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The influence of a false-positive mammogram on a woman's subsequent behaviour for detecting breast cancer

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Abstract

The aim was to investigate the influence of undergoing further examinations due to a false-positive mammogram on women's re-attendance at the next scheduled screening and their frequency of breast self-examination (BSE). Study participants included 517 women (62% response) recalled due to findings on screening mammograms indicating possible malignancies, and a matched control group of 285 women (68% response) with normal mammograms. Participants completed five and three questionnaires, respectively, during the 2 years following screening participation. While the groups did not differ significantly in screening re-attendance, women recalled due to false-positive mammograms reported significantly higher levels of anxiety related to the next screening than did women with normal mammograms. At the 1-year assessment, women with false-positive mammograms reported a significantly higher frequency of BSE than did women with normal mammograms. The present results indicate that being recalled due to a false-positive mammogram does not seem to negatively affect screening re-attendance, and may have a positive impact on BSE.

Keywords: Breast neoplasms; Mass screening; Breast self-examination; Anxiety

1. Introduction

Breast cancer screening by mammography is offered in many countries to women between the ages of 40 and 74 years. There is an ongoing debate regarding the role of mammography screening programmes in reducing breast cancer mortality and the harm to benefit ratio of mammography screening [1–3]. The main arguments against mammography screening concern the large number of medical examinations performed on healthy women in order to rule out possible malignancies and the psychological impact of screening. In this discussion, the group of women who are recalled for further investigations due to false-positive mammograms has been the focus of special attention. In comparison to women with normal mammograms, those with false-positive screening results reported higher levels of short-term psychological distress [4,5] as well as of long-term breast cancer-related concerns [4,6,7]. Among false-positive women, those who need to undergo surgical biopsy before receiving a benign result have been reported to suffer the most adverse psychological consequences [6,8].

There has been some concern that the experience of further investigation of a false-positive mammogram may have a negative effect on women's subsequent screening attendance. This issue has been investigated in a small number of studies, many of which employ a retrospective design and rely on self-reported data concerning screening [9–11]. Aro and colleagues [4] reported no group differences regarding the intention to re-attend screening among women with false-positive versus normal mammograms. Having had an abnormal mammogram has even been reported to increase the likelihood of attending the next recommended screening [10,12]. In addition, recall due to a false-positive screening mammogram has been reported to increase the frequency of breast self-examination (BSE) [4]. While an increase of breast cancer detection behaviour according to guidelines is regarded as a positive consequence of a false-positive screening mammogram, excessive (⩾weekly) performance of BSE and a high

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frequency of utilisation of mammography and associated clinical examinations is unwanted. In a recent study [10], abnormal mammograms were associated not only with higher levels of breast cancer worry and perceived risk of breast cancer, but also with a more positive attitude towards mammography screening and a greater likelihood of being on schedule for screening. These findings are in line with results indicating a positive relationship between, on the one hand, worry and perceived risk of breast cancer, and on the other, the extent of screening behaviour [13,14].

Given the high cumulative risk for a false-positive mammogram in women who regularly participate in mammography screening [15], it appears important to further investigate the consequences of a false-positive mammogram on women's subsequent behaviour for detecting breast cancer. In this context, the different types of medical examinations performed during such a work-up, as well as individual experiences of anxiety in connection to mammography screening should be considered. The aims of the present study were to prospectively investigate the extent to which a recall for a false-positive mammogram is related to women's attendance at the next scheduled screening and to their subsequent BSE behaviour.

The following specific research questions were posed:

1. Are there differences between women with false-positive and normal mammograms with regard to (a) participation in the next screening, (b) anxiety before or during the next screening, and (c) BSE behaviour 1 year after screening?
2. Among women previously recalled for work-up of false-positive mammograms, are there differences in BSE behaviour before versus 1 year after the recall?
3. Is women's anticipatory anxiety in the face of a new screening related to the extent to which they attend the next screening?

2. Patients and methods

2.1. Participants

All participants were invited in connection with their participation in a population-based mammography screening programme in Uppsala county, Sweden. All women between the ages of 40 and 54 years and between 55 and 74 years are invited every 18 months and every second year, respectively [16]. During the 1-year inclusion period (1996–1997), 80% of invited women participated in the screening. All screening attendees were informed of their test results by mail, and 3.5% of women were recalled for further investigations. The recall visit occurred within approximately 2 weeks after screening. The flow of participants throughout the study is illustrated in Fig. 1. Descriptive data on participants with false-positive and normal mammograms are shown in Table 1. The present data are part of a larger study, results of which have been reported elsewhere [5,17].

