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Participation in a Breast Cancer Screening Program: Influence of Past Behavior and Determinants on Future Screening Participation[1]

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Background. **This study analyzed the relationship between past screening behavior, determinants, intention, and future screening participation in the Dutch national breast cancer screening program.**

Methods. **Participation at the first and second screening rounds was monitored. Furthermore, between the first and the second screening rounds, women received a questionnaire (response 58%, *n* = 395). The questionnaire was based on the ASE model, including attitude (consequences, anticipated regret, and moral obligation), social influence (support and modeling), and self-efficacy. Other distal variables assessed were previous screening behavior, evaluation of screening characteristics, and demographics.**

Results. **Participants at the second screening differed from nonparticipants on all ASE determinants. Stepwise multiple regression analyses showed that for previous participants and nonparticipants different ASE determinants and distal variables explained the variance in intention to participate in the next screening (30 to 45%). Logistic regression analyses showed that past behavior and intention (which mediated the effects of the ASE variables) were significant predictors of participation in the second screening.**

Conclusions. **Differences between previous participants and nonparticipants in determinants of intention and future screening behavior can be used to improve participation and adherence to breast cancer screening.**

Key Words: **breast cancer screening; attitude; anticipated regret; self-efficacy; past behavior.**

INTRODUCTION

Breast cancer is the most prevalent type of cancer among women in the Netherlands [*1*] and most other Western countries [*2,3*]. Since there is still limited insight into the behaviors related to developing breast cancer [*4,5*], primary prevention of breast cancer proves to be very difficult. However, early detection does provide an important tool for implementing secondary prevention. By performing regular breast cancer screening on women from the high-risk age groups, possible cancer can be detected at an early stage so that the health loss for these women can be minimized [*6,7*].

In the Netherlands, a national breast screening program was started in 1989 [*8*] and eventually was implemented in all parts of the country. In this national screening program, all women in the age group 50 to 70 years receive an invitation to attend a breast cancer screening in a specially designed screening unit every 2 years. However, research shows that despite high attendance rates in the first screening round, attendance in the following years declines with every new screening round [*9–13*]. Therefore, it seems highly relevant to gain insight into the reasons why women attend the screening and why this attendance declines with time.

Theoretical Framework and Research Questions

Social psychological model suggests that behavior is determined by the intention to perform this behavior. This intention, in general, is determined by three important factors: attitude, social influence, and self-efficacy. These factors can be integrated in models such as the Model of Planned Behavior [*14*] or the ASE model (attitude–social influence–efficacy) [*15,16*], which was used in the present study (see Fig. 1).

According to the ASE model, the first possible determinant of behavioral intention is the attitude, which consists of the advantages and disadvantages of a particular behavior. These expected outcomes [*17*] can take place directly following the behavior or after a longer period. With respect to breast cancer screening, this time period between behavior and possible outcome seems particularly important: although long-term outcomes of screening might be very positive (participating in the screening could lengthen a healthy life), the short-term benefits of screening may not be so

