

# Comparing Two Theories of Health Behavior: A Prospective Study of Noncompletion of Treatment Following Cervical Cancer Screening

Sheina Orbell and Martin Hagger  
University of Essex

Val Brown and John Tidy  
Sheffield University Hospitals Trust

Some women receiving abnormal cervical screening tests do not complete recommended treatment. A prospective study ( $N = 660$ ) investigated the value of conceptualizing attendance at colposcopy for treatment as either (a) an active problem-solving response to a health threat, motivated by attitudes toward an abnormal result, as implied by self-regulation theory (H. Leventhal, D. Meyer, & D. Nerenz, 1980); or (b) as a behavior motivated by attitudes toward clinic attendance, as implied by the theory of planned behavior (TPB; I. Ajzen, 1985). Responses to questionnaires containing variables specified by these models were used to predict women's subsequent attendance or nonattendance for treatment over the following 15 months. Although the TPB offered superior prediction of intentions and completion of treatment, discriminant function analyses showed that consideration of both models was important in distinguishing between those who attended all their appointments as scheduled, attended after being prompted, or ceased attending. Implications for measurement and theory in health protection are discussed.

*Keywords:* self-regulation theory, theory of planned behavior, cervical cancer, colposcopy, prospective study

Worldwide, cancer of the cervix accounts for approximately 10% of all new cases of cancer in women (about 471,000) and 233,000 deaths, making cervical cancer the second most common cancer among women (Parkin, 2001). There will be an estimated 10,520 new cervical cancer cases in the United States in 2004 (American Cancer Society, 2004). The United Kingdom has a high rate of incidence and mortality from cervical cancer for a developed country, with a rate second only to Denmark within the European Union (Patnick, 2000). Cervical cancer is, however, preventable by cytological screening. Laboratory examination of cells removed from the cervix and smeared onto a slide may identify changes in the epithelium, usually referred to as *cervical intraepithelial neoplasia* (CIN; Richart, 1980). CIN may be classed as mild (1), moderate (2), or severe (3) representing different stages in the probability of progression to invasive cervical cancer (Miller, 2004). These abnormal cells may be excised by a variety of treatment methods. Because screening is primarily directed toward the detection of precursors, the development of invasive cancer should be prevented, reducing not only mortality

but also cancer incidence (Cuzick, 2004). The effectiveness of screening is related to the implementation of organized programs ensuring adequate population coverage. The International Agency for Research on Cancer (IARC Working Group, 1986) estimated that three yearly screenings in women aged 20–64 years would reduce the incidence of cervical cancer by 97% in women with at least one prior negative screen, assuming 100% compliance with the screening schedule.

In the United Kingdom, a nationally funded and locally administered program has offered screening to all women since 1988. A call program invites women to be screened by their primary care practitioner at three yearly intervals, and any required treatment is free at point of delivery. Since the introduction of a call program, the percentage of women screened has increased from an estimated 30–40% to about 85.3%. In England, approximately 3.6 million women are screened each year, of whom about 16% (576,000) are referred to a colposcopy clinic (U.K. Department of Health, 2001). A colposcopist performs an in situ diagnostic examination of the cells on the cervix to determine the nature and extent of precursor lesions (CIN) and to decide upon appropriate treatment and follow-up (Bornstein et al., 1999; Cuzick, 2004). Thus, having received an abnormal initial screening result, a woman may be required to attend a colposcopy clinic on several occasions: first for diagnostic purposes and subsequently for treatment, observation, or even repeat treatment, before being discharged back to the usual screening cycle. However, many women do not attend all of their colposcopy appointments (Khanna & Phillips, 2001). The National Audit Office (1998) reported “did not attend” rates at clinics across the United Kingdom that ranged from 5–20%. Because women with abnormal cervical smears are at risk for progression to cervical cancer, understanding delay and drop out from treatment has considerable importance in promoting the effectiveness of screening to prevent cancer. Missed and repeated appoint-

---

Sheina Orbell and Martin Hagger, Department of Psychology, University of Essex, Essex, United Kingdom; Val Brown and John Tidy, University Section of Reproductive and Developmental Medicine, Sheffield University Hospitals Trust, Sheffield, United Kingdom.

Martin Hagger is now at Department of Psychology, University of Nottingham, Nottingham, United Kingdom.

The present research was supported by Cancer Research U.K. Award CP1048/0101 to Sheina Orbell and John Tidy. We thank Julietta Patnick for her support of the project and Janet Williams for abstracting clinical record data.

Correspondence concerning this article should be addressed to Sheina Orbell, Department of Psychology, University of Essex, Wivenhoe Park, Colchester, Essex, CO4 3SQ United Kingdom. E-mail: sorbell@essex.ac.uk

ments also have economic and efficiency implications for colposcopy clinics and for the National Health Service. The present prospective study evaluates and compares two theoretical approaches to predicting noncompletion of treatment and follow-up after abnormal screening results.

### Theoretical Models of Completion–Noncompletion of Treatment

The decision to attend colposcopy appointments for treatment can be conceptualized as a behavior motivated by self-protection. Two alternative theoretical approaches to understanding the source of motivation to undergo treatment might be derived from consideration of self-regulation theory (Leventhal et al., 1980; Leventhal, Nerenz, & Steele, 1984) and the theory of planned behavior (TPB; Ajzen, 1985). Although the self-regulation model would propose that motivation to attend for treatment of a cervical abnormality might be understood by reference to a person's attitudes toward the cervical abnormality, the TPB would propose that motivation to attend for treatment might be understood by reference to a person's attitudes toward coming to an appointment.

When a woman receives an abnormal smear result, she learns for the first time that she has a potentially health threatening condition. According to self-regulation theory (Leventhal et al., 1980; Leventhal et al., 1984), information about a health threat, be it somatic (i.e., the onset of symptoms) or communicated by a doctor, as in this case, activates a schematic representation of illness, comprising cognitive representations of its symptoms and label (identity), how long it will last (timeline), how serious it is or is likely to become (consequences), what might have caused it (cause), whether it can be treated or controlled (control–cure). Recent operationalizations of the model have distinguished between treatment control and personal control and included the concept of illness coherence (Weinman, Petrie, Moss-Morris, & Horne, 1996). This schematic representation of the health threat is in turn proposed to activate coping responses to modify or deal with the threat. Thus, in the present context the decision to attend clinic appointments for treatment after an abnormal cervical smear result may be viewed as an active problem-solving coping response motivated by a patient's particular cognitive representation of cervical abnormalities.

Self-regulation theory has been studied in a range of health contexts such as diabetes (e.g., Hampson, Glasgow, & Foster, 1995), chronic fatigue syndrome (e.g., Heijmans, 1998), muscular skeletal injuries (e.g., Hagger, Chatzisarantis, Griffin, & Thatcher, in press), asthma (e.g., Horne & Weinman, 2002), osteoarthritis (e.g., Orbell, Johnston, Rowley, Espley, & Davey, 1998), and myocardial infarction (e.g., Petrie, Weinman, Sharpe, & Buckley, 1996). In a recent meta-analytic review of 45 studies, Hagger and Orbell (2003) obtained weighted average correlations ranging from .01 to .27 between illness representations and a range of coping responses. The review also showed that there is a paucity of (a) prospective research, (b) research in patient populations with newly diagnosed as opposed to preexisting chronic conditions, and (c) research concerning active problem-solving coping responses. The present study seeks to address each of these limitations by investigating the ability of illness representations to predict an active coping response in a prospective study of people with a newly diagnosed health threatening condition.

A second, alternative conceptualization of the decision to attend colposcopy appointments for treatment might be derived from the TPB (Ajzen, 1985). According to this approach, the most immediate determinant of behavior is the strength of a person's intention to perform the behavior (e.g., "I intend to do X"). Intentions, in turn, are predicted by attitude, subjective norms, and perceived behavioral control. *Attitude* refers to a person's overall favorable or unfavorable evaluation of her performing the behavior (e.g., "For me, doing X would be good–bad"). *Subjective norm* refers to people's perceptions of social approval for performing the behavior (e.g., "Most people who are important to me think I should do X"). *Perceived behavioral control* comprises Bandura's (1977) concept of self-efficacy (Ajzen, 1988), together with perceptions of control over behavior and refers to a person's appraisal of her ability to perform the behavior (e.g., "For me to do X would be easy–difficult"). Perceived behavioral control is proposed to influence intention formation and, to the extent that perceptions of control accurately reflect the person's actual control over behavioral performance, might also directly affect behavior (Ajzen, 2002). Thus in the present context, the decision to attend clinic appointments is motivated by a person's assessment of how worthwhile or desirable it may be to do so, whether important others approve of her doing so, and whether she feels able to do so.

