BrunnerRoutledge Taylor&Francis
healthsciences

PROSPECTIVE STUDY ON THE DETERMINANTS OF REPEAT ATTENDANCE AND ATTENDANCE PATTERNS IN BREAST CANCER SCREENING USING THE THEORY OF PLANNED BEHAVIOUR

C.H.C. DROSSAERT*, H. BOER and E.R. SEYDEL

University of Twente, Twente Institute of Communication Research, P.O. Box 217, 7500 AE Enschede, The Netherlands

This prospective study, using the Theory of Planned Behaviour (TPB) as a theoretical framework, was carried out to identify the determinants of repeat attendance and attendance patterns in organised breast screening. A group of 2657 women filled out a baseline questionnaire, approximately 8 weeks after having been invited for an initial screening in the Dutch Breast Cancer Screening Programme. Data on actual attendance in second and third screening round were subsequently collected. Personal variables such as family history of breast cancer, breast cancer in someone close and fear of breast cancer were not related to repeat attendance. The TPB variables could explain approximately 17% of the variance in attendance in the second and third round. Maintenance behaviour (consistent attendance *vs*. dropout) was related to the TPB variables, but the amount of variance explained was only 6%. Initiation of behaviour (consistent refusal *vs*. delayed attendance) also was related to TPB variables, with a substantially higher amount of explained variance than with maintenance behaviour. Results indicate that the TPB variables are more related to the initiation of screening behaviour than to the maintenance of screening behaviour. Implications of these findings for breast cancer screening are discussed.

Keywords: Theory of planned behaviour; Breast cancer screening; Participation; Prospective study; Maintenance

INTRODUCTION

Sufficient regular attendance is a critical determinant of the effectiveness of population-based breast cancer screening. Although in initial screening rounds participation rates tend to be high, many studies have shown that participation rates decline throughout the course of a breast cancer screening programme (Tabar *et al*., 1989; Williams and Vessey, 1990; Otten *et al*., 1996; Woodman and Threlfall, 2001). Understanding the factors that promote re-attendance in breast screening is important for the development of health promotion interventions aimed at improving the effectiveness of breast

---

*Corresponding author. Tel.: +31 53 4893287. Fax:+31 53 4894259.
E-mail: C.H.C.Drossaert@wmw.utwente.nl

cancer screening. Relatively few studies have examined the factors that influence re-attendance in breast cancer screening. In most of these studies, some sort of social cognition model, often the Health Belief Model (Janz and Becker, 1984), has been used. Results show that women who receive regular mammograms feel more susceptible to breast cancer than women who do not receive regular mammograms (Lerman et al., 1990; Marshall, 1994; Taylor et al., 1995; Halabi et al., 2000; Lagerlund et al., 2000). Other cognitive variables found to be associated with having had repeated mammograms in the past are: perceived barriers or costs (Lerman et al., 1990; Taylor et al., 1995; Scaf-Klomp et al., 1997; Lagerlund et al., 2000); perceived benefits or effectiveness of mammograms (Marshall, 1994; Scaf-Klomp et al., 1997; Lagerlund et al., 2000); and perceived ease of screening re-attendance (Marshall, 1994). However, most of these studies have been retrospective: women were asked about their cognitions about breast screening participation and their mammogram history was also assessed, usually by self-reports.

Only a few studies have examined the relevance of cognitive determinants of repeat attendance in organised breast cancer screening using a prospective design. In most of these studies, beliefs and intentions obtained before the *first* round of screening have been correlated to actual attendance in second round (Boer and Seydel, 1996; Cockburn et al., 1997; Rutter, 1997, 2000). Results have not been consistent. Boer and Seydel (1996), found that participation in the second screening was not related to any of the variables derived from Protection Motivation Theory (including intention, susceptibility, severity, costs, benefits, and self-efficacy expectations). Rutter (1997, 2000) found that some cognitive variables were to some extent predictive of subsequent attendance three years later (odd ratios varied from 1.6 to 2.0). In the study by Cockburn et al. (1997), intention to participate in the first screening round was revealed as a significant determinant of second round participation, but all the other obtained cognitive determinants, including perceived susceptibility, benefits, barriers, and social influence, were not associated with second round participation. An important limitation of the above studies is that cognitions were measured before the first round, and the design does not account for the fact that women might have adapted their cognitions upon their first screening experience (Drossaert et al., 2001). In a study by Lechner et al. (1997), women's cognitions, which were assessed one year after having been invited for an initial screening, were used to predict re-attendance in the second screening round. The results revealed that the second round attendance was best predicted by intention and by attendance at the first screening.

The present study was undertaken to predict and explain repeat attendance and patterns of attendance in organised breast screening using a prospective design. In our study, the Theory of Planned Behaviour (TPB; Ajzen, 1991) was used as a theoretical framework to predict repeat attendance and patterns of attendance in breast cancer screening. According to the TPB, behaviour is best predicted by a person's intention to perform the particular behaviour. Intentions in their turn are predicted by three determinants: attitude, subjective norm, and perceived behavioural control. Attitude refers to people's positive or negative evaluation of their performing the behaviour. Attitude is supposed to be the result of considerations about the costs and benefits of performing the behaviour. The second determinant of intention, subjective norm, refers to people's perceptions of approval or disapproval from significant others with regard to performing the behaviour. According to the TPB, a woman is more likely to attend breast screening if she believes that her family, friends etc.,

would want her to. The final determinant of intention, perceived behavioural control, is similar to Bandura's (1991) concept of self-efficacy and refers to people's appraisal of their ability to perform the specific behaviour (Ajzen, 2002). This includes a woman's ability to cope with all kinds of difficulties she might encounter whilst responding to the screening invitation. According to the TPB, the influence of all other variables, such as personal background or screening characteristics, on behaviour, is mediated by the cognitive determinants. The TPB, and its predecessor, the theory of reasoned action, have been applied successfully to explain various health behaviours (Godin and Kok, 1996; Conner and Armitage, 1998; Armitage and Conner, 2001), including preventive breast practices (Montano and Taplin, 1991; Powel-Cope *et al.*, 1991; Godin *et al.*, 2001; Braithwaite *et al.*, 2002).