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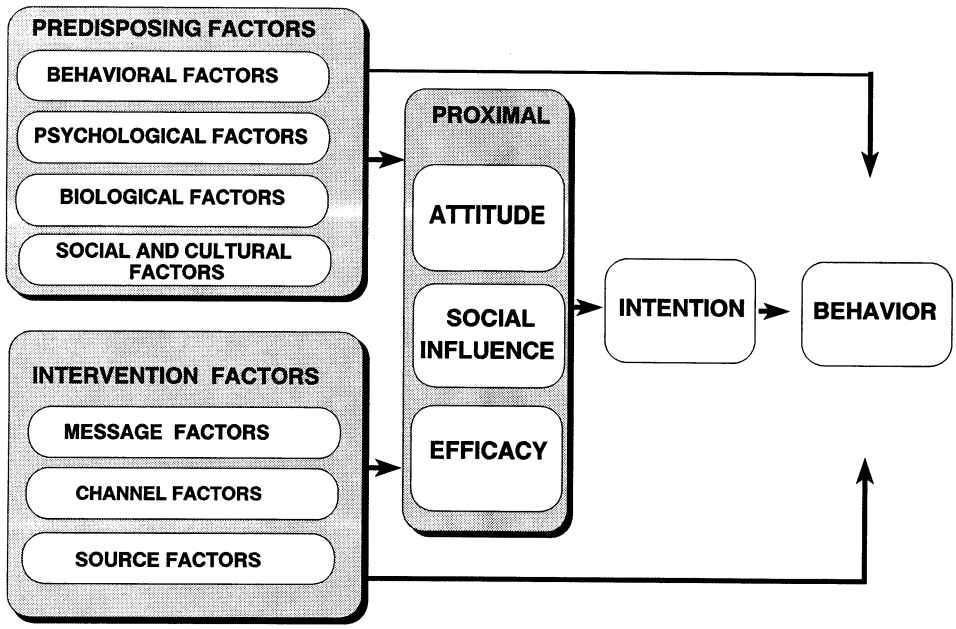

FIG. 1. The ASE model.

obvious, since screening might cause pain and may result in fear of the results. Another possible outcome of participating in the screening could be anticipated regret [*18*]. Women might think that not attending the screening would leave them with feelings of regret if at a later date breast cancer were detected. Research [*11*] has shown that the more regret women anticipate if they do not attend the screening, the more likely they are to participate in the screening. In addition, by participating in the screening, women may feel they are fulfilling a moral obligation: "by participating in the screening you show responsibility toward yourself and others." Compliance to the felt obligation could be considered an outcome of the desired behavior and therefore can be placed within the attitude concept.

A second factor consists of the social influences people encounter. This social influence can manifest itself in several ways [*19–21*]. Some evidence was found for the importance of direct social support or pressure for participating in a screening. Women who feel encouraged to participate in a screening by their spouses, family, friends, or physician are more likely to attend to the screening [*13,22–27*]. In addition to direct support, the knowledge that other women participate in the screening might also encourage women to attend the screening (modeling) [*28*].

The third factor consists of self-efficacy expectations, which are a person's beliefs in his or her abilities to perform a particular behavior. Increased self-efficacy will result in improved performance of the healthy behavior. Research over the past decades has stressed the importance of self-efficacy for enacting new healthy behaviors in general [*17,29*], as well as for attending breast cancer screening in particular [*24,30,31*].

The impact of these three proximal factors is assumed to be influenced by four types of distal, predisposing factors [*32*]. One of these factors is behavioral (e.g., previous experience with the same and related behaviors). With respect to breast cancer screening it has been found that women who have already attended an earlier breast cancer screening are more likely to attend future screening rounds [*23,25,26,28,33,34*]. This past behavior could influence intention directly or indirectly through the three proximal predictors of intention. Ajzen [*14*] suggested that past behavior would not have a great unique contribution in predicting behavior after controlling for attitude, social influence, self-efficacy, and intention. However, several studies have shown that the effects of past behavior were sometimes not fully accounted for by the model [*14,19,20,35,36*].

Other distal predisposing factors that might influence women's intention to participate are psychological factors (e.g., attributions, vicarious learning processes), biological factors (e.g., gender, age, hereditary variables), and social and cultural factors (e.g., social climate, socioeconomic status) [*32,37,38*]. Participation in breast cancer screening programs is lower for older women, for women without a spouse, and for women with a lower educational background [*7,11,12,39*].

