

Delay in seeking a cancer diagnosis: Delay stages and psychophysiological comparison processes

Barbara L. Andersen* and John T. Cacioppo

Department of Psychology, Ohio State University, 1885 Neil Avenue Mall, Columbus, OH 43210-1222, USA

Dawn C. Roberts

Bradley University

Two analyses of patient delay in seeking a medical diagnosis are considered. In the first, a model of delay is presented. Specifically, delay is comprised of four stages (appraisal, illness, behavioural and scheduling delay intervals), each governed by a conceptually distinct set of decisional and appraisal processes beginning with the initial day that an unexplained symptom is detected to the day the individual appears before a physician. The second analysis is a social psychological one of the attributions individuals draw when relating their symptoms to their expectations and knowledge about physiological bodily processes. The eight principles of Psychophysiological Comparison Theory (PCT) provide the basis for clarifying the psychological processes of symptom interpretation and appraisal. Two studies were conducted with women seeking diagnostic evaluations for prevalent cancers: breast or gynaecological tumours. Regarding the delay model, results indicated that the delay intervals were independent (i.e. uncorrelated). Also, appraisal delay constituted the majority (at least 60 per cent) of the total delay. In the rest of PCT, support was found across measures of symptoms, the context in which the symptoms arose, and the inferences people made about the symptoms.

Patient delay refers to the period between an individual's first awareness of a marker of illness (signs or symptoms, hereafter referred to simply as symptoms) and medical consultation and diagnosis. In cancer, delay in seeking a diagnosis often increases morbidity and mortality. That is, if one delays less and the disease is less advanced at diagnosis, then the likelihood of cure may be increased, or at least the interval between initial treatment and recurrence (disease-free interval) may be lengthened (Robinson, Mohilever, Zidan & Sapir, 1984). Survival rates, as well as the quality of life following treatment, are typically inversely proportional to the extent of disease at diagnosis for the more prevalent sites for disease.¹ In short, patient delay in seeking a cancer diagnosis is an important problem, and in addition, it is a behavioural problem amenable to psychological analysis.

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¹ As noted, 'symptoms' is used here to refer to bodily signs, which refer to objective physiological events which are open to public verification, and to bodily symptoms, which are subjective sensations based (presumably) on physiological events but which manifest in the reports of the patient. Interested readers may wish to consult Cacioppo, Andersen, Turnquist & Tassinari (1989) for a further discussion of the distinctions between signs and symptoms.

We have conducted an analysis of cancer patient delay from two standpoints. In the first, we consider the inferences and decisions an individual makes as time passes from the initial day that an unexplained symptom is detected to the day when s/he eventually appears before a physician. We specify a model of patient delay and investigate the duration of and interrelationships among stages in the model. The second analysis is a social psychological one of the attributions individuals draw when relating their symptoms to their prior expectations and knowledge about physiological or bodily processes. This analysis builds upon our previous theoretical discussions of Psychophysiological Comparison Theory (PCT; Andersen & Cacioppo, 1990; Cacioppo, 1983; Cacioppo, Andersen, Turnquist & Petty, 1986; Cacioppo, Andersen, Turnquist & Tassinari, 1989).

Stages of delay

In the study of delay in seeking treatment for medical conditions, several definitions of delay have been used, but a frequently chosen operationalization is the number of days from the detection of the first symptom to an end-point. This latter variable is less consistently chosen, but has included seeing a physician for symptoms (e.g. Coates *et al.*, 1992; Waters, Nichols, Wheeler, Fraser & Hayes, 1983), being diagnosed with a medical condition (Marshall, Gregorio & Walsh, 1982), or beginning treatment for the condition (e.g. Howson, 1950). According to this view, all individuals, and even some physicians, would be 'delayers'. Yet another strategy has been to designate some delay as more 'reasonable' than others (e.g. one month from symptom appearance to appearance before a physician; see early work in cancer, for example, by Pack & Gallo, 1938).