In screening behaviours, not only is the question of attendance *versus* non-attendance important, but it is also vital to understand the cognitive factors that predict a specific pattern of attendance. Sheeran *et al.* (2001) have distinguished four attendance patterns in health screening. Participants who attend after each invitation were characterised as exhibiting the desired *consistent* pattern of attendance. Participants who attend the first time but not the second exhibited an initial pattern of attendance, which in the literature on breast cancer screening attendance is mostly referred to as a *dropout* pattern. Participants who did not attend the first screening but who attended the second exhibited a *delayed* pattern of attendance, while participants who do not attend at the first nor any subsequent sessions exhibited a *refused* pattern of attendance. From their study, Sheeran *et al.* (2001) concluded that cognitive factors according to the TPB predicted attendance, but that the TPB variables did not reliably distinguish between consistent attendees, participants who initially attended then dropped out, participants who delayed attending and individuals who consistently refused attendance. Other authors have also argued that the TPB variables pre-dominantly play a role in initiating behaviour, and that their role in behavioural maintenance is less evident (Ronis *et al.*, 1989; Rothman, 2000; Sheeran, 2002).

In the present study, we assessed whether the predictive capability of the TPB still exists over a period of several years. It was also investigated whether the TPB can reliably distinguish between attendees with different attendance patterns. In the study by Sheeran *et al.* (2001), a comparison was made amongst four attendance patterns. In our study, a difference was made between attendance patterns in which maintenance of behaviour was the critical psychological process (consistent attendees *versus* dropouts) and attendance patterns in which later initiation of behaviour was the critical psychological process (consistent refusers *versus* delayed attendance). It was expected that the TPB variables would be significant and relevant predictors for the initiation of behaviour, but not for the maintenance of behaviour.

METHOD

Setting

This study was performed within the Dutch Breast Cancer Screening Programme. In this programme, women aged 50–69 years are invited every two years for a breast screening by a personal letter, including a fixed appointment that can be changed upon request. The screening is free of charge and takes place in semi-mobile or permanent screening units. Women receive the result of the screening (positive or

negative) by mail within two weeks of the mammogram. The data presented in this article were collected in the period from 1992–1998 in various parts in the Netherlands, including two urban regions (Tilburg and the Hague/Voorburg) and two rural regions (IJssel-Vecht and Haaksbergen). In all regions, the screening was being introduced at the start of our study.

Subjects

Subjects comprised a random sample of 20% of the invited women during a period of approximately three months in each region. Due to ethical considerations, women who had received a positive screening result in their first screening round were excluded. A total number of 4711 women received a baseline questionnaire. The response was 67% ($n = 3148$). Women who were under treatment or supervision for breast cancer ($n = 81$, 3%), and women who were older than 67 years of age ($n = 297$, 9%), and therefore not eligible for subsequent screening, were excluded from the analyses. Seventy-eight women (3%) objected to the collection of actual attendance data. Thirty-five women (1%) agreed to participate in the longitudinal study, but did not write their names and addresses on the questionnaires, and therefore could not be included in the longitudinal study. The data from the remaining 2657 women were used for this study.

Procedure

In all four regions, the baseline questionnaires were sent by post approximately eight weeks after the women had been invited for the first round of the screening programme. This means that a woman received a questionnaire six weeks after the scheduled appointment and about four weeks after receiving the screening result (if she had participated). Actual attendance data in the first, second, and third round were collected from the screening authorities. The data obtained from the screening authorities included data on (1) whether the particular woman had been invited for a follow-up screening round (some women were not invited because they had moved out of the region or had died), (2) whether a mammogram had been obtained, and (3) whether a woman had cancelled her appointment because of legitimate reasons (recently had a mammogram, or recently been treated for breast cancer). The names and addresses of 60 respondents could not be matched to those from the screening authorities. Due to administrative reasons, in one region, data could not be obtained about attendance in the third round. The present study, therefore, includes data about actual screening history during three rounds of screening for 2039 women, whereas attendance data from two rounds of screening is available for 2597 women.

Questionnaires

The socio-demographic variables in our study included *age*, *education*, *employment status*, and *marital status*. To establish *family history* of breast cancer, women were asked to indicate whether they had a mother or sister with breast cancer. *Familiarity with breast cancer* was measured by asking the women whether they knew (or had known) someone close who has had breast cancer. Women were also asked whether they performed *breast self-examination* (BSE), and if so, how often.

Response options ranged from 'never (1)' to 'more than once every month (5)'. The answers were dichotomised into a new variable: regular performance of BSE. This variable was coded 1 if the women performed BSE at least once a month and was coded 0 if the women did not perform BSE, or only on an occasional basis. Finally, *fear of breast cancer* was measured with an adapted version of the fear of cancer questionnaire (Boer and Seydel, 1996). In the adapted 8-item version of the scale ($\alpha = 0.92$), women were asked to indicate the extent to which negative emotions were aroused by four hypothetical situations: reading an article about breast cancer; viewing a TV-programme about breast cancer; hearing that an acquaintance has got breast cancer; and receiving an invitation for a breast examination. For each situation, women were asked to indicate on a 4-point scale, ranging from 1 (not at all) to 4 (very much), the extent to which the given situation caused nervousness and/or anxiety.