The proximal cognitions of an individual about the behavior can also be changed by an intervention, which may be elaborate but can sometimes also serve as a very salient "cue to action" [*40*]. The effectiveness of a behavioral intervention in motivating an individual to change is considered to be influenced by four types of information factors [*41*]: receiver factors, which refer to the characteristics of the target group (e.g., predispos-

ing factors like age, level of education); message factors (e.g., use of arguments in the screening invitation letter); channel variables (e.g., personal invitation to the screening, screening unit near home); and source variables (e.g., trustworthiness of the screening organization and laboratory workers at the screening). Therefore, the characteristics of the screening intervention can facilitate or enable participation at the screening. If characteristics of the screening itself are evaluated positively, women are able to participate more easily and are more likely to participate [*26,31,42–44*]. However, little is known about the way these intervention factors may influence attitudes, social influences, and self-efficacy expectations with respect to breast cancer screening.

The present study aims to analyze the way in which the ASE determinants, together with the intention and distal variables (past behavior, screening characteristics, demographics), can describe and predict the differences in participation in the second screening round. Moreover, since it is expected that intention will be an important predictor of second round participation, the predictive power of the ASE determinants, together with distal factors for the intention to participate in the next screening, will be assessed. Since it is also expected that women who have participated in the previous screening round will have more experience with screening, resulting in a stronger association between ASE determinants and (intention of) participation in the second screening round, possible interaction effects between the ASE determinants and past behavior will be analyzed in additional regression analyses. This study is the first to systematically apply the ASE model to breast cancer screening behavior, with the inclusion of both distal and proximal variables. Furthermore, new concepts were included in the model, like anticipated regret and screening characteristics. The strengths of the study include using a longitudinal design, analyzing possible interactions between distal factors (past behavior) and ASE determinants, and performing separate analyses for previous participants and nonparticipants.

METHODS

Respondents and Procedures

During the research period, measurements were taken at three times. The participation in the first screening round (past behavior) was assessed by monitoring the participation in the screening as it was registered between May and July 1993 at the screening units (T1). The determinants and intentions of future screening behavior were assessed between April and May 1994, by means of a written questionnaire (T2). The third measurement consisted of monitoring the participation of the second screening round, which took place between March and July 1995 (T3).

The national breast cancer screening program was implemented in 1993 in Kerkrade, a small Dutch town in the south of the Netherlands. The screening is free of charge for all women. A stratified random sample was selected from all women who had received an invitation to attend the first screening round (T1). Earlier research indicated a high prevalence of selective response to questionnaires among participants and nonparticipants of breast cancer screening and an overrepresentation of participants compared with nonparticipants in the first screening round [*28*]. Therefore, the sample was stratified and oversampled with women who did not attend the first screening round. Consequently, 345 questionnaires were sent to women who participated in the first screening and 453 to women who did not participate. In total 798 women received a written questionnaire between their first and second screening round (T2). Questionnaires were distributed in April 1994, together with an introductory letter and a return envelope. Two weeks later women received the first reminder, followed 2 weeks later by another reminder together with a new questionnaire.

Questionnaire

The questionnaire was based on earlier research [*28*], qualitative interviews, and a small pilot study among women from the target group ($N = 15$) [*45*]. The appendix presents the different items of the questionnaire, together with the answering scales.

Attitude was measured using several concepts:

- Perceived consequences or outcomes of the screening behavior were assessed via 11 items on 4-point scales (Cronbach's $\alpha = 0.74$). Seven items consisted of positive consequences (pros), while 4 items consisted of negative consequences (cons).
- The moral obligation women feel to participate in a national breast cancer screening program was assessed via 2 items on 4-point scales (Pearson $r = 0.53$).
- Anticipated regret of not participating in the screening was assessed with 2 items on 4-point scales ($r = 0.74$).

Social influence was assessed by two concepts:

- Social support from significant others was assessed with 4 items on 4-point scales ($\alpha = 0.77$).
- Modeling was assessed with 2 items of which 1 used a 4-point scale (modeling 1): "How many women do you know who have received an invitation to the screening?" Another item used a 5-point scale (modeling 2): "Of the women you know who also received an invitation, how many actually participated in the screening?" Both items were analyzed separately since their scaling differed.

Self efficacy was assessed using 7 items on 7-point scales ($\alpha = 0.90$). All items proposed different situa-

tions in which respondents were asked if they would feel able to participate under these circumstances.