Regardless of which definition of delay has been used, studies have, with few exceptions (Matthews, Siegel, Kuler, Thompson & Varat, 1983), lacked a model for delay. To meet this need, Fig. 1 presents a general model of total patient delay applicable to a variety of physical disorders, and one which was used in the present research. This model conceives of delay as comprised of a series of stages, each governed by a conceptually distinct set of decisional and appraisal processes. This model builds on important early work of Safer, Tharps, Jackson & Leventhal (1979).

While correlates of each stage can be studied, this analysis focuses on the delay processes of symptom interpretation—that is, the *appraisal delay*—because we hypothesized that this first interval would account for most of the delay in seeking a cancer diagnosis. There were several reasons for this hypothesis. First, the development of malignancy and the appearance of cancer symptoms are often protracted, and a complex and changing symptom can be typical, unlike the presentation of many other medical problems (e.g. myocardial infarction; see Matthews *et al.*, 1983). Symptoms can also vary with the site and extent of the disease. For example, cancer of the ovary has varied presentations—pelvic cramping, low back pain, pain or bleeding with intercourse, urinary frequency irregularities. Moreover, as cancers progress they can involve other bodily systems (e.g. gastrointestinal, lymphatics) and the symptom picture tends to change from specific or localized complaints (e.g. vaginal discharge/bleeding) to diffuse ones (e.g. loss of appetite, nausea, 'flu' symptoms). Finally, cancer is a life-threatening and a low-probability disease, and both conditions may foster distress and appraisal delay. Thus, we hypothesized that delay due to symptom interpretation (appraisal) would constitute a major portion of the total patient delay in cancer. If the appraisal delay accounts for the majority of the total

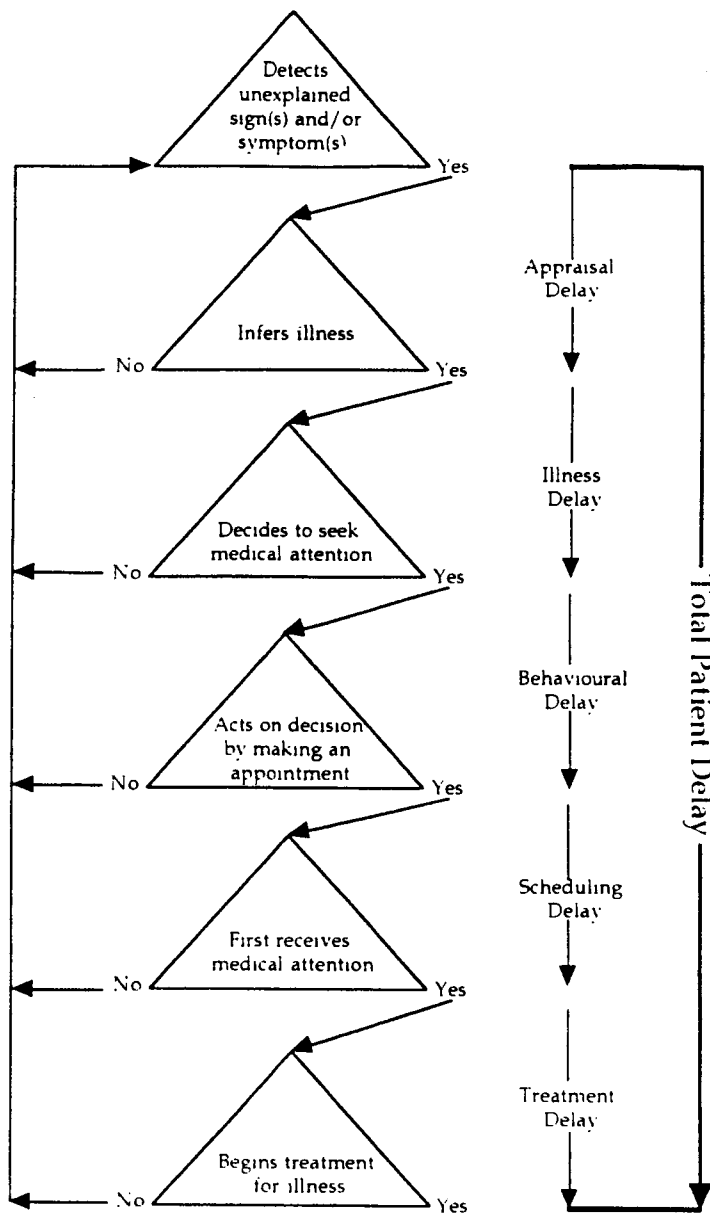


Figure 1. A general model of total patient delay.