Intention was measured regarding participation in the next screening round and in all subsequent screening rounds. Response options varied from 'definitely intend not to participate (-2)' to 'definitely intend to participate (2)'. Because the items were highly inter-correlated ($r = 0.88$), mean scores were computed. *Attitude* towards screening was measured with a 3-item scale (Cronbach's $\alpha = 0.73$). An example of an attitude item is: 'For me, participating in the coming round of breast cancer screening would be useful (2) ... useless (-2)'. *Benefits* were measured by a 3-item scale ($\alpha = 0.67$). An example of a benefits item is: 'If I would participate in the screening programme and any abnormality was found, the possibility of breast conserving treatment would be higher' (fully disagree (1) ... fully agree (5)). *Costs* were measured with a 5-item scale ($\alpha = 0.55$). An example of a cost item is: 'When having a mammogram, you are exposed to a dangerous dose of x-rays' (fully disagree (1) ... fully agree (5)). *Subjective norm* was measured with a single item: 'Most people think that I definitely should (2) ... definitely should not (-2) participate in the coming round of breast cancer screening'. Based on the work of Fischbein and Ajzen (1975), subjective norms were also measured indirectly by means of *normative beliefs* and *motivations to comply*. Six significant others were selected, namely partner, children, family/friends, peers, family doctor, and the organisation that sends the mammography invitations. An example of a normative belief question is: 'My partner thinks that I certainly should (2) ... should not (-2) participate'. An example of a motivation to comply question is: 'When it comes to early detection behaviour, I do strongly (3) ... do not (0) comply with the opinion of my partner'. Indirect subjective norm was established by computing the mean of the products of normative beliefs and motivation to comply ($\alpha = 0.80$). Finally, *perceived behavioural control* was measured directly with a single question: 'I consider myself fully capable (4) ... fully incapable (1) of participating in the next screening round'. Perceived control was also measured indirectly by seven items about the difficulties the women expected with several practical and psychological aspects of screening attendance ($\alpha = 0.78$). Examples of such expected difficulty items are: 'Getting to the screening unit is not at all difficult (1) ... very difficult (4) for me', and 'Because the screening might be painful, participating is not at all difficult (1) ... very difficult (4) for me'.

Statistical Analysis

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS). Comparisons between attendees and non-attendees were made for cognitive

determinants, personal background variables, and first round experiences, using multi-variate (MANOVA) and univariate (ANOVA) analyses of variance. Relationships between variables were assessed with Pearson correlation coefficients. Multiple regression analysis was used to predict intention to attend at subsequent screening rounds. Linear logistic regression analysis was used to predict actual attendance. In all cases, correlations and differences between groups were tested two-tailed and αs were set at 0.05.

RESULTS

Descriptive Results

Background Variables of Women in the Study Group

Of the total group of women, 78% were married ($n = 2024$) and 22% were single, divorced, or widowed ($n = 579$). Most of the women (85%) were housewives (2149), while 10% of the women were part-time employed ($n = 304$), and 5% were full-time employed ($n = 135$). 68% of the women had a lower level of education ($n = 1677$), while 25% had a medium level of education ($n = 635$), and 7% had a higher level of education ($n = 180$). The mean age of the women measured at baseline was 58.3 years. Of the women, 67% knew someone close who had been treated for breast cancer ($n = 1698$), while 11% had a mother or sister treated for breast cancer ($n = 282$). 33% said that they performed breast self examination at least every month ($n = 839$). The mean 'fear of breast cancer' score was 1.8, indicating that the women were, in general, not too anxious about breast cancer.

Actual Attendance Rates in Second and Third Screening Round

Of all the women who filled out a baseline questionnaire and were invited for second round screening, 92% (2319/2532) actually attended. Of the women who filled out baseline measurement and were invited for third screening round, 91% (1582/1743) attended. The data from the screening authorities revealed that 17% of the non-attendees in the second round (37/213) and 13% of non-attendees in the third round (19/161), had cancelled their appointments due to 'legitimate' reasons: they either had a recent mammogram, or had been recently treated for breast disease. If women with legitimate reasons for non-attendance were excluded, the attendance rates amounted to 93% (2319/2495) for second screening round, and 92% (1582/1724) for third screening round.

Differences Between Attendees and Non-Attendees in Second and Third Screening Round

Personal (Background) Variables of Attendees and Non-attendees in First, Second, and Third Screening Round

In Table I, the scores on personal (background) variables for attendees and non-attendees in first, second, and third screening rounds are shown. The results revealed that being single was significantly associated with non-attendance in first ($\chi^2 = 5.5$,

TABLE I Personal background variables of attendees and non-attendees in the first, second, and third screening round

	1st screening round[a]		2nd screening round[b]		3rd screening round[c]	
	Attended (n = 2457)	Did not attend (n = 86)	Attended (n = 2313)	Did not attend (n = 176)	Attended (n = 1576)	Did not attend (n = 142)
Marital status (% married)	78%	68%*	79%	64%***	79%	70%*
Education low	68%	55%	68%	66%	65%	74%
medium	25%	31%	25%	26%	28%	21%
high	7%	7%*	7%	9%	7%	5%
Mean age at baseline (in years)	58.3	59.6*	58.2	59.6***	57.4	57.8
Experience with BC in environment (% yes)	67%	65%	68%	67%	67%	61%
Family history of BC (% yes)	11%	14%	11%	13%	11%	7%
Regular performance of BSE (% yes)	33%	41%	33%	39%	33%	44%**
Fear of breast cancer[d]	1.7	1.7	1.7	1.7	1.7	1.8*

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; [a]Women who had legitimate reasons for not participating (e.g. recent mammogram) were excluded from analyses; [b]Women who were not invited for second screening round and women who had legitimate reasons for not participating were excluded from analyses; [c]Women who were not invited for third screening round and women who had legitimate reasons for not participating were excluded from analyses; [d]Fear of breast cancer scale (minimum = 1; maximum = 4).

d.f. = 1, $p < 0.05$), second ($\chi^2 = 22.2$, d.f. = 1, $p < 0.001$) as well as third round screening ($\chi^2 = 5.5$, d.f. = 1, $p < 0.05$). Higher education was associated with non-attendance in first round screening ($\chi^2 = 6.6$, d.f. = 2, $p < 0.05$). Older women were less likely to attend (significant effect in first and second round). Women who failed to attend third round screening were more likely to perform regular breast self examination than women who attended the third screening round ($\chi^2 = 6.2$, d.f. = 1, $p < 0.01$), and had higher scores at baseline on the fear of breast cancer scale.