Intention was assessed by asked the women if they intended to participate in the next screening round, using a 7-point scale.

In addition to the determinants intention and past behavior, questions were asked about age, educational level, and marital status. Also, several facilitating characteristics of the screening were evaluated via 4 items on 7-point scales ($\alpha = 0.79$).

Response

As was expected, a difference in response to the questionnaire occurred between women who had participated in the first screening round and women who had not participated. Of the 345 questionnaires that were distributed among participants in the first screening, 259 were returned (75%), while 229 of the 453 questionnaires of nonparticipants were returned (51%). Twenty-three women were excluded from the original sample because of ongoing treatment for breast cancer (4), language problems (9), change of address (2), or being deceased (8). Of the 488 respondents to the questionnaire, 93 respondents were excluded from further analyses, since participation at the second screening round could not be monitored (46 respondents had turned 70 or older at T3; 19 respondents were excluded because of ongoing treatment for (breast) cancer, change of address, or being deceased at T3; 28 respondents could not be monitored because of missing data at T3). This resulted in 395 respondents for further analyses (response 58%), of whom 219 (55%) had participated and 176 (45%) had not participated in the previous screening.

Statistical Analysis

Data analyses included basic descriptive statistics of the respondents. Statistical differences between participants and nonparticipants at the second screening round were analyzed using *t* tests. Logistic regression was used to assess the predictive value of the intention together with the determinants and the distal variables (past behavior, screening characteristics) for the participation in the second screening round. Regression analyses were used to assess the predictive value of the determinants together with the distal variables (past behavior, screening characteristics) for the intention to participate in the next screening round. The assumptions for regression analysis to be applicable were satisfied: none of the independent variables showed high colinearity, the residuals of intention were approximately normally distributed, there were no outliers or influential cases, and examination of scatter plots showed that intention was linearly related to the independent variables. All analyses were performed using the SPSS-X statistical program [*46*] (differences were significant for $P < 0.05$).

RESULTS

Respondents

The average age of the respondents was 59 years, ranging from 50 to 69 years. Of the respondents 75% had a spouse, 14% were widowed, and 11% were single. Of the respondents 4% had a high level of education (higher vocational school or university), 22% had a medium level of education (secondary vocational school or high school), and 74% had a lower educational level (primary or basic vocational school).

Correlations of Distal Variables, ASE Determinants, Intention, and Behavior

Table 1 presents the correlations between the different concepts of the ASE model. All ASE concepts correlated significantly with future screening intention and behavior.

The different attitude concepts had high intercorrelations, ranging from 0.47 to 0.48, showing that the

TABLE 1

Correlations between the Different ASE Determinants, Distal Variables, Intention, and Behavior

	I	AR	CO	MO	SS	M1	M2	SE	PB	SC
Intention (I)	—									
Anticipated regret (AR)	0.58	—								
Consequences (CO)	0.49	0.47	—							
Moral obligation (MO)	0.36	0.48	0.48	—						
Social support (SS)	0.33	0.35	0.34	0.38	—					
Modeling 1 (M1)	0.28	0.26	0.16	0.21	0.30	—				
Modeling 2 (M2)	0.29	0.27	0.19	0.30	0.30	0.41	—			
Self-efficacy (SE)	0.54	0.56	0.41	0.37	0.30	0.36	0.28	—		
Past behavior (PB)	0.45	0.46	0.28	0.18	0.23	0.30	0.23	0.46	—	
Screening characteristics (SC)	0.41	0.44	0.42	0.44	0.26	0.15	0.18	0.40	0.36	—
Screening behavior round 2 (B2)	0.56	0.36	0.28	0.12*	0.20	0.24	0.20	0.30	0.56	0.23

* Correlation significant at $P < 0.05$. All other correlations are significant at $P < 0.01$.

different concepts were related to each other. This was also true for three social influence concepts, intercorrelations ranging from 0.30 to 0.41. The distal variable characteristics of the screening intervention showed high correlations with the different attitude concepts (at least 0.42) and with the self-efficacy variable (0.40). Past behavior showed high correlations with anticipated regret (0.45) and self-efficacy (0.46). Screening behavior at the second round showed the highest correlations with past behavior and the intention to participate at the second screening.