Meta-analytic reviews indicate that attitudes, subjective norms, and perceived behavioral control are reliable predictors of health-related behavioral intentions and that intentions and perceived behavioral control provide reasonable prediction of behavior, generally accounting for 20–30% variance in prospective studies (e.g., Ajzen, 1991; Armitage & Conner, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Sheeran & Orbell, 1998). A few studies have used the TPB in the context of cervical screening uptake (Bish, Sutton, & Golombok, 2000; Orbell & Sheeran, 1993; Sheeran & Orbell, 2000). Reviews of the literature have suggested that prediction of screening uptake from TPB constructs might be lower than for other types of health behavior. Godin and Kok (1996) found that intentions accounted for, on average, 12% of variance in 8 studies of screening behaviors. Conner and Sparks (2005) report a weighted average correlation of .32 (equivalent to 10% of explained variance) between intention and behavior across 12 prospective studies of screening and self-examination behaviors. In summary, the predictive validity of the TPB is well established in health psychology research, although its usefulness in understanding behavioral responses to abnormal screening results in particular is not as well established.

### Present Study

Very little research in health psychology has concerned empirical comparisons of different models (Weinstein, 1993). Both self-regulation theory and the TPB would suggest that actively seeking to comply with recommended treatment for cervical abnormalities might be a personally motivated behavior driven by social–cognitive representations of a health threat and the desire to avoid an adverse outcome. Self-regulation theory emphasizes the evaluation of a health threat in terms of its identity, consequences, timeline, and cause (if no action were taken), and includes a

separate variable (cure-control) to assess the likely effectiveness of taking action, in this case by attending treatment. In the TPB, a single attitude component is used to assess the benefits of taking action in terms of the evaluation of attending treatment. However, the attitude component incorporates a broader evaluation than merely whether the behavior might be effective in reducing a health threat, such as whether the behavior itself might have unpleasant consequences.

The two theories are also distinctive in further respects. Self-regulation theory focuses almost entirely on evaluations of the health threat and does not take account of the difficulties of taking action, nor of the possibility that there may be social influences on taking action, which are assessed within the TPB. Finally, self-regulation theory proposes that active problem solving in the form of treatment-seeking behavior follows directly from the evaluation of the health threat and its curability, whereas the TPB is explicit in proposing an intervening variable (i.e., behavioral intention) that (together with perceived behavioral control under conditions of low volitional control) predicts behavior. Thus, our empirical comparison of the two theories focuses on the relative importance of attitudes toward a cervical abnormality and toward treatment-seeking behavior in explaining that behavior.

The present study specifically concerns women's behavioral responses to a series of appointments for treatment and follow-up at a colposcopy clinic. Each woman in the study received between two and four scheduled clinic appointments until she was discharged from the clinic, having completed any appropriate treatment, and returned to the normal screening cycle. We seek to evaluate the predictive ability of self-regulation theory, the TPB, and a combined model in relation to three questions. Our first question concerns the prediction of motivation to attend appointments at the clinic and is evaluated here in terms of the ability of the theories to explain variance in behavioral intentions. Our second question relates to whether a patient completed her treatment or ceased attending before being formally discharged. A third question is also important and relates to the ability of these two theoretical models to discriminate among and classify patients according to whether they attended all of their appointments as scheduled (*scheduled attenders*), failed to attend until prompted by the clinic (*prompted attenders*), or failed to attend even in response to additional prompts from the clinic (*ceased attenders*). These distinctions permit examination of predictors of motivational differences between women who respond versus those who do not respond to prompts from the clinic (prompted attenders vs. ceased attenders) and differences between women who delay or those who do not delay attending until prompted (prompted attenders vs. scheduled attenders). Motivational variables associated with delay are important in a context in which missed appointments may have implications for health risk as well as economic costs. Similarly, variables associated with responding to a prompt may inform clinics about women's information needs. We evaluate each of these three questions in a prospective study with an objectively observed dependent measure.

## Method

### Participants and Procedure

The study took place in two colposcopy clinics in a town in England between 1999 and 2001. A consecutive sample of women ( $N = 1,911$ ) with

abnormal cervical screening results were recruited at the time of their first diagnostic appointment at the colposcopy clinic over a 12-month period. After excluding those women ( $N = 653$ ) whose examinations at first appointment indicated no requirement to attend further clinic appointments, a total of 1,258 women were eligible to participate. Questionnaire booklets and explanatory leaflets were mailed to these women, by the research team, 3 weeks before their second appointment date. This procedure ensured that women knew that their examination had revealed abnormalities requiring further treatment at the colposcopy clinic and were aware of their second appointment date before they received the questionnaire booklet. Data from questionnaires were used to predict subsequent attendance at up to three further colposcopy clinic appointments. The number of appointments required for each patient depended on individual clinical management plans as they evolved over time; thus a patient may have been required to attend a total of two, three, or four colposcopy clinic appointments, without knowing at the outset exactly how many would be required. The mean length of time between the first and last appointment for all women, irrespective of how many appointments each individual had, was 303.78 days ( $SD = 158.13$  days). The mean intervals to a second, third, and fourth appointment, respectively, were 171.98 ( $SD = 98.92$ ), 326.30 ( $SD = 129.12$ ), and 494.98 ( $SD = 160.63$ ) days.

Women ( $N = 1,258$ ) received questionnaires and appointment letters, and 660 of whom returned the questionnaires for a response rate of 52.46%. Responders were slightly older ( $M = 33.92$ ,  $SD = 10.28$ ) than were nonresponders ( $M = 32.58$ ,  $SD = 10.33$ ),  $t(1) = 2.30$ ,  $p < .05$ , and were of higher socioeconomic status (SES; responders:  $M = 2.63$ ,  $SD = 3.66$ ; nonresponders:  $M = 3.40$ ,  $SD = 3.69$ ),  $t(1) = -3.75$ ,  $p < .01$ . As might be expected in a study of this kind, our sample also slightly underrepresented women who "dropped out" from treatment (10.2%) compared with the percentage among all women referred for colposcopy during the study (16.6%). Implications of these findings are outlined in the discussion.

Carstairs scores for the 660 participants ranged from  $-3.99$  to  $9.77$  ( $M = 2.63$ ,  $SD = 3.67$ ). Higher positive scores indicate higher deprivation and lower SES. The sample had a mean age of 33.92 years ( $SD = 10.28$ ). Sixty-three percent of the sample were married or living with a partner, 70% were employed outside of the home, and 53% had a child living at home. Mean age of leaving full-time education was 17.37 years ( $SD = 2.84$ ). As might be expected, given epidemiological evidence of an association between cervical abnormalities and cigarette smoking (Ho et al., 1998), the present sample of women, all of whom had abnormal cervical screening results, were more likely to be smokers (43.7%) than the U.K. general population average of 25% (U.K. Department of Health, 2004). Age at first sexual intercourse ranged from 10 to 31, with 23.2% of the sample reporting first sexual intercourse before the age of 16. These findings are consistent with epidemiological evidence regarding risk factors for cervical abnormalities (Bosch, 2004; Brinton et al., 1987). No participant in the study had invasive cancer of the cervix. Sixty-two percent were diagnosed with CIN2 or CIN3, 16% with CIN1, and 22% with unclassified cellular evidence of cervical infection with human papilloma virus (which might be considered to precede CIN1; Miller, 2004).

### Measures

The questionnaire contained a range of demographic and behavioral measures and measures specified by the self-regulation model and the TPB. All items used 6-point scales labeled as specified below, except where indicated otherwise. A summary score for each scale was created by taking the mean of relevant items.