TPB Scores of Attendees and Non-attendees in Second and Third Screening Round

The overall scores on the TPB variables (Table II) were rather skewed. A large majority of women (85–88%) strongly intended to attend the subsequent screening round(s). Nearly all women considered participation as being 'good', 'wise', and 'useful'. Most respondents felt that breast cancer was a very serious disease and most felt to a certain extent susceptible to breast cancer. Also, most women felt encouraged by their social environment to (re-)attend and considered attending to be not too difficult. Table II shows that nearly all of the obtained cognitions were able to discriminate significantly between attendees and non-attendees in subsequent screening rounds. In other words: even 2 or 4 years in advance, non-attendees in second and third screening round had significantly less positive thoughts about future attendance than did attendees.

Prediction of Actual Attendance in Second and Third Screening Rounds

The univariate intercorrelations between the components of the model were examined (see Table III). As the TPB predicts, intention was significantly correlated to all of the determinants measured. However, only the correlations with direct attitude ($r = 0.60$),

TABLE II   Cognitive variables of attendees and non-attendees in the second and third screening round

	Overall mean scores and standard deviations		Mean scores by attendance at 2nd screening round[a]		Mean scores by attendance at 3rd screening round[b]	
			Attended (n = 2289)	Did not attend (n = 174)	Attended (n = 1558)	Did not attend (n = 138)
Intention (−2/+2)	1.8	(0.60)	1.9	1.2***	1.9	1.2***
Direct attitude (−2/+2)	1.8	(0.51)	1.9	1.5***	1.9	1.5***
Benefits (1/5)	4.3	(0.90)	4.4	4.1**	4.4	4.1***
Costs (1/5)	1.9	(0.80)	1.9	2.3***	1.9	2.3***
Direct subjective norm (−2/2)	1.4	(0.79)	1.5	1.2***	1.5	1.1***
Norm. bel* motiv to comp (−6/6)	2.7	(1.72)	2.8	1.9***	2.9	2.1***
Perceived control (−2/+2)	1.7	(0.60)	1.8	1.2***	1.8	1.2***
Expected difficulties (1/4)	1.2	(0.31)	1.1	1.4***	1.1	1.4***
			$F_{multiv}(10, 2214) = 25.5$, $p < 0.001$		$F_{multiv}(10, 1533) = 20.6$, $p < 0.001$	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; [a]Women who were not invited for second screening round and women who had legitimate reasons for not participating were excluded from analyses; [b]Women who were not invited for third screening round and women who had legitimate reasons for not participating were excluded from analyses.

TABLE III   Relationships between the cognitive determinants (Pearson's correlations)

		2	3	4	5	6	7	8
1	Intention	0.60	0.14	−0.20	0.20	0.19	0.49	−0.38
2	Direct attitude	–	0.15	−0.16	0.13	0.13	0.32	−0.27
3	Benefits		–	–	0.09	0.16	0.15	–
4	Costs			–	–	–	−0.16	0.42
5	Direct subjective norm				–	0.39	0.16	−0.08
6	Norm. bel* motiv to comp					–	0.16	−0.08
7	Perceived control						–	−0.34
8	Difficulties							–

Correlations with $p > 0.001$ are not shown.

perceived control ($r = 0.49$), and expected difficulties ($r = -0.38$) were > 0.30, indicating moderate to strong correlations.

Multiple regression analysis revealed that intention to participate could be significantly predicted by the TPB variables ($F(9, 2164) = 227.5$, $p < 0.001$; $R^2 = 48.6\%$). Significant independent predictors with considerable β weights were: direct attitude ($\beta = 0.42$, $p < 0.001$); perceived control ($\beta = 0.29$, $p < 0.001$); and expected difficulties ($\beta = -0.20$, $p < 0.001$).

A series of hierarchical logistic regression analyses was performed to assess the relative importance of the various variables on attendance in second and third screening rounds. Results are summarised in Table IV.

The first analysis was aimed to predict attendance in the second screening round. In the first block, all the TPB variables were entered as predictor variables. As predicted by the theory, intention was revealed to be the best significant predictor of actual attendance ($OR = 2.1$, $p < 0.001$). However, expected difficulties, as well as indirect social norm, remained significant independent predictors of behaviour, alongside intention, indicating that the influence of these variables was not fully mediated by intention. In the second block, age, education, and marital status were entered: marital

TABLE IV   Logistic regression analysis to predict attendance in the second and third screening round

Variables entered on step number...	Second round attendance		Third round attendance	
	Significant predictors	OR	Significant predictors	OR
1 TPB variables	Intention	2.1***	Intention	1.9***
	Expected difficulties	0.5**	Expected difficulties	0.4***
	Norm bel* motiv to comply	1.2**	Perceived control	1.5**
	Nagelkerke's $R^2 = 0.15$		Nagelkerke's $R^2 = 0.18$	
2 Sociodemographics[a]	Intention	2.1***	Intention	1.9***
	Expected difficulties	0.5*	Expected difficulties	0.04***
	Norm bel* motiv to comply	1.2*	Perceived control	1.5**
	Marital status	1.6*		
	Nagelkerke's $R^2 = 0.16$		Nagelkerke's $R^2 = 0.18$	
3 Previous attendance[b]	Attendance round 1	8.3***	Attendance round 2	15.0***
	Intention	1.8**	Attendance round 1	4.3*
	Marital status	1.7*	Perceived control	1.5*
	Nagelkerke's $R^2 = 0.20$		Nagelkerke's $R^2 = 0.32$	

$*p < 0.05$; $**p < 0.01$; $***p < 0.001$; [a]only age, education, and marital status were included since these were the only variables that were univariately associated with participation in more than one occasion (see Table III); [b]In the analysis to explain second round attendance, first round attendance was entered in this step. In the analysis to explain second round attendance, both first round attendance and second round attendance were entered in this step.

status was shown to have a significant contribution to the prediction of second round attendance (OR = 1.6, $p = 0.03$). In the final block, past behaviour (attendance in first round) was entered. This factor was revealed to be the best predictor of second round screening attendance (OR = 11.3, $p < 0.001$) and absorbed the variance explained by expected difficulties and indirect social norms. In summary, the most important predictors of attendance in second screening round were: attendance in first round; intention to re-attend and having a partner. It was noted, however, that the effect sizes were small, with a maximum value of Nagelkerke's R^2 of 0.20.