Differences between Participants and Nonparticipants at the Second Screening

In order to analyze whether differences in participation at the second screening (T3) could be described on the basis of already existing differences in motivational determinants (as assessed at T2), potential differences in scores on various determinants are presented in Table 2. There were no differences between both groups concerning level of education, age, or marital status. However, participants had significantly more positive scores than nonparticipants on all ASE determinants and on the intention to participate in the next screening round.

Women who participated in the second screening round at T3 were at T2 (a year earlier) already more convinced of the positive consequences of participation and less of the negative consequences, they felt more morally obliged to participate, and they anticipated more regret if they did not participate in the screening.

TABLE 2

Differences between Participants and Nonparticipants at the Second Screening Round

	Participants	Nonparticipants
Intention	2.39	0.48***
Attitude concepts		
Anticipated regret	2.43	1.67***
Consequences total	2.12	1.84***
Moral obligation	1.83	1.57*
Social influence		
Modeling	1.47	1.10***
Modeling 2	2.24	1.28***
Social support	1.61	1.16**
Self-efficacy	1.91	0.97***
Distal variables		
Screening characteristics	2.41	1.97***
Participation first screening[a]	74%	13%***

Note. Ranges: intention, self-efficacy, screening characteristics from -3 to 3; anticipated regret, consequences screening, moral obligation, modeling from 0 to 3; modeling 2 from 0 to 4.

[a] Differences in participation in the previous screening were analyzed using a χ^2 test; all other tests were *t*-tests.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

With regard to social influence, women who had participated in the second screening round at T3 reported at T2 more support from significant others for participating, knew more women who had received invitations to the first screening, and knew more women who had actually participated in the first screening round. Moreover, women who had participated in the second screening round were at T2 more convinced of their ability to participate in the screening if they were placed in difficult situations (like being tense for the screening). Analyses of the distal variables showed that women who had participated in the second screening (T3) had more positive evaluations regarding various characteristics of the intervention at T2 than did women who had not participated in the second screening. Finally, there was a difference in past behavior indicating that of the respondents who participated in the second screening round (T3), 74% had also participated in the first screening round (T1), while from the respondents who had not participated in the second screening round, only 13% had participated in the previous screening ($\chi^2 = 126.5$; $df = 1$; $p < 0.0001$).

Determinants of Future Screening Behavior

A stepwise logistic regression was used to assess the predictive value of the intention together with the proximal ASE determinants and the distal variables (past behavior, screening characteristics, demographics) for the participation in the second screening round (see Table 3). To test the ASE model different steps were taken in the analyses. In the first step all attitude, social influence, and self-efficacy constructs were entered in the model. Three concepts proved to be significant predictors of participation: consequences of the screening, anticipated regret, and how many women they knew who had participated in the previous screening (modeling). In a second step the intention to participate was entered in the analyses, resulting in a significantly higher prediction of participation (see Table 3). In agreement with the ASE model, all ASE variables were now fully mediated by the intention to participate. In a third step, background variables were entered. Two significant predictors of second-round participation remained in the model: the intention to participate and past behavior.