*Self-regulation model variables.* Illness representations were assessed with items from the Revised Illness Perception Questionnaire (IPQ-R; Moss-Morris et al., 2002; see also Hagger & Orbell, 2005; Weinman et al., 1996), which is a measure of illness representations based on Leventhal et al.'s (1980) self-regulation theory and the measure of choice in recent

studies on self-regulation theory (e.g., Brewer, Chapman, Brownlee, & Leventhal, 2002; Heijmans & De Ridder, 1998). The IPQ-R contains subscales assessing identity, timeline acute-chronic, serious consequences, causal attributions, illness coherence, personal control, and treatment control. The IPQ-R was adapted so that each item began with the stem "The problem with my cervix . . ." because pilot work conducted with women attending their first colposcopy appointment indicated that this was well understood by patients. Items from the IPQ-R assessing timeline (e.g., "The problem with my cervix will last a short time"), consequences (e.g., "The problem with my cervix is a serious condition"), illness coherence (e.g., "I have a clear picture or understanding of the problem with my cervix"), personal control (e.g., "There is a lot I can do to control the problem with my cervix"), treatment control (e.g., "Treatment will be effective in treating the problem with my cervix"), and cause (e.g., "Stress or worry caused the problem with my cervix"), were included in the questionnaire, each with a 6-point response scale ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Causal attribution items from the IPQ-R were augmented to include risk factors associated with cervical cancer such as "warts virus" and "sexual intercourse." Although the condition is likely to be asymptomatic, a symptom identity scale was developed specifically for the study on the basis of pilot interviews with women, which included items such as "Have you experienced any of the following symptoms as a result of the problem with your cervix? pain, soreness, discharge, sleep difficulties, foul odor, bleeding, and discomfort during sexual intercourse." Responses to each identity item were rated on 4-point scales ranging from 1 (*never*) to 4 (*all the time*).

A full confirmatory factor analysis of the items and scales used here has been reported previously (Hagger & Orbell, 2005). Cronbach's alpha was satisfactory for each of the scales' timeline, consequences, illness coherence, personal control, and treatment control (.88, .72, .90, .73, and .72, respectively). The causal attribution items produced a three-factor solution. Factor 1, Cause Stress, comprised 6 items (e.g., stress or worry, my mental attitude). Cronbach's alpha was .89. Factor 2, Cause Sex, comprised 4 items (e.g., a germ or virus, sexual intercourse). Cronbach's alpha was .67. Factor 3, Cause Behavior, comprised 4 items (e.g., alcohol, smoking). Cronbach's alpha was .72. The symptom identity scale developed for the study had a Cronbach's alpha of .82.

**TPB variables.** Measures specified by the TPB should be operationalized with respect to action, target, context, and time (Ajzen, 1991; Ajzen & Fishbein, 1980). Because the number of appointments required differed among women, we operationalized each of the TPB measures with respect to "attending all of my appointments at the colposcopy clinic in the next 15 months." Because our concern here is primarily with predicting behavior and with comparing the relative importance of attitudes toward "illness" and attitudes toward behavior, we used direct measures of attitude: subjective norm and perceived behavioral control. Indirect measures of beliefs underlying attitudes and subjective norms are proposed by the theory to relate to intentions and behavior only if an empirical relation has first been established between a measure of attitude or subjective norm and intention. Moreover, different individuals holding an equally positive attitude or subjective norm may do so for different reasons; that is, their attitudes may be based on different beliefs or their subjective norms on different referents. Belief-based measures may therefore provide an inaccurate evaluation of the importance of attitude in predicting behavior (Ajzen, 1985; Ajzen & Fishbein, 1980).<sup>1</sup>

Attitude was measured by responses to the stem "Attending all my appointments at the colposcopy clinic in the next 15 months would be. . . ." on eight bipolar scales (wise-foolish, important-unimportant, satisfying-unsatisfying, pleasant-unpleasant, worthwhile-not worthwhile, necessary-unnecessary, good-bad, useful-of no use). Cronbach's alpha was .74. The subjective norm measure comprised 2 items: "Most people who are important to me think that I should attend all of my appointments at the colposcopy clinic in the next 15 months" (*extremely likely* or *extremely unlikely*) and "People who are important to me think I should/should not

attend all my appointments at the colposcopy clinic in the next 15 months" (*definitely should* or *definitely should not*). Cronbach's alpha was .67. Perceived behavioral control was measured with 11 items, for example, "Do you think it would be easy or difficult for you to attend all of your appointments at the colposcopy clinic in the next 15 months?" (*extremely easy* or *extremely difficult*); "How much personal control do you have over attending all of your appointments at the colposcopy clinic in the next 15 months?" (*extremely high control* or *extremely low control*); "If it were entirely up to me, I am confident that I would be able to attend all of my appointments at the colposcopy clinic in the next 15 months" (*agree very strongly* or *disagree very strongly*). Cronbach's alpha was .80.

**Sociodemographic and behavioral variables.** Participants' age was determined from their medical records. SES was measured by the Carstairs Index (Carstairs & Morris, 1989). This index allocates a deprivation score to postal codes on the basis of a series of indicators such as local unemployment records and number of households with no car. A series of items were included in the questionnaire to assess education, employment status, marital status, children at home, travel time to the clinic, sexual history, and cigarette smoking. All noncontinuous demographic and behavioral measures were recoded into dummy variables for analyses.

**Severity of disease.** The severity of cervical abnormality was assessed by CIN. CIN data was abstracted from medical records. A dummy variable was created to compare mild abnormalities and CIN1 with CIN2 and CIN3, according to the Bethesda system (Miller, 2004).

**Intention and behavior.** Motivation to attend treatment was assessed by means of behavioral intention. Intention was measured with four items: "I plan to attend all of my appointments at the colposcopy clinic in the next 15 months (*agree very strongly* or *disagree very strongly*)," "I intend to attend all of my appointments at the colposcopy clinic in the next 15 months (*agree very strongly* or *disagree very strongly*)," "I will attend all of my appointments at the colposcopy clinic in the next 15 months (*agree very strongly* or *disagree very strongly*)," and "How likely is it that you will attend all of your appointments at the colposcopy clinic in the next 15 months? (*extremely likely* or *extremely unlikely*)." Cronbach's alpha was .87.

Medical records were used to determine the number of appointments issued to individual women and their attendance compliance. Each woman in the study received between two and four scheduled clinic appointments prior to discharge. The number of appointments required was idiosyncratic and was not predetermined at the start of the study but evolved as treatment was undertaken. For each of her scheduled appointments, a patient may have responded in one of three ways: She may have kept her scheduled appointment; she may have failed to attend her scheduled appointment, but, having received a letter and a repeat appointment date from the clinic she

<sup>1</sup> A series of indirect measures based on modal beliefs were also developed during the study, and, as might be expected because belief-based measures are an imperfect "sample" of all relevant beliefs (Ajzen & Fishbein, 1980), they showed weaker associations with intention and behavior than did the direct measures reported in the article ( $r$  with intention = .27 (Instrumental Attitude Beliefs  $\times$  Evaluation), -.17 (Affective Attitude Beliefs  $\times$  Evaluation), .17 (Normative Beliefs  $\times$  Compliance Motivation) and .41 (control beliefs; all  $p < .05$ ). Only control beliefs showed a significant correlation with behavior ( $r = .11, p < .01$ ). Regression of intention showed that indirect measures accounted for a 17% increment in explained variance after accounting for demographic variables,  $\Delta F(4, 640) = 35.79, p < 0.01$ . Regression of behavior showed that indirect measures were not associated with a significant increase in explained variance after inclusion of demographic variables (Step 2:  $\chi^2[4, N = 660] = 7.44, ns$ ), but a significant value was obtained for perceived behavioral control (odds ratio = 1.31, 95% confidence interval = 1.02–1.68,  $p < .05$ ). In summary, the pattern of findings is unchanged by the use of indirect measures.

may have kept this repeat appointment; she may have failed to attend both her scheduled appointment and her repeat appointment.<sup>2</sup> Two behavioral indices were computed. First, a dichotomous variable was created to represent whether a woman completed all of her required treatment, irrespective of how she came to complete it and whether repeat appointments were necessary (coded 1) or dropped out from treatment before being appropriately discharged (coded 0). Second, women were classified into three outcome groups in order to examine differences among (a) women who kept all of their required appointments as scheduled (scheduled attenders); (b) women who kept all of their required appointments, but at least one of their appointments was a repeat appointment (prompted attenders); (c) women who dropped out of treatment and did not keep all of their required appointments (ceased attenders).