A similar logistic regression analysis was performed to predict attendance in the third screening round. When all the TPB variables were entered, intention was the most important predictor of third round attendance. Expected difficulties and perceived control were both significant, independent predictors of third round attendance. Inclusion of socio-demographics (block 2) could not improve the prediction of third round attendance. The final step, in which past behaviour was entered, revealed that both second and first round attendance were significant predictors of third round attendance. These variables absorbed the influence of nearly all factors that were previously included, except perceived control. In summary, the most important predictors of attendance in third screening round were: previous attendance and perceived control. Effect sizes were, however, rather small, with a maximum value of Nagelkerke's R^2 of 0.32.

Prediction of Maintenance: Consistent Attendees versus Dropouts

Within the subgroup of first round attendees, we examined whether the TPB variables were able to predict a consistent pattern of attendance. Table V shows the mean of the cognitions of consistent attendees versus dropouts in screening rounds two and three.

Significant differences with $p < 0.001$ existed between consistent attendees and dropouts on four TPB variables, in both the second and third screening rounds. In comparison to consistent attendees, dropouts had a lower intention to participate, perceived more costs involved in participation, had a lower level of perceived control, and expected more difficulties. Logistic regression analysis revealed that consistent attendance in the second round could be significantly predicted by the TPB variables (Model $\chi^2(8, 2252) = 42.7$, $p < 0.001$; Nagelkerke's $R^2 = 0.06$). Intention to attend (OR = 1.5, $p = 0.04$), indirect social norms (OR = 1.2, $p = 0.009$), and expected difficulties (OR = 0.4, $p = 0.001$) were independent, significant predictors of consistent attendance.

Consistent attendance in the third round could be significantly predicted by the TPB variables (Model $\chi^2(8, 1554) = 46.2$, $p < 0.001$; Nagelkerke's $R^2 = 0.08$). Intention to attend (OR = 1.9, $p = 0.007$), perceived control (OR = 1.5, $p = 0.013$), and expected difficulties (OR = 0.53, $p = 0.048$), were significant predictors. In summary, although consistent attendance could be explained significantly by the TPB variables, the percentages of explained variances in both rounds two and three were very small.

Prediction of Initiation of Behaviour: Consistent Refusal versus Delayed Attendance

Within the group of first round non-attendees, we examined whether the TPB variables were able to predict delayed attendance. Table VI shows the mean of the cognitions of consistent refusers *versus* delayed attendees in screening rounds two and three.

In screening round two, several significant differences existed between consistent refusers and delayed attendees. In comparison to consistent refusers, delayed attendees held more positive intentions, had a more positive attitude, perceived fewer costs, experienced more indirect social influence, reported more perceived control, and expected fewer difficulties. In screening round three, almost the same pattern of means was found, but with less statistical significance, possibly due to the limited number of observations. Logistic regression analysis revealed that delayed attendance in the second round could be significantly predicted by the TPB variables (Model $\chi^2(8, 65) = 32.8$, $p < 0.001$; Nagelkerke's $R^2 = 0.53$). Intention to attend (OR = 2.4, $p = 0.03$) and fewer perceived costs (OR = 0.3, $p = 0.014$) were significant predictors of delayed attendance. Consistent attendance in the third screening round could not

TABLE V   Means and differences in cognitive variables between women who attended consistently and women who dropped out in the second or third screening round

	2nd screening round		3rd screening round	
	Consistent attendees (n = 2254)	Dropouts (n = 121)	Consistent attendees (n = 1537)	Dropouts (n = 100)
Intention	1.9	1.6***	1.9	1.5***
Direct attitude (−2/+2)	1.9	1.8	1.9	1.7**
Benefits (1/5)	4.4	4.3	4.4	4.3
Costs (1/5)	1.9	2.1***	1.9	2.2***
Direct subjective norm (−2/2)	1.5	1.3*	1.5	1.3*
Norm. bel* motiv to comp (−6/6)	2.8	2.2***	2.9	2.4**
Perceived control (−2/+2)	1.8	1.6***	1.8	1.5***
Expected difficulties (1/4)	1.1	1.3***	1.1	1.3***
	$F_{\text{multiv}}(8, 2243) = 7.4$, $p < 0.001$		$F_{\text{multiv}}(8, 1545) = 8.8$, $p < 0.001$	

TABLE VI Means and differences in cognitive variables between women who consistently refused attendance and delayed attendees

	2nd screening round		3rd screening round	
	Consistent refusers (n=53)	Delayed attendees (n=35)	Consistent refusers (n=38)	Delayed attendees (n=21)
Intention	−0.1	1.0***	0.1	0.7
Direct attitude (−2/+2)	0.6	1.5***	0.8	1.4
Benefits (1/5)	3.7	4.2	3.6	4.3*
Costs (1/5)	2.7	2.1**	2.7	2.1*
Direct subjective norm (−2/2)	0.8	1.1	0.7	0.9
Norm. bel* motiv to comp (−6/6)	1.1	2.4***	1.2	1.8
Perceived control (−2/+2)	0.4	1.2**	0.6	1.1
Expected difficulties (1/4)	1.8	1.3***	1.8	1.4*
	$F_{multiv}(8, 56) = 4.2, p < 0.001$		$F_{multiv}(8, 34) = 1.3$, n.s.	

be significantly predicted by the TPB variables (Model $\chi^2(8, 43) = 13.9$, $p = 0.08$; Nagelkerke's $R^2 = 0.37$). This might be due to small numbers.

