and psychological processes involved. These components were therefore expected to impact on the survivors' cognitions about their illness. The CSM stresses that illness perceptions are a part of self-regulative system, where both emotions and the physical state of the patients play a prominent role by feeding back on their cognitive representations of illness [7]. From this argument, the daily exercise and the group discussions (where sharing of experiences with other survivors were in focus) during the rehabilitation course would also be likely to affect the survivors' interpretation of their bodily sensations and to affect their feelings of distress and loneliness, which then in turn would influence on the survivors' illness perceptions.

Moreover, there are considerable differences in the time-frame and the design of the interventions between our study and the two earlier mentioned studies of respectively MI patients [16] and diabetes patients [17], which could have contributed to the different findings. On average 13 months had passed since surgery, during which the breast cancer survivors might have stabilized emotionally and formed stable, comprehensive beliefs about their illness. On the other hand, the patients from the earlier two studies were exposed to the intervention shortly after diagnosis, while the idea of being seriously ill was still new. Finally, the development in the survivors' illness perceptions and level of adjustment might have been different if they had been less well-adjusted before the rehabilitation course, when more extreme illness perceptions would have been expected. A comparison of the survivors' level of distress (baseline TMD = 10.9–16.9) with those in a US study of 428 cancer patients, with TMD scores of 13.1 for non-depressed patients and 44.1 for depressed patients

Table III. Illness perceptions, general distress, and global quality of life at baseline and follow-up in Danish survivors of breast cancer participating in the FOCARE study, 2005–2006.

| | Baseline mean (SD) | | | 1 month follow-up mean (SD) | | | | 6 month follow-up mean (SD) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Illness perceptions (range of scores) | Standard participants | Survivors from the randomised trial[a] | F-value | Standard Participants | Randomised participants | Controls | F-value[b] | Standard participants | Randomised participants | Controls | F-value[b] |
| Illness identity (0–14) | 5.6 (3.0) | 5.3 (3.5) | 0.15† | 5.7 (3.2) | 6.9 (3.7) | 4.1 (4.0) | 0.29† | 5.5 (3.3) | 5.9 (3.7) | 3.8 (3.5) | 0.65† |
| Timeline (6–30) | 16.8 (5.0) | 15.7 (6.0) | 0.58† | 17.5 (5.5) | 17.1 (5.3) | 14.9 (5.7) | 0.99† | 17.5 (5.5) | 17.9 (5.9) | 16.1 (5.9) | 0.27† |
| Consequence (6–30) | 19.6 (4.3) | 19.5 (5.3) | 0.01† | 19.9 (4.2) | 20.1 (5.9) | 17.8 (5.5) | 1.11† | 18.9 (4.7) | 20.1 (6.0) | 18.5 (5.9) | 0.21† |
| Personal control (6–30) | 19.6 (4.4) | 21.7 (4.2) | 4.83* | 20.3 (3.9) | 21.0 (3.1) | 21.3 (4.5) | 0.07† | 19.7 (3.9) | 18.7 (3.1) | 21.0 (4.5) | 2.07† |
| Treatment control (5–30) | 18.6 (3.0) | 19.7 (3.2) | 3.93* | 18.6 (2.6) | 19.2 (3.3) | 18.25 (4.1) | 0.58† | 18.2 (2.7) | 19.9 (3.1) | 18.6 (3.7) | 1.24† |
| Emotional response (6–30) | 21.3 (4.4) | 20.6 (5.0) | 0.79† | 20.7 (3.9) | 21.1 (5.5) | 18.7 (6.4) | 0.90† | 20.2 (4.5) | 20.5 (4.9) | 19.1 (5.5) | 0.34† |
| Cause: stress or worries (1–5) | 3.3 (1.2) | 3.6 (1.2) | 0.51† | 3.5 (1.1) | 3.9 (1.2) | 3.5 (1.3) | 0.20† | 3.3 (1.1) | 3.7 (1.2) | 3.7 (1.0) | 1.31† |
| Cause: heredity (1–5) | 2.9 (1.3) | 2.8 (1.6) | 0.10† | 3.0 (1.3) | 3.1 (1.7) | 2.5 (1.3) | 0.42† | 2.9 (1.3) | 3.3 (1.6) | 2.7 (1.3) | 1.25† |
| Cause: chance or bad luck (1–5) | 3.4 (1.1) | 3.4 (1.3) | 0.00† | 3.4 (1.0) | 3.6 (1.2) | 3.3 (1.5) | 0.11† | 3.3 (1.0) | 3.4 (1.3) | 3.2 (1.4) | 0.13† |
| Quality of life (0–100) | 63.4 (20.0) | 66.9 (24.7) | 0.87† | 66.5 (19.6) | 58.9 (23.7) | 69.3 (22.3) | 1.34† | 66.5 (21.0) | 62.0 (16.7) | 68.8 (21.2) | 0.44† |
| Distress (−24 to 124) | 13.6 (20.0) | 13.8 (28.7) | 0.06† | 10.5 (21.0) | 16.5 (25.5) | 7.9 (21.1) | 0.35† | 9.9 (23.1) | 16.8 (21.1) | 14.2 (20.2) | 0.93† |

Note. a This group consists of both randomised participants and controls at baseline (prior to the rehabilitation). b = F value from general linear model analyses used to examine the change from baseline to 1 month and from baseline to 6 months after the rehabilitation course between the three groups. * = $p < 0.05$, † = non-significant.

[24], indicates that the Danish survivors were not even near clinically depressed.

Our study was the first in Scandinavia examining illness perceptions in cancer patients. Similarly to the previous six cancer studies [9–14] (Table I), we found that illness perceptions were associated with both general distress and QoL. There is, however, considerable variation among these studies in the components of illness perception reported to be associated with or predictive of psychosocial adjustment. This is probably due to variation in the number of components analysed, the measures used, and differences in design. For future research, an exploratory analysis of the illness perception components in cancer patients could add to the theory-driven basis of how to design cancer rehabilitation interventions focusing on illness perceptions.

The advantages of this study include the fact that we were able to include a control group. Other advantages were the long follow-up time, the nationwide recruitment basis, and a public rehabilitation program offered free of charge to breast cancer survivors. The measure of illness perceptions was thoroughly translated and pilot-tested, and the analysis included detailed socio-demographic data and clinical information. The limitations of our study include the inclusion of data from two different sub-studies from the 'FOCARE', even though both examined the same rehabilitation course, and the limited size of the sample from randomised trial, resulting in low power. We sought to overcome the first limitation by comparing the survivors from the two sub-studies on the demographic and clinical factors most likely to affect illness perceptions and level of adjustment. The limited randomised sample size made it impossible to firmly state, whether the rehabilitation course had an effect. However, from a thorough search for non-significant patterns in the data we did not find any marked tendency of specific change among the standard participants and the randomised participants compared to the controls. Finally, like other cancer studies on illness perceptions (all studies shown in Table I, except [12]), we had problems with selection bias reducing the generalizability of the study.

The present study adds empirical support for a concurrent relation between illness perceptions and psychosocial adjustment in Danish breast cancer survivors and thus is in line with the earlier findings from European and American studies. Our findings indicate, however, that the illness perceptions of cancer survivors are not changed by a short multicomponent rehabilitation program.

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## Appendix 1. Flow-chart of inclusion and exclusion of participants in the two sub-studies, FOCARE study 2005–2006.