2.1.1. Recalled group

Among 838 eligible women who were recalled by letter, 517 women (62%) agreed to participate and were asked to complete five questionnaires. Participants and non-participants did not differ significantly with regard to age (data not shown). Data from women with breast malignancies (i.e. true-positive mammograms) ($n=44$) were excluded from analysis in the present study.

2.1.2. False-positive group

All recalled women with false-positive mammograms ($N=465$) received complete mammography examination with or without ultrasound at the recall visit. Using the information in the medical records, participants with non-malignant screening results were categorised into four groups, based on performed medical examinations, received information at the recall visit and final screening outcome (Fig. 1). Data from eight women were excluded from the analysis since they could not be categorised into any of these groups.

2.1.3. Normal screening group

The normal screening group included women who were not recalled after their mammography screening. For reasons unrelated to the present study, they were matched to the recalled women who were referred for surgical biopsy. In the total recalled group invited to the study ($n=838$), 139 women were surgical referrals. For every referred woman, we invited three women in the same 5-year age segment who had participated in mammography screening during the same month, but with normal screening results ($n=417$; Fig. 1). Participants and non-participants did not differ significantly with regard to age (data not shown).

2.2. Procedure

The study was approved by the Uppsala University Medical Faculty Research Ethics Committee.

2.2.1. Recalled group

Women recalled for further investigation after mammography screening received an invitation to the present study and the first questionnaire with their recall letter. This questionnaire was completed prior to the recall visit. Participating women completed four follow-up assessments, the first of which was to be completed shortly after the recall visit. Three months, 1 and 2 years