delay time for cancer, then understanding the psychological processes underlying this stage is theoretically and practically important (see discussion of PCT theory below).

Briefly considering the other stages, *illness delay* is defined as the number of days elapsing from the time an individual concludes he or she is ill to the day s/he decides to seek medical help. At this time individuals must decide, for example, whether to seek assistance from others (e.g. physician, others with a similar condition) or to self-treat the

illness. After this the remaining delay time is spent between the time (days) that elapses between the decision to seek medical attention and the person acting on this decision by making an appointment—*behavioural delay*—and the time that elapsed between the person making an appointment and first receiving medical attention—*scheduling delay*. Response-control factors such as affordability, normative factors such as family pressure, and cognitive factors such as the extent to which the decision to seek medical help is based on issue-relevant thinking are more likely to modulate the time between a decision and an action (e.g. Cacioppo & Petty, 1982) for the behavioural delay time. In contrast, both patient characteristics (such as the manner in which the person describes their concerns and symptoms) and medical environment characteristics (such as an appointment backlog), which are not under an individual's control, may modulate the delay incurred when scheduling an appointment.

Psychophysiological comparison theory

There is a rich tradition of theory and research in social psychology which has highlighted processes believed to be central to illness appraisals and inferences. These include Festinger's (1954) and Schachter's (1959) emphasis on people's high motivation to maintain an explicable world, Schachter & Singer's (1962) stress on the evaluative need and search for comparison information initiated by unexpected changes in physiological arousal, and Lazarus's (1966; Lazarus & Folkman, 1984) research on the prior knowledge and coping responses that can be brought to bear on the threat. Other efforts within health psychology have examined symptom interpretation (e.g. focus of attention, illness prototypes; cf. Bishop, 1987; Bishop & Converse, 1986; Meyer, Leventhal & Gutman, 1985; Pennebaker, 1982). From these disparate literatures, a general attributional framework has been proposed for the psychological processes governing the detection of symptoms and their translation into illness inferences and appraisal delay (Cacioppo, 1983). The principles of PCT are presented in Table 1.

We propose eight principles governing symptom/sign appraisal. This process is conceptualized as one of psychophysiological comparison—a comparison of bodily symptoms with at least two types of circumstances: salient situational events and/or circumstances (e.g. nausea may be due to eating something 'bad', low back pain may be due to strenuous exercise) and/or those of known illness prototypes (e.g. acute abdominal pain may be appendicitis). Individuals' knowledge base about illness prototypes comes from a variety of routes: first-hand experience (evaluate current symptoms on the basis of past afflictions); self-education (e.g. reading newspaper articles about cancer); or observation (e.g. learning about cancer from seeing a relative with cancer).

Considering the theory, we offer assumptions about symptom interpretations. In principle 1 we suggest that individuals are motivated to maintain an understanding of their bodily (i.e. physiological) condition. This is due in part to the fact that uncertainty *per se* appears to be aversive, possibly due, as Schachter (1959) suggested, to a basic drive to achieve cognitive clarity regarding personally relevant stimuli and events. When unexplained symptoms of any variety occur, this motivation is tapped and individuals begin the symptom evaluation process. In a classic article on the pre-hospitalization activities of individuals having a heart attack, Hackett & Cassem (1975) observed that the onset of the initial symptoms lead to an active effort on the victim's part to understand and deal with