Determinants of Future Screening Intention

Since intention to participate in the next screening proved to be such an important predictor of second-round participation, it was decided to analyze to what extent the different determinants could predict the intention to participate in the next screening. A stepwise multiple regression analysis was conducted, involving three steps. First, all mediating ASE variables were entered, resulting in 45% explained variance of the in-

TABLE 3

Multivariate Analyses of Predictors of Participation at the Second Screening Round, Using Stepwise Logistic Regression

	Step 1		Step 2		Step 3	
Variable	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Att. consequences	2.78*	(1.21–6.39)	NS		NS	
Anticipated regret	1.79**	(1.22–2.64)	NS		NS	
Modeling 2	1.22*	(1.02–1.46)	NS		NS	
Intention			2.20***	(1.53–3.08)	2.23***	(1.48–3.35)
Past behavior					8.17***	(4.06–20.09)

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

tention to participate in the next screening round. The attitude concept anticipated regret explained 33% of the variance in intention, followed by significant unique contributions of self-efficacy (8%) and the attitude concept consequences (4%). In the second step, the distal variables were entered stepwise in the regression analysis, showing that past behavior made a significant contribution (3%) to the prediction of intention. Additionally, the screening characteristics made a small but significant contribution (1%) to the prediction of the intention. Total explained variance of the ASE determinants together with the distal variables was 49%.

In the third step, possible relevant interaction terms of the determinants and past behavior were entered. Since the interaction of previous behavior with the attitude concept consequences showed a small but significant unique contribution (R^2 changed to 0.51), multiple regression analyses were performed separately for participants and nonparticipants at the previous screening round (see Table 4). Among participants at the first round, the model was predictive of intention ($F = 21.14$; $P < 0.0001$; $R^2 = 0.30$). Four predictors remained in the model for previous participants: self-efficacy was the strongest predictor, followed by moral obligation, anticipated regret, and screening characteristics. Among nonparticipants in the previous screening round, the model was also highly predictive of intention ($F = 40.80$; $P < 0.0001$; $R^2 = 0.45$). Two predictors of intention remained in the model for previous nonparticipants: anticipated regret was the most important predictor with an explained variance of 36%, followed by consequences of the screening, which added another 9% to the explained variance.

DISCUSSION

This study analyzed the influence of the determinants attitude, social influence, and self-efficacy together with the past behavior and the screening characteristics on the intention to participate and on the actual participation in the second round of the Dutch national breast cancer screening. In addition, the study tried to analyze the way in which past behavior (participation in the first screening round) was related to determinants of participation in the next round of the national breast cancer screening. The results showed that past breast cancer screening participation was strongly associated with positive determinants toward future screening participation, with the positive intention to participate in the next screening, and with the actual repeated participation in the second screening.

Although the participation at the first screening occurred long before the measurement of the determinants, it is difficult to get an insight into the causality of the relationship between past behavior and the determinants. This relationship may have been directed both ways. Determinants of women who participated in the first screening round were probably already positive before entering the first screening round, since

TABLE 4

Stepwise Multiple Regression Analysis, Prediction of Intention to Participate in the Next Breast Cancer Screening Round, Separate for Participants and Nonparticipants at the First Screening

Step	Variable	R	R^2	β	$P<$	r
			Participants round 1			
1	Self-efficacy	0.42	0.18	0.37	0.001	0.42
2	Attitude, moral obligation	0.47	0.22	0.07	0.01	0.28
3	Attitude, anticipated regret	0.49	0.24	0.10	0.05	0.31
4	Screening characteristics	0.55	0.30	0.27	0.001	0.34
			Nonparticipants round 1			
1	Attitude, anticipated regret	0.60	0.36	0.41	0.001	0.60
2	Attitude, consequences	0.67	0.45	0.36	0.001	0.58

otherwise they would not have participated. On the other hand, experiences women had with participating in the first screening round will have influenced, reinforced or enfeebled, the existing determinants of future screening behavior. For a further insight into the interactions of behavior and determinants it is of great importance to obtain longitudinal data on screening behavior and their determinants over several rounds of the screening program.

By oversampling the nonparticipants of the previous screening round, it was possible to get a substantial number of previous nonparticipants in the study, despite the lower response among previous nonparticipants. Studying the determinants of nonparticipants especially provides an important tool for trying to motivate women to start participating. However, this difference in response rates between previous participants and nonparticipants should not be forgotten. Caution should be taken when generalizing the nonparticipants findings toward all nonparticipants of breast cancer screening programs.