### Overview of Data Analyses<sup>3</sup>

Our first question relates to the ability of variables specified by the self-regulation model and the TPB to predict intentions to attend clinic appointments for treatment. We use a series of linear regression analysis procedures to examine the ability of variables specified by each theory and a combination of variables from both theories to predict intention. Second, we seek to distinguish between women who completed their treatment and women who did not. Behavior was a dichotomous variable (kept all required appointments = 1, did not keep all required appointments = 0). Binary logistic regression is the most appropriate analysis when the dependent variable is dichotomous, and we use it here in a series of logistic regression analyses to examine the ability of each of the theoretical models to predict behavior (Tabachnik & Fidell, 1989). A logistic regression model is evaluated by the statistic,  $-2 \log$  likelihood, which is a measure of variability in the data and can be interpreted as a chi-square test on how well the model fits the data. A  $-2 \log$  likelihood value of 0.00 would indicate that the predictors specified in the model fit the data perfectly. The effect of including additional predictor variables in a logistic regression model is assessed by the reduction in the value of  $-2 \log$  likelihood because this reduction represents the amount of variability that remains after the relevant predictors have been taken into account. The reduction in the  $-2 \log$  likelihood represents the reduction in chi-square that can be attributed to adding the predictor(s) and can be evaluated as such, where the degrees of freedom correspond to the number of additional predictors.

Our third aim is to evaluate the ability of demographic variables and variables specified by self-regulation theory and the TPB to explain differences between scheduled attenders, prompted attenders, and ceased attenders. Discriminant-function analysis is the most appropriate statistical technique for determining what factors differentiate between participants belonging to different groups (Tabachnik & Fidell, 1989).<sup>4</sup>

Because it is important to demonstrate that psychological measures predict attendance after demographic characteristics have been taken into account, we conducted all analyses by using hierarchical entry procedures in which demographic and behavioral variables were entered into the models at the first step. Demographic covariates were included in the analyses only if they demonstrated significant univariate relations with the relevant dependent measure. Finally, to guard against potential multicollinearity, we computed correlations between all study variables (see Table 1).<sup>5</sup> None of the correlations between predictors exceeded .50, which suggests that multicollinearity is not a problem for the present data (Tabachnik & Fidell, 1989).

## Results

### Screening Behavior

Eighty-three percent of women ( $N = 549$ ) completed all of their required colposcopy appointments as scheduled, prior to being discharged back to primary care (scheduled attenders). Thus, 17%

of women with abnormal smears failed to attend some of their scheduled appointments during the study period. Of these, 7% ( $N = 44$ ) of women who had failed to keep an appointment or contact the clinic to reschedule, did in fact complete their treatment following the issuing of repeat invitation letters and appointments by the clinic (prompted attenders). Therefore, efforts made by the clinic were successful in increasing completed treatment from 83% to 90%. However, a further 10% ( $N = 67$ ) of women dropped out from treatment prematurely, even after being issued with repeat appointments (ceased attenders).

### Theoretical Predictor Variables

Table 1 shows the means, standard deviations, and correlations among predictor variables specified by the self-regulation model and the TPB. As might be expected in the present context, women reported very low illness identity. Women generally agreed that cervical abnormalities had adverse consequences ( $M = 3.14$ ), and more serious consequences were associated with a longer perceived timeline. Although causal attributions were relatively low, with all mean scores below the scale midpoint of 3, the highest mean score observed was for the Cause Sex Scale, on which attributions were made to sexually related viral causes, suggesting that women internalized the view that cervical abnormalities are a form of sexually transmitted disease. Representations of coping potentials were relatively high. In particular, women perceived that treatment was highly likely to be effective in controlling the problem with their cervix ( $M = 4.71$ ), indicating high confidence in available treatment. Means for attitude, subjective norm, and perceived behavioral control from the TPB were all above scale midpoints, indicating generally positive evaluations of clinic attendance.

<sup>2</sup> Women who contacted the clinic prior to an appointment to reschedule and kept the subsequent appointment were classified as *scheduled attenders*. Women who failed to turn up for a scheduled appointment and did not contact the clinic and subsequently attended a repeat appointment issued by the clinic were classified as *prompted attenders*.

<sup>3</sup> There were 0–5% missing values across items. Missing values were computed by using the expectation-maximization method in SPSS.

<sup>4</sup> Because it is important in discriminant function analysis to minimize the number of predictor variables relative to the size of the smallest group in order to avoid overfitting (Tabachnik & Fidell, 1989), we identified variables for inclusion in the discriminant analysis if they demonstrated significant univariate relationships to group membership a priori. This reduced the number of variables included in the discriminant function analysis from 25 to 12.

<sup>5</sup> The full  $26 \times 26$  correlation matrix is too large to include in the present article but may be obtained on request from Sheina Orbell. Inspection of associations among demographic variables included in the analyses showed that Spearman's rank correlation coefficients ranged from  $-.02$  to  $.27$ , indicating that multicollinearity was not a problem for these variables. Employed women were less likely to smoke ( $r = -.11, p < .05$ ), were of higher SES ( $r = -.13, p < .05$ ), and reported a shorter travel time to the clinic ( $r = -.15, p < .01$ ). Smokers were also younger ( $r = -.16, p < .01$ ), and of lower SES ( $r = .27, p = .01$ ), whereas older women were more likely to be married ( $r = .20, p < .01$ ). Demographic variables showed small correlations with variables specified by each of the models ranging from  $.00$  to  $.32$ .

Table 1  
Correlations Among Illness Representations and Theory of Planned Behavior Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Behavior 1 = attend, 0 = drop out	5.63	0.62	—	.17**	-.05	-.06	.02	.04	-.04	-.04	-.09*	.05	-.01	-.04	-.01	.10**
2. Intention	1.47	0.50		—	-.01	-.05	.02	.11**	-.13**	-.07	-.11**	.19**	.02	.35**	.35**	.67**
3. Identity	3.04	0.92			—	.16**	.27**	-.11**	.12**	.09*	.14**	-.11**	-.01	.03	.03	-.11**
4. Timeline	3.14	0.96				—	.50**	-.13**	.16**	.21**	.13**	-.49**	-.07	-.14**	-.04	-.10*
5. Consequences	3.66	1.24					—	-.19**	.22**	.19**	.15**	-.19**	.06	-.02	.01	-.06
6. Illness coherence	2.16	0.98						—	-.24**	-.03	-.17**	.19**	.13**	.10**	.05	.12**
7. Cause stress	2.79	1.07							—	.28**	.57**	-.26**	.08	-.08*	-.15**	-.20**
8. Cause sex	2.05	0.93								—	.28**	-.19**	.16**	-.06	-.01	-.07
9. Cause behavior	4.71	0.78									—	-.21**	.04	-.03	-.09*	-.19**
10. Treatment control	3.28	0.96										—	.16**	.26**	.15**	.27**
11. Personal control	5.25	0.52											—	.06	-.03	.06
12. Attitude	5.85	0.40												—	-.03	.41**
13. Subjective norm	5.20	0.64													—	.38**
14. Perceived control																—

Note. All correlations are Pearson's product-moment correlations, except those for Behavior, which are Spearman's rank correlation coefficients.  
\*  $p < .05$ . \*\*  $p < .01$ .

Prediction of Intention by Illness Representations and TPB Variables

Table 2 summarizes the findings from the hierarchical regressions of intention on each of the predictor models. As can be seen from column 1, demographic variables alone were capable of explaining a significant 4% of variance in intention. Women were more likely to intend to attend if they were of higher SES, were employed outside of the home, and had a shorter travel time to the clinic. Column 2 shows that the inclusion of illness representations produced a significant 4% increment in explained variance, whereas all demographic predictors remained significant, indicating that their effects on intention were not mediated by illness representations. Only one illness representation achieved a significant beta value in the equation. Women were more likely to intend to attend if they had more positive treatment control beliefs. The third model, evaluating the TPB variables, also produced a significant 42% increment in explained variance after accounting for demographic variables and attitude, subjective norm, and perceived behavioral control, each a significant predictor of intention. In this model the beta values of SES, employment, and travel time were all reduced to nonsignificance. Comparing the total variance explained by the different models, it can be seen that the TPB provided superior prediction of intention (47% total variance explained) compared with the self-regulation model (8% total variance explained).