Table 1. Psychophysiological Comparison Theory

Principles of psychophysiological comparison processes
<p><i>Assumptions:</i></p> <ol style="list-style-type: none"> 1. People are motivated to maintain an explicable physiological condition. 2. Symptom perception need not be accurate in terms of physiological aetiology.
<p><i>Antecedents:</i></p> <ol style="list-style-type: none"> 3. The strength of the motivation to understand and evaluate one's symptoms is a function of their unexpectedness, salience, personal relevance and perceived consequences.
<p><i>Psychophysiological comparisons:</i></p> <ol style="list-style-type: none"> 4. Symptom interpretation involves a comparison of the symptoms with the known consequences of salient situational stimuli (e.g. exposure to pathogens, recent medications) and physiological conditions (e.g. allergies, diseases, that is, illness prototypes). 5. Symptom interpretation is governed in part by logical consistency. For example, the probability of a specific illness inference is a direct function of its accessibility (familiarity) and an inverse function of the discrepancy between the symptoms and the illness prototype. 6. Symptom interpretation is governed in part by an optimistic bias. For example, innocuous explanations (e.g. prototypes which suggest the symptoms are transient or self-correcting) diminish an individual's motivation to obtain additional information or explanations for the condition to a greater degree, <i>ceteris paribus</i>, than to threatening explanations. 7. The more diffuse the symptoms, the greater the number of potential comparisons and, consequently, the greater the likelihood of erroneous interpretations of the symptoms and the more susceptible to change are the interpretations.
<p><i>Effects of failing to find a comparison:</i></p> <ol style="list-style-type: none"> 8. If a situational stimulus or illness prototype cannot be initially identified to account for the symptoms, then the stimuli or prototype(s) which maximizes the logical and optimistic bias principles above will be considered. This will influence the subsequent symptom interpretation process in at least two ways: <ol style="list-style-type: none"> (a) The implicit theories people have about stimuli or prototypes will influence the attention to and detection of symptoms and the production of symptoms for interpretation. (b) The particular symptoms chosen will influence people's implicit theories about stimuli or prototypes.

the symptoms. As noted in principle 2, we do not presume that individuals need be 'accurate' in their perceptions of their symptoms, only that once the perception occurs they are motivated to understand from whence it comes. People are poor at tracking physiological processes and at identifying the actual source of a detected response, even though people believe they are proficient at these tasks (e.g. Pennebaker, 1982). Not only can noticeable bodily responses go undetected (e.g. Scheier, Carver & Matthews, 1983), but people even evaluate their 'physiological reactions' and conditions in the *absence* of actual feelings of pain or bodily sensations. Valins (1966), in fact, was the first to propose that the mere belief that a change in physiological 'arousal' had occurred would cause indi-

viduals to search for information that would allow them to label this change. In a more recent demonstration, McCaul, Thiess-Duffy & Wilson (1992) studied college students who were randomly assigned to experimental conditions which informed them falsely that they were at risk for, or actually had, gum disease. Two days later subjects in both conditions reported higher rates of gum bleeding (a symptom of gum disease) than subjects in the control condition who were informed that they had no gum disease.

Principle 3 states that there are antecedents to beginning the process of psychophysiological comparison. We posit that the strength of the motivation to evaluate symptoms is a function of both symptom attributes and perceived consequences of the symptoms. Symptom attributes can include such aspects as how salient (noticeable), how unexpected, or how relevant the symptoms are to one's prior health status. Personal consequences of the symptoms can include how disruptive they are to one's life or how difficult it is to tolerate the symptom(s). The rationale for this principle is based on the notion that people are limited in terms of their time and capacity for processing information and, therefore, must allocate their limited resources to deal with both internal and external events. Research in social and cognitive psychology has demonstrated, in fact, that people allocate more of their cognitive resources to process stimuli that are perceived as being personally relevant or consequential rather than to those perceived as being irrelevant or inconsequential (e.g. Petty & Cacioppo, 1986). Thus, a symptom that is highly salient (e.g. painful breast lump) should attract more attention and processing capacity than an equally severe but less salient sign or symptom (e.g. a painless breast lump).