In this research, the women that were studied came from a relatively small town and were predominantly white with no relevant minority groups. These women were specially invited to participate and did not have to pay for their screening. These factors make it somewhat difficult to generalize the findings to communities with other characteristics and different health care systems. Recent studies show that ethnic groups differ in their screening behavior [*38,47*] and have different beliefs concerning cancer screening [*13,38*]. Therefore, it is of great importance to further study if relatively new concepts, like anticipated regret, are also of relevance in other communities.

The importance of the intention in predicting screening behavior, which was also found in other studies [*23,34,48,49*], confirms the theoretical basis of the ASE model, which suggests that intention is the best predictor of behavior. These results also confirm the theoretical basis of the ASE model, which suggests that the influence of the ASE determinants on behavior is mediated through the intention. However, past behavior was not fully mediated by the ASE determinants or the intention to participate, showing that there also seems to be a direct influence of past screening behavior on future screening behavior. This finding is in line with other studies applied to smoking cessation, showing that after ASE determinants past behavior has some small but significant additional predictive power toward explaining (intention of) quitting smoking [*19,50*]. The present findings, therefore, suggest the inclusion of a direct relationship between past behavior and the intention and behavior in the ASE model, supporting similar conclusions reached by others [*35,36*]. However, it may also be that the direct effect of past behavior on future behavior may occur not at the level of the underlying theoretical constructs, but at the level of the assessments of those constructs. If two subjects profess high intentions to act, one subject may mean this much more than the other. Thus, it may be the inability to assess cognitive states (like intention or determinants) with enough precision that allows past behavior to have an incremental effect over and above the cognitive constructs.

The great impact of anticipated regret on the prediction of the intention to participate in the next screening ($R^2 = 0.33$) stresses the importance of addressing this concept as a separate concept within attitude, instead of integrating it into one overall attitude score. Although correlations between the different attitude concepts (anticipated regret, consequences, and moral obligation) were high (at least 0.47), using the concepts separately in the analyses provides relevant additional information for motivational campaigns. The need for different attitude concepts was also illustrated by the results of the separate regression analyses for participants and nonparticipants of the previous screening. Anticipated regret proved to be an important predictor of intention for both groups, but mostly for nonparticipants at the first screening. The consequences of screening were only a significant predictor of intention for nonparticipants, while moral obligation was only a significant predictor of intention for previous participants.

There were clear differences between previous participants and nonparticipants in predictors of intention to participate at the second screening. For previous participants self-efficacy proved to be the best predictor of the intention to participate again. These previous participants might already have experienced some difficulties during their first screening, which might have had a negative influence on their self-efficacy. For these women situations like being tense and being afraid of possible pain during the screening were situations in which they thought it was difficult to participate. For these women, health education should focus on preparing them thoroughly for the following screening rounds and giving them clear and easy information to alleviate feelings of tension (for example, giving them relaxation exercises). Furthermore, laboratory workers should be instructed to be very careful during the actual screening to minimize possible pain, in order to prevent future dropout. Possible barriers that can diminish women's self-confidence of being able to participate in future screening rounds should be reduced as much as possible.

For previous nonparticipants anticipated regret proved to be the best predictor of the intention to participate at the second screening. Since it is difficult to get an insight into the causality between the relation of anticipated regret with intention and participation in screening rounds, different explanations of these findings are possible. For example, it might be possible that the women who reported high anticipated regret

were partly those who wanted to participate in the first screening round, but were unable to. Naturally, such women would be especially likely to participate in the second round. It might also be that anticipating more regret could actually influence intention and future behavior. If the latter is true, this anticipated regret concept may provide relevant additional information for motivational campaigns. Health education directed toward nonparticipants could explicitly appeal to the possible feelings of regret women might feel if they decide not to participate at the screening. This message could be further personalized by letting a woman from the target group tell them her own experience how sorry she expects to be if she did not participate and a possible lump was not detected. However, further research into the causality of the different concepts needs to be done first.