DISCUSSION

The underlying reason for initiating the present longitudinal study was that early experimental programmes with breast screening in specific test regions had revealed that inconsistent attendance or dropout formed a serious threat to the effectiveness of breast cancer screening. However, actual re-attendance rates in subsequent screenings were higher than expected at the start of our study. Of the respondents in the present study, nearly 96% attended the first screening, 92% attended the second screening, and 91% attended the third screening. This phenomenon of higher actual re-attendance rates was not only observed in our sample, but existed throughout the Netherlands (Fracheboud et al., 1998, 2001). The attendance rates achieved in our sample were higher than the reported national attendance rates for the first and subsequent screening rounds (Fracheboud et al., 1998). This indicates that a response bias might have occurred (women who decline screening also decline questionnaires about this screening). Such response bias seems to be inevitable, and has been reported in previous studies (Fallowfield et al., 1990; Norman and Fitter, 1991; Scaf-Klomp et al., 1997; Burton et al., 1998). The response bias may have led to a somewhat over-optimistic picture with respect to women's attitudes to breast cancer screening. The dropout-rates (percentage of non-attendance among previous participants) in our sample are in line with available national data. National dropout-rates among previous attendees are about 9% (Fracheboud et al., 1998). From national data it is known that at least 15–20% of the drop-outs have cancelled their appointments because of legitimate reasons, e.g. recent mammography or being under treatment or supervision for breast disease (Fracheboud et al., 1998). This means that the national net dropout-rates are somewhere between 7 and 8%. In our study, 5% of first round attendees did not return for second screening without legitimate reason and 6% did not attend the third screening. Dropout rates in the sample are still about 2% lower than the national data. Despite the high re-attendance rates in our sample, the large number of women involved in the baseline measurement provided us with baseline data for a considerable number of non-attendees in subsequent screening rounds.

With regard to the role of demographic variables in screening (re-)attendance, it was found that younger women were more likely to attend than elderly women (significant effect in first and second round). This confirms the results from previous studies (Haiart et al., 1990; Mah and Bryant, 1997). Marital status was, in line with previous studies (Vaile et al., 1993; Mah and Bryant, 1997; Aro et al., 1999; Michielutte et al., 1999; Rutter, 2000), significantly associated with better attendance in first screening round, and also in second and third rounds. Higher education level was a predictor for non-attendance in first screening round, but was not associated with non-attendance in second and third screening. This result is in accordance with the finding that in countries where (nationwide) screening programmes are strictly organised, and women in the target group receive personal invitations that include fixed appointments, either no relation exists (Calnan, 1984; Maclean et al., 1984; Sutton et al., 1994; Burton et al., 1998) or higher education is associated with poorer adherence (Rutledge et al., 1988; Rutter, 1997; Aro et al., 1999).

The influence of the personal variables related to breast cancer (family history, breast cancer in someone close, regular BSE, and fear of breast cancer) was very limited. Although statistically significant in some instances, the established differences between attendees and non-attendees on personal variables were all very small (explained variance <1% for any of the variables). It can be concluded that in organised screening, personal background variables do not influence repeat attendance.

Predicting Attendance in Subsequent Screening Rounds with TPB-variables

In this study, 49% of the variance in intention to (re-)attend could be explained by the TPB variables. This amount of explained variance is comparable to the results from other studies using the TPB (Godin and Kok, 1996). Whereas intention to re-attend could be adequately predicted by the TPB variables, prediction of actual attendance was less successful. Non-attendees in the second and third screening round differed from attendees in the second and third screening round on all cognitive determinants assessed in the baseline measurement. However, the TPB variables only explained 15 and 18% of the variance in attendance behaviour in screening rounds two and three, respectively. This is less than the 20–40% generally found in studies examining health behaviour with the TPB (Godin and Kok, 1996; Conner and Armitage, 1998), but is comparable to some previous studies considering breast preventive behaviours (McCaul et al., 1993; Sutton, 1998) and health screening behaviour (Sheeran et al., 2001).

An interesting finding was that both the direct measure of perceived control (operationalised as: 'do you consider yourself capable of attending'), and perceived difficulties, independently contributed to the prediction of attendance behaviour. This suggests that both variables represent two different underlying constructs. The relatively low correlation between perceived control and perceived difficulties ($r = 0.34$) underlines this assumption. Women might consider themselves capable of re-attending, yet at the same time consider attending to be difficult. Other authors have shown that perceived control and perceived self-efficacy refer to different cognitions (Trafimow et al., 2002). In a recent review, Ajzen (2002, p. 16) concludes that "the overarching concept of perceived behavioural control (…) is comprised of two components: self-efficacy (dealing largely with the ease or difficulty of performing the behaviour) and controllability (the extent to which the performance is up to the actor)".

Maintenance of behaviour, i.e. consistent attendance within the group of first round attendees, was difficult to predict. Although the TPB variables predicted re-attendance significantly, the total amount of explained variance was very small (6 and 8%). Delayed attendance, defined as later attendance among first round non-attendees, could be better explained by the TPB variables (53 and 37% explained variance for rounds two and three, respectively). Intention and perceived costs were independent predictors of delayed attendance. Sheeran *et al.* (2001) concluded in their study that the TPB could not distinguish among consistent, dropout, and delayed patterns of attendance. This finding may have been caused by the fact that in the study of Sheeran *et al.*, attendance patterns referring to maintenance behaviour and initiation behaviour were analysed in one single discriminant analysis. In the present study, separate analyses were made of the determinants of maintenance of behaviour (consistent attendance *versus* dropouts) and the determinants of the initiation of behaviour (consistent refusal *versus* delayed attendance). The results from these analyses suggest that TPB variables are not relevant for maintenance behaviour, but are indeed relevant for the initiation of behaviour.