The final column of Table 2 shows the results of the inclusion of all psychological predictor variables specified by each of the theories in a single regression equation. Notably, in this combined model, attitude, subjective norm, and perceived behavioral control retained significant beta values, whereas treatment control beliefs did not. Additional analyses showed that though adding TPB variables to a model including demographic and illness representation variables produced a significant 39% increment in explained variance,  $\Delta F(3, 644) = 158.80, p < .01$ , adding illness representations to a model including demographic and TPB variables did not,  $\Delta F(9, 644) = .147, ns$ . These findings confirm that TPB variables provided optimal prediction of intention.

Prediction of Completion of Treatment From Illness Representations and TPB Variables

Table 3 summarizes the findings from the binary logistic regression of behavior. In these analyses, we compare the predictive validity of self-regulation model variables and TPB variables to predict behavior without the inclusion of intention. This procedure was adopted to permit a test of the predictive validity of the two models at the same level. Column 1 shows that the inclusion of demographic variables was associated with a significant explanation of variance, as indicated by Model  $\chi^2(5, N = 660) = 26.54, p < .00$ . The odds ratios show that women were more likely to have kept all of their appointments if they had a shorter travel time to the clinic and were nonsmokers. The odds of a smoker keeping all of her appointments were about 50% lower than the odds of a nonsmoker doing so. Illness representations were added to the equation at the second step. The chi-square test for this step showed that the inclusion of illness representations was not associated with a significant increase in explained variance beyond demographic variables. Travel time and smoking remained signif-

Table 2  
*Regression of Intention on Background, Illness Representations, and Theory of Planned Behavior (TPB) Variables*

Variable	Background variables	Illness representations	TPB	Combined model
$\beta$				
Step 1				
Carstairs SES	-.10**	-.10**	-.04	-.05
Employed	.09*	.08*	.01	.02
Travel time	-.12**	-.11**	.00	.01
Step 2				
Identity		.04		.06
Timeline		.03		-.01
Consequences		.08		.07
Illness coherence		.05		.05
Cause stress		-.07		.01
Cause sex/virus		-.03		-.05
Cause behavior		-.01		.03
Treatment control		.17**		-.01
Personal control		-.01		-.01
Attitude			.07**	.07**
Subjective norm			.10**	.10*
Perceived control			.59**	.61**
Model <i>F</i>	8.06**	4.91**	93.60**	38.56**
<i>df</i>	3, 656	12, 647	6, 653	15, 644
Model <i>R</i> <sup>2</sup>	.04	.08	.46	.47
Step 2 Model $\Delta F$		3.76**	172.82**	44.58**
Step 2 Model $\Delta R^2$		.04	.42	.43

Note. *N* = 660. High positive scores indicate greater socioeconomic deprivation. Employment status was coded: 1 = employed outside of home, 0 = not employed. SES = socioeconomic status.  
 \* *p* < .05. \*\* *p* < .01.

icant predictors in this model. The third column of Table 3 shows that the inclusion of TPB variables was associated with a significant explanation of variance, after accounting for demographic variables. Women were more likely to have kept all of their appointments if they perceived greater control over doing so. Notably, the effects of travel time and smoking retained significant values in this model, indicating that their effects on behavior were not mediated by attitude, subjective norm, or perceived behavioral control.

The fourth column of Table 3 shows the results of testing a combined model. Additional analyses showed that adding TPB variables to a model including demographic variables and illness representations resulted in a significant improvement in explained variance. The  $-2$  log likelihood was reduced from 396.10 to 384.73,  $\chi^2(3, N = 660) = 11.37, p < .05$ . In contrast, adding illness representations to a model including demographic and TPB variables did not result in a significant improvement in explained variance. The  $-2$  log likelihood changed from 395.40 to 384.73,  $\chi^2(9, N = 660) = 10.67, ns$ . Thus, comparing the models, perceived behavioral control from the TPB together with the demographic variables, travel time to the clinic and smoking, provided optimal prediction of behavior. The last column of Table 3 shows that the inclusion of intention in a combined model reduces the effect of perceived behavioral control to nonsignificance. Additional analyses showed that the change in  $-2$  likelihood associated with including intention in the model was significant,  $\chi^2(1, N = 660) = 15.52, p < .01$ . Thus the predictive ability of perceived behavioral control was mediated by intention. A one-point increase

in intention was associated with a nearly threefold increase in the odds of a woman keeping all of her appointments.<sup>6</sup>

#### *Distinguishing Scheduled, Prompted, and Ceased Attenders*

In the present sample there were 549 (83%) scheduled attenders, 44 (7%) prompted attenders, and 67 (10%) ceased attenders. Two significant discriminant functions were calculated to discriminate between the three groups. Both discriminant functions were statistically significant (Function 1: canonical *r* = .29,  $\chi^2[22, N = 660] = 80.55, p < .01$ , and Function 2: canonical *r* = .20,  $\chi^2[10, N = 660] = 25.37, p < .01$ ). Eighty-three percent of grouped cases were correctly classified, which is 12.7% greater than chance after adjusting for group size with computations provided by Tabachnik and Fidell (1989).

Inspection of the group centroids shows that function one clearly separates scheduled attenders (group centroid = .13) and ceased attenders (group centroid = -.78) from each other. Table 4 shows that age, employment status, being a smoker,

<sup>6</sup> Some studies (Ajzen & Madden, 1986) have suggested that perceived behavioral control should moderate the relation between intention and behavior. This was examined in the present data by including the interaction term Intention  $\times$  Perceived Behavioral Control, derived after mean centering each variable at the final step of the logistic regression shown in Table 3. The interaction term obtained a nonsignificant improvement in explained variance,  $\chi^2(1, N = 660) = 3.29, ns$ .

Table 3  
*Logistic Regression of Behavior on Background, Illness Representation, and Theory of Planned Behavior (TPB) Variables*

Variable	Background variables		Illness representations		TPB		Combined model		Combined model with intention	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Step 1										
Age	1.02	0.99–1.05	1.03	1.0–1.06	1.02	0.99–1.05	1.03	1.00–1.06	1.04	1.0–1.07
Employed	1.58	0.92–2.69	1.50	0.85–2.62	1.34	0.77–2.33	1.31	0.74–2.33	1.31	0.72–2.37
Married	1.56	0.92–2.63	1.55	0.91–2.66	1.60	0.94–2.72	1.60	0.93–2.77	1.64	0.94–2.87
Travel time	0.98**	0.97–1.00	0.99**	0.97–1.00	0.98**	0.97–1.00	.99*	0.97–1.00	0.98**	0.97–1.00
Smoker	0.51**	0.30–0.87	0.57*	0.32–1.02	0.52*	0.30–0.88	0.54*	0.30–0.98	0.52*	0.28–0.94
Step 2										
Identity			0.87	0.51–1.50			0.97	0.55–1.70	0.91	0.51–1.64
Timeline			0.74	0.51–1.08			0.72	0.49–1.04	0.72	0.49–1.05
Consequences			1.50 <sup>a</sup>	1.05–2.12			1.55 <sup>a</sup>	1.08–2.22	1.53 <sup>a</sup>	1.06–2.20
Illness coherence			1.12	0.89–1.40			1.12	0.89–1.41	1.11	0.88–1.40
Cause stress			1.06	0.75–1.50			1.04	0.73–1.48	1.03	0.71–1.49
Cause sex/virus			1.00	0.76–1.31			1.00	0.76–1.32	1.02	0.77–1.36
Cause behavior			0.75	0.53–1.06			1.00	0.56–1.13	0.77	0.53–1.10
Treatment control			1.03	0.69–1.55			1.07	0.70–1.63	1.13	0.74–1.75
Personal control			0.82	0.61–1.11			0.82	0.60–1.11	0.82	0.60–1.13
Attitude					0.45 <sup>a</sup>	0.25–0.82	0.43 <sup>a</sup>	0.23–0.79	0.35 <sup>a</sup>	0.18–0.66
Subjective norm					0.78	0.35–1.72	0.77	0.35–1.71	0.70	0.31–1.58
Perceived control					1.85**	1.20–2.86	1.76*	1.12–2.77	0.87	0.48–1.57
Intention									2.81**	1.66–4.77
Model $\chi^2$	26.54**		37.39**		38.08**		48.75**		64.28**	
–2log likelihood	406.95		396.10		395.40		384.73		369.21	
df	5		14		8		17		18	
Step 2 $\chi^2$			10.85		11.55**		22.22**		37.74**	

Note. *N* = 660. High positive Carstairs scores indicate greater socioeconomic deprivation. Employment status was coded: 1 = employed outside of home, 0 = not employed. Married was coded: 1 = married or living together, 0 = single, widowed, divorced. Smoker was coded: 1 = current smoker, 0 = nonsmoker or ex-smoker. OR = odds ratio; CI = confidence interval.