The predictive power of the evaluation of intervention characteristics on the intention to participate in the second screening stresses the importance of providing good basic facilities (sending invitations, screening by special appointment in a screening unit near home) to guarantee as few barriers as possible to women's participation. In accordance with the theoretical model the influence of this concept on intention was highly mediated by the ASE determinants, which was reflected in high correlations of the characteristics evaluation with the attitude and self-efficacy concepts.

An important objective of applying theoretically based models, such as the ASE model that was used in this study, is trying to gain more insight into the determinants of breast cancer screening behavior and the maintenance of this behavior. In the application of the ASE model toward breast cancer screening, some choices were made in the constructs that were assessed. Since the model presented in this study was a very broad model, not all concepts of the model were fully assessed. The choice of concepts that were assessed was based on previous (qualitative) research [*28,45*] and on findings from other studies. Moreover, some aspects of the screening were confidential medical information (result of the first screening) to which this study had no access. The findings suggest that even with these limitations, the application of the model was of substantial relevance. The results prove that in addition to the more often applied Health Belief Model [*23,25,26,43,51–53*] other more general models on determinants of behavior, such as the ASE model, may facilitate the understanding of mammography behavior. Total explained variance of the intention by the attitude, social influence, and self-efficacy concepts was rather high (45%). Separate regression analyses of intention for participants and nonparticipants showed similar or higher explained variances, compared with other studies [*25,54*]. The application of the different concepts of the ASE model, and the differentiation in subfactors within these concepts, provides important additional information that can be used to motivate women to start participating in the national screening program and, furthermore, to maintain their participation in the following screening rounds.

APPENDIX: ITEMS USED IN THE QUESTIONNAIRE

Attitude: Consequences of Participating

If I participate in the screening:

- I will feel a lot (3) to no (0) more certain about my health.
- it will be possible to detect a lump a lot (3) to no (0) earlier.
- I can increase the quality of my life very much (3) to not at all (0).
- I will get a lot (3) to no (0) reassurance.
- I will show that I care for my health very much (3) to not at all (0).
- I will get a lot (3) to no (0) personal attention during the screening.
- I will get a very clear (3) to no clear (0) explanation of the screening.
- I will experience a lot of (0) to no (3) pain.
- it will cost a lot of (0) to no (3) time.
- it will invade my privacy very much (0) to not at all (3).
- I will experience a lot of (0) to no (3) fear of the results.

Attitude: Moral Obligation

I feel that by participating in the screening program:

- I fulfil a very great (3) to no (0) obligation to myself.
- I fulfil a very great (3) to no (0) obligation to my family.

Attitude: Anticipated Regret

- If I did not participate in the screening, afterward I would feel very much regret (3) to no regret at all (0).
- If I did not participate in the screening, I would feel very much regret (3) to no regret at all (0) if, at a later date, breast cancer were detected.

Modeling

- How many women do you know who have received an invitation to the screening? [Very many (3) to no (0) women.]

Modeling 2

- Of the women you know who also received an invitation, how many actually participated in the screening? [All women (4) to no (0) women.]

Social Support

I receive a lot of support (3) to no support (0) to participate in the screening:

- from my spouse.
- from my children.
- from my friends.
- from my GP.

Self Efficacy

Do you think you are able to participate in the screening [certainly yes (+3) to certainly not (–3)]:

- if there is a large distance to the screening unit?
- if the screening might be painful?
- if the screening costs money?
- if you are tense for the screening?
- if other women disagree with participation?
- if it costs you much time?
- if the time of the screening were unfavorable for you?

Screening Characteristics

How do you value the following aspects of the screening? [very pleasant (+3) to very unpleasant (–3)]:

- The screening is on a special appointment.
- The screening is free of charge.
- You get a personal invitation to come to the screening.
- The screening takes place in a specially developed screening unit.

Intention

- Do you intend to participate in the next screening round [certainly yes (+3) to certainly not (–3)]?

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