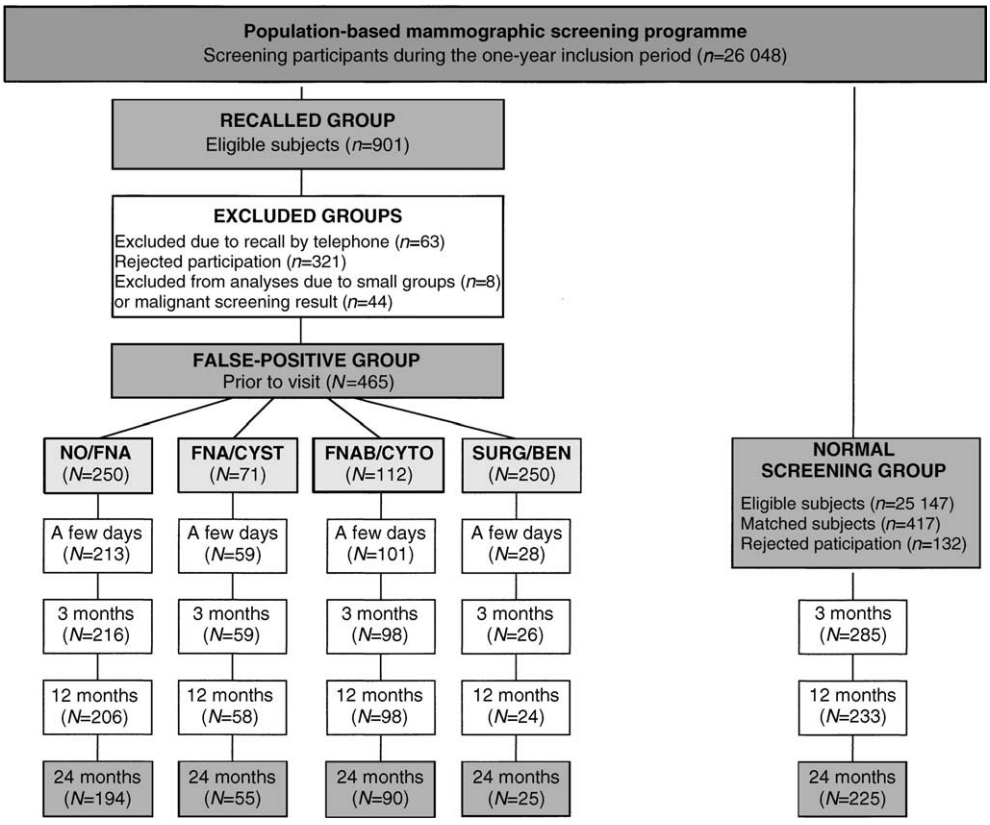

Fig. 1. Flowchart of study participants. 'NO/FNA', immediate information about normal results. No fine-needle aspiration (FNA). 'FNA/CYST', FNA of a cyst with or without pneumocystography, and immediate information about a benign diagnosis. No cytological examination. 'FNAB/CYTO', fine-needle aspiration biopsy (FNAB) of a lesion judged as probably benign at mammography, and immediate information about a probable benign diagnosis. After the mammography department received a non-malignant cytology report on the specimen, women were informed of the benign results in a mailed letter (approximately 1–2 weeks after the visit). 'SURG/BEN', examination with or without FNAB, immediate information about a possible or probable malignancy and referral to the surgical department for open biopsy. Information about benign results was given after biopsy, in a majority of cases (67%) within 6 weeks after the recall visit.

Table 1
Descriptive characteristics of participants at study inclusion

	False-positive ($N=465$)	Normal screening group ($N=285$)
Age: mean ± S.D. (range 40–74 years)	53 ± 9.2	56 ± 10.2
Family (%)		
Married/cohabitant	76	69
Parent	88	91
Work (%)		
Work	64	56
Retired	24	34
Other (e.g. student)	12	10
History of breast cancer screening (%)		
Attendance at screening		
None	7	7
One or two	17	9
Three or more	76	84
Previous recall for further investigation	16	18
History of breast cancer	1	1

S.D., standard deviation.

after the recall visit, all participants were mailed additional questionnaires, which were followed by a mailed reminder to non-responders after approximately 2 weeks.

2.2.2. Normal screening group

This group was invited to the study by a letter mailed with the first questionnaire three months after screening participation. Women were asked to complete three questionnaires, 3 months, 1 and 2 years after screening participation. The women received their questionnaires and reminders at approximately the same points in time as their matched peers in the recalled group. All questionnaires were to be completed at home and returned by mail.

All participants also completed a demographic questionnaire.

2.3. Instruments

2.3.1. Numerical 0–10 scale assessing situation-specific anxiety

A numerical 0–10 scale was used for the assessment of patient anxiety specifically associated with screening re-attendance. In this scale, the numbers 0–10 are printed along a continuum, with the endpoints defined as 'no anxiety at all' and 'worst possible anxiety'. At the 2-year follow-up, all participants were asked to report whether they had attended their next routine mammography screening. Based on their answer, they were asked to respond to one of the following questions by crossing the digit that best corresponded to their experience of anxiety: 'How much anxiety did you feel at the mammography screening?, 'How much anxiety do you now feel in the face of a new mammography screening?'. The assessment of situation-specific anxiety by a single numerical scale has its limitations. However, comparisons of ratings on this scale with ratings on the Hospital Anxiety and Depression Scale (HADS) [18] have indicated sufficient convergent and discriminant validity of the numerical scale [19]. Thus, a strong correlation was observed with the HADS anxiety subscale ($r = 0.51$, $P < 0.01$, $n = 130$), and a weak correlation with the depression subscale ($r = 0.20$, non-significant (NS), $n = 130$). In addition, assessments with this scale have shown high test-retest correlations between anxiety ratings reported 1 week before and on the day of a follow-up visit ($r = 0.72$, $P < 0.01$, $n = 76$) [20].

2.3.2. Breast self-examination (BSE)

There was one question regarding BSE. Participants were asked to report how frequently they perform BSE by choosing one of four response alternatives: 'never', 'seldom', 'once a month' and 'more frequently than once a month'.

2.3.3. Demographic questionnaire and medical file data

At inclusion, subjects were asked to report civil and occupational status, whether they had children, whether they were currently afflicted by any illness, and if they previously had been diagnosed with a cancerous disease. Medical file data included age, screening participation, dates for screening, work-up and surgical biopsy, as well as the results of the examinations. Data on the results of further breast examinations and the occurrence of breast cancer were gathered throughout the data collection period. In the present study, data were excluded from participants who were diagnosed with breast cancer during the 2-year period of data inclusion ($N = 9$).

2.3.4. Other study questionnaires

In addition to the above instruments, the present study included other questionnaires, data from which have been presented elsewhere [5,17]. The Hospital Anxiety and Depression Scale (HADS) was included in all assessments, and a revised version of the The Life Value Questionnaire [21] in all but one assessment. In addition, questionnaires included study-specific questions regarding life events, perceptions of the initial screening visit and recall visit, and perceptions of life value changes in connection with breast cancer.