<sup>a</sup> Significant values obtained for these variables are most likely suppressor effects because there was no univariate association with behavior.

\**p* < .05. \*\**p* < .01.

beliefs in behavior as a cause, intention, and perceived behavioral control had strong correlations with Function 1. Univariate *F* tests and least significant difference (LSD) tests were computed for continuous variables, and chi-square tests were computed for dichotomous variables. The findings from these tests

demonstrate an interesting pattern of results. Scheduled attenders were older and more likely to have employment outside of the home. They were also less likely to be current smokers than either ceased or prompted attenders. Ceased attenders were more likely than were scheduled attenders to attribute the cause

Table 4  
*Summary of Discriminant Function Analysis of Three Attendee Groups*

Variable	Function 1	Function 2	Ceased			Prompted			Attended			<i>F</i> / $\chi^2$
	<i>r</i>	<i>r</i>	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	
Age	.31	–.08	31.60 <sub>a</sub>	10.51		31.93	9.77		34.36 <sub>a</sub>	10.26		3.06*
Carstairs SES	–.24	.52	2.80 <sub>a</sub>	3.54		4.30 <sub>a,b</sub>	3.28		2.47 <sub>b</sub>	3.68		5.23**
Employed	.40	–.19			58.2 <sub>b</sub>			56.8 <sub>a</sub>			73.0 <sub>a,b</sub>	10.41**
Travel time	–.35	–.50	35.63 <sub>a,b</sub>	25.22		24.12 <sub>a</sub>	15.06		27.19 <sub>b</sub>	18.08		6.97**
First sex (age)	.33	–.29	16.50	1.91		16.16 <sub>a</sub>	1.63		17.02 <sub>a</sub>	2.27		4.40*
Smoker	–.48	.09			61.2 <sub>a</sub>			56.8 <sub>b</sub>			40.5 <sub>a,b</sub>	13.72**
Identity	–.28	.29	1.54	0.51		1.63 <sub>a</sub>	0.62		1.45 <sub>a</sub>	0.48		3.36*
Illness coherence	.04	.49	3.45 <sub>a</sub>	1.25		4.06 <sub>a,b</sub>	1.25		3.66 <sub>b</sub>	1.24		3.17*
Cause behavior	–.37	–.05	2.33 <sub>a</sub>	1.06		2.16	0.91		2.01 <sub>a</sub>	0.91		4.03*
Intention	0.62	0.15	5.31 <sub>a</sub>	0.87		5.53	0.73		5.63 <sub>a</sub>	0.56		11.37**
Perceived control	0.40	–.01	5.00 <sub>a</sub>	0.70		5.09	0.71		5.24 <sub>a</sub>	0.63		4.68*

Note. SES = socioeconomic status. High positive scores indicate greater socioeconomic deprivation. Means in a row sharing the same subscript differ significantly at *p* < .05.

\**p* < .05. \*\**p* < .01.

of their abnormal smear to their behavior and to have lower perceived behavioral control over attending and less intention to attend. Function 2 clearly discriminates prompted attenders (group centroid = .69) from both of the other two groups, scheduled attenders (group centroid = -.02) and ceased attenders (group centroid = -.27). Function 2 had strong correlations with SES, travel time to the clinic, identity, and illness coherence. Chi-square tests, univariate *F* tests, and LSD post hoc tests showed that prompted attenders were from more socioeconomically deprived areas than either scheduled or ceased attenders. However, they reported a shorter travel time to the clinic than did ceased attenders. Prompted attenders also reported higher identity (symptoms) than did scheduled attenders and were more likely to report illness coherence. Thus the discriminant function analysis was successful in characterizing the three different groups by reference to a combination of demographic and behavioral variables and, importantly, by reference to both illness representations and TPB variables.

We conducted a final set of analyses to confirm the observation that discrimination of the three groups was facilitated by consideration of both theoretical models. Hierarchical discriminant function analysis showed that demographic and behavioral variables alone were capable of discriminating the three groups (canonical  $r = .22$ ),  $\chi^2(12, N = 660) = 46.47, p < .01$ . The addition of the self-regulation theory variables cause behavior, identity and illness coherence to the equation significantly improved the fit of the model,  $\Delta\chi^2(6, N = 660) = 13.24, p < .05$ . The inclusion of intention and perceived behavioral control at the third step further improved the fit of the model,  $\Delta\chi^2(4, N = 660) = 20.84, p < .01$ . Conversely, adding intention and perceived behavioral control to the equation including demographic variables produced a significant improvement in fit,  $\Delta\chi^2(4, N = 660) = 21.06, p < .01$ , and the inclusion of self-regulation theory variables at the final step was also significant,  $\Delta\chi^2(6, N = 660) = 13.02, p < .05$ . These findings confirm that each of the models contributed independently to the discrimination of ceased, prompted, and scheduled attenders.

## Discussion

To date, very little research has compared the predictive validity of more than one theoretical model of health behavior in the same study (Hunter, Grunfield, & Ramirez, 2003; Weinstein, 1993). Our findings show that both the TPB and self-regulation theory were capable of explaining significant variance in intentions to attend clinic appointments. However, the TPB provided optimal prediction, and prediction was not significantly augmented by simultaneous consideration of illness representations. The behavioral measure of completed treatment was not capable of being predicted by self-regulation theory, and the TPB provided optimal prediction. Classification of scheduled attenders, prompted attenders, and ceased attenders depended on a combination of both illness representations and TPB variables. Evaluations of an abnormal smear thus would appear to be important in understanding delay in completing treatment and in distinguishing between those people who respond or those who do not respond to prompts.

In the present study, one illness representation, treatment control, was an important independent predictor of intention. This

finding is consistent with previous research on self-regulation theory. In their meta-analytic review, Hagger and Orbell (2003) obtained weighted average correlations .27 and .12 between the cure-control dimension of illness representations and generic and specific measures of problem-focused coping, respectively. However, in line with the present findings, problem-focused coping was not associated with any other dimension of illness representations in that review of 45 studies. Thus, motivation to complete treatment would appear to be influenced less by, for example, whether a woman views an abnormal smear as very serious and more by whether she thinks it can be controlled by treatment.

Attitude, subjective norm, and perceived behavioral control were all important determinants of intention and mediated the effects of SES, employment, and travel time to the clinic on motivation to attend. In the regression of behavior, perceived behavioral control was the only significant independent predictor. Although perceived behavioral control mediated the effects of demographic variables on intention, travel time and being a smoker remained significant direct predictors of behavior even after the inclusion of intention in the logistic regression analysis. A possible explanation of this finding is that perceived control beliefs assessed at the outset of the study lacked veridicality and therefore had smaller associations with actual behavior than did the measure of travel time (Ajzen & Madden, 1986). In summary, behavioral intentions and their determinants are clearly important variables predicting noncompletion of treatment and follow up.