We suggest in principles 4, 5 and 6 that the process of comparison making is governed by logical yet optimistic tendencies. For the logical aspects, individuals choose those comparisons (i.e. hypotheses for their symptoms) with which they are most familiar (e.g. prior experience or heavy knowledge base) and which are the best 'fit' to their notion/understanding of the illness prototype. To the extent that symptoms and information/experience about any particular prototype are discrepant, that prototype hypothesis will wane in favour and the person will continue the search for more viable ones. Principle 5 is in line with Leventhal's work on 'common sense' models of illness (e.g. Leventhal, Meyer & Nerenz, 1980). Briefly, specific signs and symptoms are associated during illness episodes with medical visits, diagnoses, treatment and the social comparisons with others. These associations result in a set of learned illness prototypes that can be activated by the appearance of a sign (e.g. a breast lump in the past which has been associated with the diagnosis of fibrocystic disease). In terms of principle 4, these 'common sense' models of illness represent potential internal causes for detected signs and symptoms, and in agreement with the work of Leventhal, the stronger the association between the detected signs and symptoms and the illness prototype, the more likely the illness label will be invoked. All other constant, low base rate diseases will also be less likely to be selected as causes than relatively common disorders.

The other side of this process, noted in principle 6, is an optimistic bias. That is, all things being equal, individuals will adopt privately the innocuous rather than the more serious or more threatening hypotheses for symptoms. Thus, individuals will be more inclined to appraise a new and unexpected symptom as illness reflecting a transient, self correcting, and/or less serious condition than a life-threatening condition. For example, the 45-year-old woman will hypothesize 'menopause' for her irregular bleeding symptoms rather than cervical cancer; the 60-year-old male will hypothesize 'haemorrhoids' for

his rectal bleeding rather than colorectal cancer; the young man with nagging fatigue and malaise will hypothesize the 'flu, lack of sleep, stress, or all of the above' rather than lymphoma. Temoshok, Di Clemente, Sweet, Blois & Sagebiel (1984), in studying diagnostic delay in melanoma patients, found that even the patients who sought treatment relatively quickly also minimized the seriousness of the condition. Continuing with principle 7, the more diffuse or confusing the symptoms, the more likely individuals will make errors in this process. Obviously this optimistic bias does something good—it keeps one from a chronic state of somatic worry over every symptom. A possible problematic side is that to the extent that individuals are skilled at generating benign hypotheses, albeit plausible rival ones, the motivation to continue to obtain information and 'self-study' one's symptoms will decline. When wrong, this benign hypothesizing results in delay.

What are the effects of failing to find a comparison when neither situational explanations nor available illness prototypes seem to capture the symptom experience? As stated in principle 8, the guiding principles of logical consistency and optimistic bias operate, and hypotheses that fit these principles are chosen. While we have thus far described this hypothesis testing as if it were a static process, it is likely to be a dynamic one. Specifically, individuals' implicit theories about situational events or illness prototypes will increase one's attention to and detection of symptoms which 'fit' the illness. And the particular symptoms experienced will also influence an individual's implicit theories about situational events or illness prototypes. Pennebaker & Skelton (1981) argued that the differential reporting of bodily events is due in part to the selective monitoring and hypothesis testing of actual physiological events. Thus, a feedback loop from comparison of bodily condition with illness prototypes is proposed. If nothing changed, this process could perpetuate false beliefs about illnesses as well as selective attention to symptoms. However, it is usually the case that as time passes, additional symptom information accrues; specifically, physical conditions may worsen or improve. This additional information will provide new bases for choosing and modifying hypotheses. The psychophysiological comparison process will continue to be guided by logical and optimistic principles, and new circumstances or illness prototypes will arise.