Another interesting result of this study is the role of past attendance in the prediction of future attendance. Since attendance at breast screening is only relevant once every few years, it is unlikely that the behaviour becomes habitual. We would therefore have expected that any influence of past behaviour on future behaviour would be mediated by beliefs and intentions. However, the results from our study suggest a strong residual influence of previous attendance on future attendance. Similar results were found in two other prospective studies concerning repeat attendance in organised breast screening in the Netherlands (Lechner *et al.*, 1997) and in the UK (Rutter, 2000). Two notable findings in this respect were that attendance in third round screening (after 4 years from baseline) could be even better predicted than attendance in second round (32 *versus* 22% explained variance), and that the relative importance of cognitions (including intention) was lower in third round than in second round. This suggests that in subsequent rounds of organised breast screening, a woman does not have to rethink her reasons or objections towards attending. The uniformity of the screening and invitation procedures in the well-established Dutch and British screening programmes stimulates women to simply execute a decision that has been made previously.

The practical implication for health educators that can be drawn from this study is that attempts to improve first round screening attendance should be continued. Once a woman has decided to attend once, she is likely to return for subsequent screenings. On the other hand, women who have not participated in the first round of screening are not automatically lost to the programme: they might be persuaded to participate in later screening rounds. In order to improve (initial) attendance in breast screening, interventions should focus on women's attitudes towards screening, their perceived behavioural control, and the difficulties they expect with attending, since these factors were found to be important in explaining both intentions and actual behaviour. To promote re-attendance, the positive decision to attend on previous occasions could be reinforced in the invitation letter. Careful evaluations of such interventions are required to reveal whether any changes in intentions and behaviour are mediated by TPB components. This will contribute to our knowledge about the predictive value of the model and its usefulness in designing behaviour change interventions (Hardeman *et al.*, 2002).

Acknowledgements

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, **50**, 179–211.

Ajzen, I. (2002). Perceived behavioural control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, **32**, 665–683.

Armitage, C.J. and Conner, M. (2001). Efficacy of the theory of planned behaviour: a meta-analytic review. *British Journal of Social Psychology*, **40**, 471–499.

Aro, A.R., de Koning, H.J., Absetz, P. and Schreck, M. (1999). Psychological predictors of first attendance for organised mammography screening. *Journal of Medical Screening*, **6**, 82–88.

Bandura, A. (1991). Self-efficacy mechanism in physiological activation and health-promoting behavior. In: Madden, J., Matthysse, S. and Barchas, J. (Eds.), *Adaptation, Learning, and Affect*, pp. 226–269. Raven, New York.

Boer, H. and Seydel, E.R. (1996). Protection motivation theory. In: Conner, M. and Norman, P. (Eds.), *Predicting Health Behaviour*, pp. 95–120. Open University Press, Buckingham.

Braithwaite, D., Sutton, S. and Steggles, N. (2002). Intention to participate in predictive genetic testing for hereditary cancer: the role of attitude toward uncertainty. *Psychology and Health*, **17**, 761–772.

Burton, M.V., Warren, R., Price, D. and Earl, H. (1998). Psychological predictors of attendance at annual breast screening examinations. *British Journal of Cancer*, **77**, 2014–2019.

Calnan, M. (1984). The health belief model and participation in programmes for the early detection of breast cancer: a comparative analysis. *Social Science and Medicine*, **19**, 823–830.

Cockburn J., Schofield, P., White, V., Hill, D. and Russell, I. (1997). Predictors of returning for second round screening at a population based mammographic screening programme in Melbourne, Australia. *Journal of Epidemiology and Community Health*, **51**, 62–66.

Conner, M. and Armitage, C.J. (1998). Extending the theory of planned behavior: a review and avenues for further research. *Journal of Applied Social Psychology*, **28**, 1429–1464.

Drossaert, C.H.C., Boer, H. and Seydel, E.R. (2001). Does mammographic screening and a negative result affect attitudes towards future breast screening? *Journal of Medical Screening*, **8**, 204–212.

Fallowfield, L.J., Rodway, A. and Baum, J. (1990). What are the psychological factors influencing attendance, non-attendance and re-attendance at a breast screening centre? *Journal of the Royal Society of Medicine*, **83**, 547–551.

Fishbein M. and Ajzen, I. (1975). *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Addison Wesley, Reading Mass.

Fracheboud, J., de Koning, H., Beemsterboer, P.M.M., Boer, R., Hendriks, J.H.C.L., Verbeek, A.L.M., Van Ineveld, B.M., De Bruyn, A.E. and Van der Maas, P.J. (1998). Nation wide breast cancer screening in the Netherlands: results of initial and subsequent screening 1990–1995. *International Journal of Cancer*, **75**, 694–698.

Fracheboud, J., de Koning, H.J., Boer, R., Groenewoud, J.H., Verbeek, A.L.M., Broeders, M.J.M., Van Ineveld, B.M., Hendriks, J.H.C.L. and De Bruyn, A.E. (2001). Nationwide breast cancer screening programme fully implemented in the Netherlands. *The Breast*, **10**, 6–11.

Godin, G. and Kok, G. (1996). The theory of planned behavior: a review of its applications to health related behaviors. *American Journal of Health Promotion*, **11**, 87–97.

Godin, G., Gagné, C., Maziade, J., Moreault, L., Beaulieu, D. and Morel, S. (2001). Breast cancer: the intention to have a mammography and a clinical breast examination. Application of the theory of planned behavior. *Psychology and Health*, **16**, 423–441.

Haiart, D.C., McKenzie, L., Henderson, J., Pollock, W. and McQueen, D.V. (1990). Mobile breast screening: factors affecting uptake, efforts to increase response and acceptability. *Public Health*, **104**, 239–247.

Halabi, S., Skinner, C.S., Samsa, G.P., Strigo, T.S., Crawford, Y.S. and Rimer B.K. (2000). Factors associated with repeat mammography screening. *Journal of Family Practice*, **49**, 1104–1112.

Hardeman, W., Johnston, M., Johnston, D.W., Bonetti, D., Wareham, N.J. and Kinmonth, A.L. (2002). Application of the theory of planned behaviour in behaviour change interventions: a systematic review. *Psychology and Health*, **17**, 123–158.

Janz, N.K. and Becker, M.H. (1984). The health belief model: a decade later. *Health Education Quarterly*, **11**, 1–47.