2.4. Statistical analyses

Differences between two independent group means were tested by unpaired, two-tailed *t*-tests. Factorial one-way and two-way analyses of variance were used for testing differences between several means. In case of unequal sample sizes, the Games–Howell test [22] was chosen for *post-hoc* comparisons. The Chi-square test was used for calculation of differences in observed frequencies. The Wilcoxon signed-rank test was used to test differences in ranks between two related groups.

3. Results

3.1. Differences in re-attendance at mammography screening between women with false-positive and normal mammograms at the previous screening

All except 74 study participants had received an invitation to their next scheduled screening within 2 and a half years after study inclusion. Among reasons for non-invitation within this timeframe were death ($n = 5$), old age ($\geqslant 75$ years) ($n = 26$), and delayed screening due to organisational problems at the Mammography Unit for women aged 55–74 years ($n = 26$). Most of the invited participants attended their next scheduled screening regardless of whether their mammograms at the previous screening had been normal or false-positive (Table 2). Although the proportion of non-attendees

Table 2
Re-attendance at mammography screening among women with normal and false-positive mammograms at the previous screening

	Re-attendance			
	Yes		No	
	N	(%)	*N*	(%)
Normal screening group	236	(94)	16	(6)
False-positive group (total)	397	(95)	19	(5)
NO/FNA	219	(96)	10	4
FNA/CYST	58	(95)	3	5
FNAB/CYTO	93	(94)	6	6
SURG/BEN	27	(100)	0	(0)

among the false-positive subgroups differed, the low total amount of non-attendees ($n = 19$) entailed a violation of requirements for statistical analysis with the Chi-2 test.

3.2. Differences in anxiety in connection with re-attendance at mammography screening between women with false-positive and normal mammograms at the previous screening

Women with false-positive mammograms at their previous screening reported significantly higher anxiety levels in connection to screening re-attendance than did women with previously normal mammograms (Table 3). This was true for those women who following re-attendance reported their anxiety during that screening ($t(299) = 6.00$, $P < 0.0001$), as well as for those women who had not yet re-attended and reported their anticipatory anxiety in the face of a new screening ($t(254) = 2.97$, $P < 0.01$). In order to analyse potential differences between false-positive subgroups, factorial ANOVAs were performed. Results indicate that each subgroup of women previously recalled for false-positive mammograms reported significantly higher levels of anxiety during their next screening than did women with normal screening results ($F(4, 296) = 9.18$, $P < 0.0001$). There were no significant differences regarding anticipatory anxiety between false-positive subgroups and the normal screening group.

Due to the selection method of the normal screening group, there was a significant mean age difference between that group and the recalled group ($t(748) = 4.02$, $P < 0.0001$) (Table 1). Therefore, additional ANOVAS were performed including age as an independent variable. Participants were divided into subgroups using the mode of the age distribution (52 years) as a cut-off point. Results indicated that age had no significant main or interaction effect on anxiety in connection with screening participation.

3.3. Differences in breast self-examination behaviour 1 year after screening among women with false-positive and normal mammograms at the previous screening

One year after screening, women with false-positive mammograms reported significantly higher frequencies of BSE than did women with normal mammograms ($\chi 2 = 14.9$, degrees of freedom (df) = 3, $P < 0.01$) (Table 4). Analysis including false-positive subgroups indicated that the greatest differences in BSE were found between the normal screening group and groups FNA/CYST and FNAB/CYTO ($\chi 2 = 29.5$, df = 12, $P < 0.01$). Specifically, the proportion of women reporting that they seldom performed BSE was significantly lower in group FNAB/CYTO compared with the normal screening group. Similarly, the proportion of women who reported monthly BSE was significantly higher in group FNA/CYST compared with the normal screening group. Additional factorial ANOVAS includ-

Table 3
Anxiety in connection with re-attendance at mammography screening in women with normal and false-positive mammograms at the previous screening

	Mean	S.D.
Anxiety during screening re-attendance		
Normal screening group ($N = 98$)	1.6	1.9
False-positive group (total $N = 203$)	3.4	2.6
NO/FNA ($N = 110$)	3.2	2.7
FNA/CYST ($N = 29$)	3.6	2.7
FNAB/CYTO ($N = 48$)	3.4	2.6
SURG/BEN ($N = 16$)	3.7	2.4
Anxiety in the face of the next screening		
Normal screening group ($N = 114$)	1.7	2.2
False-positive group (total $N = 142$)	2.5	2.4
NO/FNA ($N = 76$)	2.5	2.3
FNA/CYST ($N = 21$)	3.0	3.0
FNAB/CYTO ($N = 37$)	2.4	2.3
SURG/BEN ($N = 8$)	2.1	2.2