In the combined model, treatment control was no longer a significant predictor of intention once attitude, subjective norm, and perceived behavioral control were taken into account, suggesting, perhaps, that these variables mediated the effects of treatment control on intention. Treatment control is assessed by the IPQ-R in terms of whether treatment is likely to be effective in controlling illness, but it does not include any evaluation of that treatment in terms of its desirability, pleasantness, the ease or difficulty with which it can be completed, or of whether an individual is likely to be encouraged to comply by significant others. Correlations computed among predictor variables showed that treatment control was significantly associated with attitude, subjective norm, and perceived behavioral control. Thus, one interpretation of this finding is that the concept of treatment control should be expanded to take account of these additional dimensions. This finding would lend some support to suggestions by Horne and Weinman (1999, 2002), for example, who have proposed that self-regulation theory might be augmented by additional development of the cure-control dimension to include beliefs about the necessity, effectiveness, and concerns about treatment; although, their proposals to date do not include the role of social influences, self-efficacy, or personal control.

In evaluating the superiority of the TPB variables observed here it is important to distinguish between fundamental theoretical differences in the theories and methodological issues surrounding the operationalization of the theories. From a methodological point of view, the present findings might be attributed in part to the greater degree of specificity and correspondence between measures of attitude, subjective norm, and perceived behavioral control with intentions and behavior than has been demonstrated by measures of illness representations, such as perceived consequences or timeline (Ajzen & Fishbein, 1973, 1974; Orbell, in

press). The present study used appropriate operationalizations of the constructs specified by the two theories. Nonetheless, although the TPB requires that measures of attitude correspond in terms of action, target, context, and time with measures of intention and behavior, self-regulation theory makes no such specification regarding the assessment of treatment control. This might explain why in Hagger and Orbell's (2003) meta-analysis the cure-control construct was shown to predict generic problem-focused coping response measures more successfully than specific behavioral measures. It is possible that treatment control, or personal control, as specified by the IPQ-R, might successfully predict an aggregated behavioral index comprising a range of treatment or personal behaviors (Ajzen & Fishbein, 1980). One possible avenue for further research might be to examine ways of specifying illness representations so that they relate more directly to the coping responses under investigation. For example, the consequences or timeline of a health threat might be separately assessed in relation to whether or not a recommended action is taken (e.g., "consequences if I do attend treatment" vs. "consequences if I do not attend treatment").

Methodological issues notwithstanding, there are also fundamental differences between the theoretical models themselves. Self-regulation theory proposes a well-validated set of constructs concerning a person's representation of a health threat. However, in many tests of the theory, constructs such as consequences, identity, timeline, and cause have been shown to have weak or nonsignificant associations with active coping attempts but are more generally positively associated with the use of avoidance, denial, or emotional expression (Hagger & Orbell, 2003). Although it may be argued from a theoretical point of view, that awareness of a health threat is a fundamental prerequisite of attempts to control or modify that threat, research to date suggests that the conceptual elaboration of a health threat along the lines proposed by self-regulation theory is of less value in distinguishing those who do or do not adopt a self-protective behavior than is the conceptual elaboration of the behavior that is proposed to modify that threat.

For clinics in this context, and for health behaviors more generally, an important issue to examine is the motivational differences between people who delay acting until prompted by a clinic and who may or may not respond to those prompts. The fact that ceased attenders, as suggested by the present data, can be characterized as a group who are young, unemployed, smokers, who have to travel a considerable time to get to the clinic, have low perceived control and intention to attend, and believe that their behavior (smoking, alcohol, having children) is responsible for their cervical screening result might be of concern. For this group, low motivation to attend the clinic is perhaps consistent with low motivation for health behavior, suggesting that this group is at high risk of recurrence and is least likely to receive appropriate treatment. Prompted attenders who initially failed to keep appointments but who subsequently responded to repeat invitations can be characterized slightly differently. This group was distinguishable by early age of first sexual intercourse and by greater symptom identity and illness coherence. Their reports of distressing symptoms and relatively high illness coherence may imply that they felt they 'knew all they wished to know' about their condition. It is possible that these beliefs are indicative of nonattendance as an avoidant

coping response (Hagger & Orbell, 2003). Taken together, these findings suggest that might be classified as having low motivation to attend clinic appointments largely on the basis of their low intentions and perceived behavioral control, whereas prompted attenders might be classified as avoiding attendance in response to their representation of the health threat. Thus, both theoretical models were important in distinguishing different attender-type groups.

A number of aspects of the present study should be acknowledged as limitations to the generalizability of the findings. The present data were collected in the context of an established, organized screening program, in which uptake was in the region of 85% among eligible women and compliance with treatment was also very high. Even in this context, if we were to extrapolate from the present local area study, a 10% noncompletion of treatment implies approximately 20,000 women with confirmed abnormal cervical smears not completing colposcopy treatment each year. The equivalent figure without clinics' efforts to contact those who fail to attend, would be as high as 33,000. Nonetheless, the present study concerned a small minority of women not completing treatment, and it should be acknowledged that our representative checks showed, younger women, and women of lower SES were slightly underrepresented. Previous studies of this type have also overrepresented attendees and people of higher SES (e.g., Norman & Fitter, 1991; Sheeran, Conner, & Norman, 2001). Caution is nonetheless warranted in making generalizations from the present findings. In particular, it remains possible that in parts of the world where screening is not an established behavior and is not organized by a call program attitudes toward a cervical abnormality may be of greater importance in understanding women's motivation to seek treatment.

In summary, the present study shows that understanding women's particular responses to an abnormal screening result may benefit from attention both to illness representations and to attitudes about behavior. Although the present findings relate to the cervical screening context, they are likely to be of relevance to a range of health behavior interventions in which delay and drop out have implications for health and for other forms of screening, such as for breast, bowel, or colorectal cancer.

## References

- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11–39). Berlin, Germany: Springer-Verlag.
- Ajzen, I. (1988). *Attitudes, personality and behavior*. Chicago, IL: Dorsey.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control and the theory of planned behavior. *Journal of Applied Social Psychology*, 32, 665–683.
- Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behaviors. *Journal of Personality and Social Psychology*, 27, 41–57.
- Ajzen, I., & Fishbein, M. (1974). Factors influencing intentions and the intention-behavior relation. *Human Relations*, 27, 1–15.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior:

- Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, 22, 453–474.
- American Cancer Society. (2004). *Cancer facts and figures 2004*. Atlanta, GA: American Cancer Society.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology*, 40, 471–499.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191–215.
- Bish, A., Sutton, S., & Golombok, S. (2000). Predicting uptake of a routine cervical smear test: A comparison of the health belief model and the theory of planned behavior. *Psychology and Health*, 15, 35–50.
- Bornstein, J., Yaakov, Z., Pascal, B., Faktor, J., Baram, A., Zarfati, D., & Abramovici, H. (1999). Decision making in the colposcopy clinic: A critical analysis. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 85, 219–224.
- Bosch, F. X. (2004). The etiology of squamous cell cervical cancer. In T. E. Rohan & K. V. Shah (Eds.), *Cervical cancer: From etiology to prevention* (pp. 191–216). Dordrecht, the Netherlands: Kluwer Academic.
- Brewer, N. T., Chapman, G. B., Brownlee, S., & Leventhal, E. (2002). Cholesterol control, medication adherence, and illness cognition. *British Journal of Health Psychology*, 7, 433–447.
- Brinton, L. A., Hamman, R. F., Huggins, G. R., Levine, R. S., Mallin, K., & Fraumeni, J. F. (1987). Sexual and reproductive risk factors for invasive squamous cell cervical cancer. *Journal of the National Cancer Institute*, 79, 23–30.
- Carstairs, V., & Morris, R. (1989). Deprivation, mortality, and resource allocation. *Community Medicine*, 11, 364–372.
- Conner, M., & Sparks, P. (2005). The theory of planned behavior and health behaviors. In M. Conner & P. Norman (Eds.), *Predicting health behavior: Research and practice with social cognition models* (2nd ed., pp. 170–222). Buckingham, England: Open University Press.
- Cuzick, J. (2004). Screening for cervical cancer. In T. E. Rohan & K. V. Shah (Eds.), *Cervical cancer: From etiology to prevention* (pp. 261–300). Dordrecht, the Netherlands: Kluwer Academic.
- Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11, 97–98.
- Hagger, M. S., Chatzisarantis, N. L. D., & Biddle, S. J. H. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology*, 24, 3–32.
- Hagger, M. S., & Orbell, S. (2003). A meta-analytic review of the common-sense model of illness representations. *Psychology and Health*, 18, 141–184.
- Hagger, M. S., & Orbell, S. (2005). A confirmatory factor analysis of the revised illness representations questionnaire in a cervical screening context. *Psychology and Health*, 20, 161–173.
- Hagger, M. S., Chatzisarantis, N. L. D., Griffin, M., & Thatcher, J. (2005). Injury representations, coping, emotions, and functional outcomes in athletes with sport-related injuries: A test of self-regulation theory. *Journal of Applied Social Psychology*, 35, 2345–2374.
- Hampson, S., Glasgow, R. E., & Foster, L. S. (1995). Personal models of diabetes among older adults: Relationship to self-management and other variables. *Diabetes Educator*, 21, 300–306.
- Heijmans, M. (1998). Coping and adaptive outcome in chronic fatigue syndrome: Importance of illness cognitions. *Journal of Psychosomatic Research*, 45, 39–51.
- Heijmans, M., & De Ridder, D. (1998). Assessing illness representations of chronic illness: Explorations of their disease specific nature. *Journal of Behavioral Medicine*, 21, 485–503.
- Ho, G. Y., Kadish, A. S., Burk, R. D., Basu, J., Palan, P. R., Mikhail, M., & Romney, S. L. (1998). HPV 16 and cigarette smoking as risk factors for high-grade cervical intra-epithelial neoplasia. *International Journal of Cancer*, 78, 281–285.
- Horne, R., & Weinman, J. (1999). Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *Journal of Psychosomatic Research*, 47, 555–567.
- Horne, R., & Weinman, J. (2002). Self-regulation and self-management in asthma: Exploring the role of illness perceptions and treatment beliefs in explaining nonadherence to preventer medication. *Psychology and Health*, 17, 17–32.
- Hunter, M. S., Grunfield, E. A., & Ramirez, A. J. (2003). Help-seeking intentions for breast cancer symptoms: A comparison of the self-regulation model and the theory of planned behavior. *British Journal of Health Psychology*, 8, 319–333.
- IARC Working Group on Evaluation of Cervical Cancer Screening Programs. (1986). Screening for squamous cervical cancer: Duration of low risk after negative results of cervical cytology and its implications for screening policies. *British Medical Journal*, 293, 659–664.
- Khanna, N., & Phillips, M. (2001). Adherence to care plan in women with abnormal Papanicolaou smears: A review of barriers and interventions. *Journal of the American Board of Family Practitioners*, 14, 123–130.
- Leventhal, H., Meyer, D., & Nerenz, D. (1980). The common sense model of illness danger. In Rachman, S. (Ed.), *Medical psychology* (Vol 2, pp. 7–30). New York: Pergamon Press.
- Leventhal, H., Nerenz, D. R., & Steele, D. J. (1984). Illness representations and coping with health threats. In A. Baum, S. E. Taylor, & J. E. Singer (Eds.), *Handbook of psychology and health: Social psychological aspects of health* (Vol. 4, pp. 219–252). Hillsdale, NJ: Erlbaum.
- Miller, A. B. (2004). The natural history of cervical cancer. In T. E. Rohan & K. V. Shah (Eds.), *Cervical cancer: From etiology to prevention* (pp. 61–78). Dordrecht, the Netherlands: Kluwer Academic.
- Moss-Morris, R., Weinman, J., Petrie, K. J., Horne, R., Cameron, L. D., & Buick, D. (2002). The Revised Illness Perception Questionnaire (IPQ-R). *Psychology and Health*, 17, 1–16.
- National Audit Office. (1998). *The performance of the NHS Cervical Screening Program in England*. London: Author.
- Norman, P., & Fitter, M. (1991). Predicting attendance at health screening: Organizational factors and patients' health beliefs. *Counseling Psychology Quarterly*, 4, 143–155.
- Orbell, S. (in press). Motivational models, volitional processes, and the promotion of health behaviors. In D. C. Park & L. L. Liu (Eds.), *Social and cognitive perspectives on medical adherence*. Washington, DC: American Psychological Association.
- Orbell, S., Johnston, M., Rowley, D., Espley, A., & Davey, P. (1998). Cognitive representations of illness and functional and affective adjustment following surgery for osteoarthritis. *Social Science and Medicine*, 47, 93–102.
- Orbell, S., & Sheeran, P. (1993). Health psychology and uptake of preventive health services: A review of 30 years' research on cervical screening. *Psychology and Health*, 8, 417–433.
- Parkin, D. M. (2001). Global cancer statistics in the year 2000. *Lancet Oncology*, 2, 533–543.
- Patnick, J. (2000). Cervical cancer screening in England. *European Journal of Cancer*, 36, 2205–2208.
- Petrie, K. J., Weinman, J., Sharpe, N., & Buckley, J. (1996). Role of patients' view of their illness in predicting return to work and functioning after myocardial infarction: Longitudinal study. *British Medical Journal*, 312, 1191–1194.
- Richart, R. M. (1980). The patient with an abnormal Pap smear: Screening techniques and management. *New England Journal of Medicine*, 302, 332–334.
- Sheeran, P., Conner, M., & Norman, P. (2001). Can the theory of planned

behavior explain patterns of health behavior change? *Health Psychology*, 20, 12-19.

Sheeran, P., & Orbell, S. (1998). Do intentions predict condom use? Meta-analysis and examination of six moderator variables. *British Journal of Social Psychology*, 37, 231-250.

Sheeran, P., & Orbell, S. (2000). Using implementation intentions to increase attendance for cervical cancer screening. *Health Psychology*, 18, 283-289.

Tabachnik, B. G., & Fidell, L. S. (1989). *Using multivariate statistics*. New York: Harper Row.

U.K. Department of Health. (2001). *Statistical bulletin: Cervical Screening Program England 1999/2000*. London: Author.

U.K. Department of Health. (2004). *General Household Survey: Mid-2002 population estimates*. London: Author.

Weinman, J., Petrie, K. J., Moss-Morris, R., & Horne, R. (1996). The illness perception questionnaire: A new method for assessing the cognitive representation of illness. *Psychology and Health*, 11, 431-444.

Weinstein, N. D. (1993). Testing four competing theories of health: Protective behavior. *Health Psychology*, 12, 324-333.



**AMERICAN PSYCHOLOGICAL ASSOCIATION  
SUBSCRIPTION CLAIMS INFORMATION**

Today's Date: \_\_\_\_\_

We provide this form to assist members, institutions, and nonmember individuals with any subscription problems. With the appropriate information we can begin a resolution. If you use the services of an agent, please do **NOT** duplicate claims through them and directly to us. **PLEASE PRINT CLEARLY AND IN INK IF POSSIBLE.**

PRINT FULL NAME OR KEY NAME OF INSTITUTION _____		MEMBER OR CUSTOMER NUMBER (MAY BE FOUND ON ANY PAST ISSUE LABEL) _____
ADDRESS _____		DATE YOUR ORDER WAS MAILED (OR PHONED) _____
CITY _____ STATE/COUNTRY _____ ZIP _____		<input type="checkbox"/> PREPAID <input type="checkbox"/> CHECK <input type="checkbox"/> CHARGE CHECK/CARD CLEARED DATE: _____
YOUR NAME AND PHONE NUMBER _____		(If possible, send a copy, front and back, of your cancelled check to help us in our research of your claim.) ISSUES: <input type="checkbox"/> MISSING <input type="checkbox"/> DAMAGED
TITLE _____	VOLUME OR YEAR _____	NUMBER OR MONTH _____
_____	_____	_____
_____	_____	_____

*Thank you. Once a claim is received and resolved, delivery of replacement issues routinely takes 4-6 weeks.*

(TO BE FILLED OUT BY APA STAFF)

DATE RECEIVED: _____	DATE OF ACTION: _____
ACTION TAKEN: _____	INV. NO. & DATE: _____
STAFF NAME: _____	LABEL NO. & DATE: _____

Send this form to APA Subscription Claims, 750 First Street, NE, Washington, DC 20002-4242

**PLEASE DO NOT REMOVE. A PHOTOCOPY MAY BE USED.**