Lagerlund, M., Hedin, A., Sparén, P., Thurffjell, E. and Lambe, M. (2000). Attitude, beliefs and knowledge as predictors of non-attendance in a Swedish population based mammography screening program. *Preventive Medicine*, **31**, 417–428.

Lechner, L., de Vries, H. and Offermans, N. (1997). Participation in a breast cancer screening program: influence of past behavior and determinants of future screening participation. *Preventive Medicine*, **26**, 473–482.

Lerman, C., Rimer, B., Trock, B., Balshem, A. and Engstrom, P.F. (1990). Factors associated with repeat adherence to breast cancer screening. *Preventive Medicine*, **19**, 279–290.

Maclean, U., Sinfield, D., Klein, S. and Harnden, B. (1984). Women who decline breast screening. *Journal of Epidemiology and Community Health*, **38**, 278–283.

McCaul, K.D., Sandgren, A.K., O'Neill, H.K. and Hinsz, V.B. (1993). The value of the theory of planned behavior, perceived control, and self-efficacy expectations for predicting health-protective behaviors. *Basic and Applied Social Psychology*, **14**, 231–252.

Mah, Z. and Bryant, H.E. (1997). The role of past mammography and future intentions in screening mammography usage. *Cancer Detection and Prevention*, **21**, 213–20.

Marshall, G.A (1994). A comparative study of re-attenders and non-re-attenders for second triennial national breast cancer screening program appointments. *Journal of Public Health Medicine*, **16**, 79–86.

Michielutte, R., Dignan, M.B. and Smith, B.L. (1999). Psychosocial factors associated with the use of breast cancer screening by women age 60 years or over. *Health Education and Behaviour*, **26**, 625–47.

Montano, D.E. and Taplin, S.H. (1991). A test of an expanded theory of reasoned action to predict mammography participation. *Social Science and Medicine*, **32**, 733–741.

Norman, P. and Fitter, M. (1991). Predicting attendance at health screening: organisational factors and patients' health beliefs. *Counselling Psychology Quarterly*, **4**, 143–155.

Otten, J.D.M., van Dijck, J.A.A.M., Peer, P.G.M., Straatman, H., Verbeek, A.L.M., Mravunac, M., Hendriks, J.H.C.L. and Holland, R. (1996). Long-term breast cancer screening in Nijmegen, The Netherlands: the nine rounds from 1975–92. *Journal of Epidemiology and Community Health*, **50**, 353–358.

Powel-Cope, G.M., Lierman, L.M., Kasprzyk, D., Young, H.M. and Benoliel, J.Q. (1991). The theory of reasoned action in prediction of breast self-examination: a comparison of two studies. *Health Care for Women International*, **12**, 51–61.

Ronis, D.L., Yates, F.J. and Kirscht, J.P. (1989). Attitudes, decisions and habits as determinants of repeated behavior. In: Pratkanis, A.R., Breckler, S.J. and Greenwald, A.G. (Eds.), *Attitude, Structure and Function*, pp. 213–239. Hillsdale, Erlbaum, N.J.

Rothman, A. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology*, **19**(1, Suppl.), 64–69.

Rutledge, D.N., Hartman, W.H., Kinman, P.O. and Winfield, A.C. (1988). Exploration of factors affecting mammography behaviors. *Preventive Medicine*, **17**, 412–422.

Rutter, D.R. (1997). Predicting re-attendance in the second round of the UK National Breast Screening Programme: a prospective 3-year longitudinal analysis. *The Breast*, **6**, 120–125.

Rutter, D.R. (2000). Attendance and re-attendance for breast cancer screening: a prospective 3-year test of the theory of planned behaviour. *British Journal of Health Psychology*, **5**, 1–13.

Scaf-Klomp, W., Van Sonderen, E. and Van Den Heuvel, W. (1997). Compliance after 17 years of breast cancer screening: factors associated with re-attendance for periodic breast screening. *European Journal of Public Health*, **7**, 182–187.

Sheeran, P. (2002). Intention-behavior relations: a conceptual and empirical review. In: Stroebe, W. and Hewstone, M. (Eds.), *European Review of Social Psychology*, pp. 1–36. Wiley, Chichester.

Sheeran, P., Conner, M. and Norman, P. (2001). Can the theory of planned behavior explain patterns of health behavior change? *Health Psychology*, **20**, 12–19.

Sutton, S., Bickler, G., Sancho Aldridge, J. and Saidi, G. (1994). Prospective study of predictors of attendance for breast screening in inner London. *Journal of Epidemiology and Community Health*, **48**, 65–73.

Sutton, S. (1998). Predicting and explaining intentions and behaviour: how well are we doing? *Journal of Applied Social Psychology*, **28**, 1317–1338.

Tabar, L., Fagerberg, G., Duffy, S.W. and Day, N.E. (1989). The Swedish two county trial of mammographic screening for breast cancer: recent results and calculation of benefit. *Journal of Epidemiology and Community Health*, **43**, 107–114.

Taylor, V., Taplin, S., Urban, N., White, E. and Peacock, S. (1995). Repeat mammography use among women ages 50–75. *Cancer Epidemiology, Biomarkers and Prevention*, **4**, 409–413.

Trafimow, D., Sheeran, P., Conner, M. and Finlay, K.A. (2002). Evidence that perceived behavioural control is a multidimensional construct: perceived control and perceived difficulty. *British Journal of Social Psychology*, **41**, 101–121.

Vaile, M.S.B., Calnan, M., Rutter, D.R. and Wall, B. (1993). Breast cancer screening services in three areas: uptake and satisfaction. *Journal of Public Health Medicine*, **15**, 37–45.

Williams, E.M.I. and Vessey, M.P. (1990). Compliance with breast cancer screening achieved by the Aylesbury Vale mobile service 1984–1988. *Journal of Public Health Medicine*, **12**, 51–55.

Woodman, C.B.J. and Threlfall, A.G. (2001). NHS breast screening programme: compliance over successive screening rounds. *Journal of Medical Screening*, **8**, 161–162.