Table 4
Breast self-examination in women with false-positive or normal mammograms at the previous screening

	Breast self-examination (%)			
	Never	Seldom	Once a month	More frequently
Prior to the recall visit				
False-positive group ($N=373$)	12	55	23	10
NO/FNA ($N=199$)	12	58	20	10
FNA/CYST ($N=54$)	8	59	24	9
FNAB/CYTO ($N=96$)	16	44	31	9
SURG/BEN ($N=24$)	4	71	17	8
One year after screening				
False-positive group ($N=373$)	9	40	37	14
NO/FNA ($N=199$)	8	43	34	15
FNA/CYST ($N=54$)	5	41	48	6
FNAB/CYTO ($N=96$)	14	33	35	18
SURG/BEN ($N=24$)	12	42	42	4
Normal screening group ($N=228$)	8	56	25	11

ing age as an independent variable (cut-off point 52 years), indicated that age had no significant main or interaction effect on BSE.

3.4. Differences in breast self-examination (BSE) behaviour before versus 1 year after the recall visit among women recalled for false-positive mammograms

Comparison of assessments performed before the recall visit and one year later indicated a significant increase of BSE among groups NO/FNA ($z=5.01$, $P<0.0001$) and FNAB/CYTO ($z=3.18$, $P<0.01$). Half of the women in these groups who initially reported that they never performed BSE, 1 year later reported that they seldom did so (Table 4). Similarly, a large proportion of women (25–30%) who reported that they seldom performed BSE before the recall visit, reported monthly BSE at the 1-year assessment. In group FNAB/CYTO, one in four women who initially performed BSE monthly, 1 year later reported that they examined their breasts more frequently.

3.5. Associations between anticipatory anxiety in the face of a new screening and re-attendance at the next scheduled screening mammography

There was no significant difference in anticipatory anxiety between subsequent screening attendees (mean = 2.2, standard deviation (S.D.) = 2.3, $n=200$) and non-attendees (mean = 2.7, S.D. = 3.0, $n=17$). Separate analysis of data from the false-positive group showed a greater, although statistically non-significant, mean value difference in anticipatory anxiety between attendees (mean = 2.6, S.D. = 2.4, $n=112$) and non-attendees (mean = 3.9, S.D. = 3.0, $n=8$) at the next scheduled screening.

4. Discussion

The present study investigated the influence of a false-positive mammogram on subsequent behaviour and anxiety related to breast cancer detection. Going through different medical examinations before receiving notification of normal or benign results did not appear to have a negative effect on subsequent screening attendance. However, women with previous false-positive mammograms reported higher anxiety levels in connection to their next scheduled screening than did women with normal mammograms at the previous screening. One year after screening participation, women with false-positive mammograms reported significantly higher frequencies of BSE than did women with normal mammograms. This was due to a significant increase in BSE since the recall invitation in two subgroups of women with false-positive mammograms. The present results indicate that being recalled for a false-positive mammogram does not seem to negatively affect screening re-attendance, and may even have a positive impact on BSE behaviour.

A large majority of women with false-positive and normal mammograms attended their next scheduled mammography screening, and there was no significant difference in re-attendance between these groups. These results are in line with earlier findings regarding the intention to re-attend mammography screening [4] and do not confirm findings indicating a higher likelihood of screening re-attendance among women with false-positive mammograms compared with women with normal mammograms [10,12]. The present finding of consistent re-attendance among participants who underwent surgical biopsy in order to rule out malignancies (SURG/BEN) lends support to earlier findings [11] indicating increased intention to re-attend screening in this group.

However, these findings should be regarded with caution due to the small size of that group.

The present results indicate that women who had been recalled for work-up of a false-positive mammogram were significantly more anxious in connection to their next scheduled screening than were women with normal mammograms. These findings are in line with other studies indicating that women with false-positive mammography results report more breast cancer-related fear as long as 12 months after their recall [4]. Although women with previous false-positive mammograms reported significantly higher levels of anxiety in the face of the next screening than did the normal-mammogram group, anticipatory anxiety related to the next screening was not significantly associated with subsequent re-attendance. However, these results are based on small numbers and should be regarded with caution. No other studies have been found investigating anxiety in connection to re-attendance among women with a history of false-positive mammograms.

One year after attending screening mammography, women with false-positive mammograms reported significantly higher frequencies of BSE than did women with normal mammograms, which supports earlier findings [4]. This group difference is most likely due to the significant increase of BSE since the recall invitation in the false-positive group. The similar proportions of women reporting different frequencies of BSE in the present normal-mammogram group and those earlier reported in another study from the same screening programme [23] attest to the validity of our findings. In Uppsala county, the written information provided together with the notice of normal or benign screening results entails a detailed instruction regarding BSE and a recommendation to perform BSE monthly. A combination of regular mammography screening and monthly BSE is regarded as optimal for the early detection of breast malignancies. Therefore, the finding that the frequency of BSE increased among subgroups of false-positive women may be regarded a positive consequence of a false-positive screening mammogram.

The major methodological strengths of the present study are its prospective design, eliminating problems relating to retrospective designs, and our reliance on file data concerning screening attendance. The relatively low response rate in the recalled group (62%) was investigated in a substudy that indicated no systematic response bias with regard to anxiety ratings prior to the recall visit [5]. The matching procedure resulted in a significant mean age difference between the normal screening group and the total false-positive group. Therefore, age was included as an independent variable in all analyses, and was found to have no significant effect on the study variables. In order to investigate whether a woman's willingness to participate in the survey study was related to screening attendance, re-attendance rates of study participants were compared with those of non-participants (after exclusion of women with breast malignancies). Among women recalled due to false-positive mammograms, those who declined participation in the present study re-attended screening mammography to a significantly lesser extent (88%) than did study participants (96%) ($\chi 2 = 13.52$, $P < 0.001$). No corresponding group difference was found between study participants and non-participants among women with normal screening mammograms. This finding somewhat limits the conclusions that can be drawn regarding screening re-attendance in the false-positive group. Further investigation of the influence of a false-positive mammogram on subsequent screening attendance should be made the subject of a large epidemiological study. Furthermore, the validity of the retrospective assessment of anxiety during the next screening can be questioned due to a relatively long time interval between screening and the completion of the questionnaire ($N = 299$, $M = 14$ weeks, range = 0–34 weeks). However, the fact that the number of weeks since screening was not associated with the anxiety levels during screening ($N = 267$, $r = 0.07$), suggests no biasing influence of time on anxiety assessments.

In conclusion, compared with women with normal mammograms, women recalled for false-positive mammograms report more short-term psychological distress [4,5] and higher levels of breast cancer-related concerns [6,7], including anxiety in connection with subsequent screening. The fact that women in the false-positive group subsequently engage in breast cancer detection behaviour (mammography screening and BSE) to the same or a greater extent than women with normal mammograms may represent one part of their coping with the recall experience and its adverse emotional consequences. In earlier research [24], attempts to attribute meaning to a negative event has been regarded as an important aspect of coping. In the screening context, the recall has been suggested to serve as a 'wake-up call' with regard to a woman's awareness of her breast cancer risk. In addition, the recall event may be attributed meaning as a positive indicator that mammography is a powerful tool for the detection of abnormal masses in breast tissue. Since the recall experience may be perceived as a temporary loss of control over one's health, some women may subsequently engage in active problem-focused coping behaviours aimed at regaining control, e.g. attending screening and performing BSE. It has recently [13] been suggested that screening attendees and non-attendees cope with breast cancer-related worry in different ways. While worry may serve as a cue to action in some women, others may react to worry with cognitive and behavioural avoidance of breast cancer-related issues. This notion was partly supported by our finding that recalled women who declined participation in the present survey (i.e. who avoided cognitive

engagement in of breast cancer-related aspects) were to a higher degree non-attendees at subsequent screening.

The present finding of more screening-related anxiety among women previously recalled due to false-positive mammograms than in women with normal mammograms are in line with earlier results indicating more breast-cancer related concerns in this group [4,6,7]. While there is no indication that anticipatory anxiety has a negative impact on women's screening re-attendance, this group may benefit from measures aimed at reducing such screening-related anxiety. In a recent study [25], Swedish women reported negative experiences related to the mammography examination itself as well as to their encounter with the mammography staff. These researchers proposed an increased dialogue between mammography staff and screening participants as a way of adapting the screening situation to meet the varied needs and expectations of women. This may include allowing more time for screening visits by women with a history of false-positive mammograms. In addition, a more individualistic approach could involve written invitations to mammography screening tailored to groups of women with different screening histories.

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