In summary, these principles portray psychophysiological comparison processes as being pervasive, influential and in many cases biased to support a positive view of oneself and one's physiological condition. For instance, although the similarity between symptoms and a disease prototype is posited to increase the likelihood that the person will infer the presence of the disease given these symptoms (logical consistency, principle 5), equally plausible but less threatening accounts are embraced more quickly (optimistic bias, principle 6). Although the psychophysiological comparison model of symptom interpretation and appraisal delay accounts for a wide variety of existing research (see Cacioppo *et al.*, 1986, 1989), here we provide empirical tests of principles 1, 3, 5, 6 and 7 in the stage of appraisal delay for a real or potential cancer diagnosis.

The present research

Two studies were conducted. In the first, newly diagnosed cancer patients were assessed. Women who had been diagnosed approximately one week previously with malignant gynaecological disease were individually queried on their symptoms, illness inferences and the time line for delay. The foci of the data analyses were to

describe the length of each delay stage, determine the interrelationships among the component stages, and examine the role of psychophysiological comparison processes in appraisal delay. In addition, a structured interview assessed several individual difference factors (e.g. medical habits, demographic variables) which have been suggested in previous studies of patient delay (e.g. Goldston, Gerhardt & Handy, 1957; see Kutner & Gordon, 1961 or Antonovsky & Hartman, 1974 for classic reviews of the literature). By examining the latter variables we sought to determine whether or not PCT principles show stronger and more consistent relationships for delay behaviour than other, non-theoretical moderators culled from the literature. In Study 2, women seeking a diagnosis for breast symptoms/signs were interviewed. At the time of their interview neither they nor we knew whether the breast conditions were malignant or benign. Thus, Study 2 sought to replicate the findings of Study 1 with a symptom assessment which was not confounded with cancer diagnosis, a period of emotional crisis (Andersen, Anderson & deProsse, 1989). This second study would also provide a test of the generalization of the conceptualizations across disease sites and symptom presentations in cancer delay.

STUDY 1

Method

Subjects

Subjects were consecutive referrals to a large tertiary care hospital who were diagnosed with gynaecological cancer one or two weeks previously and who were having diagnostic studies of the tumour prior to treatment. To be eligible for participation, women had to have self-detected symptoms, sought medical treatment on their own initiative, and received their first diagnosis of cancer. Of 39 women meeting study criteria and approached, 34 agreed to participate (89 per cent). Their diagnoses were at the following sites: cervix, $N = 14$; endometrium, $N = 11$; vulva, $N = 6$; ovary $N = 2$; vagina, $N = 1$. All women were white and ranged in age from 24 to 75 years ($M = 49.6$; $SD = 14.5$). Most had at least a high school education (77 per cent), were currently married (48 per cent) or divorced (23 per cent), and were employed outside the home (61 per cent). Average family income was \$17 120. These data reflect the age and socio-economic characteristics of women diagnosed with gynaecological cancer and the distribution of these tumour types (Boring, Squires, Tong & Montgomery, 1994; Brinton & Hoover, 1992).

Measures

Delay stages. Subjects were asked to identify the five critical calendar dates in the delay time line, and from these dates the length (in days) of the four stages of delay and a measure of total delay were determined.² The five dates were (1) the date the subject detected her first symptom; (2) the date the subject decided she was ill (*appraisal delay* is defined as the number of days elapsing from (1) to this second date); (3) the date the subject decided to seek medical care (*illness delay* is defined as the number of days elapsing from (2) to this date); (4) the date the subject acted on this decision by making an appointment to secure medical attention (*behavioural delay* is defined as the number of days elapsing from (3) to this date); (5) the date the subject first obtained medical attention for her symptoms (*scheduling delay* is defined as the number of days elapsing from (4) to this date). Delay intervals of zero days were, of course, a possibility. For example, if a subject did not

² Subjects provided information about the symptoms noticed at each critical date listed above, but only appraisal delay data are relevant to the present analysis. Turnquist (1986) examined the predictors of the illness, scheduling and behavioural stages of patient delay and confirmed that the variables thought to predict appraisal delay were unrelated to other delay stages.

call for an appointment, but waited until a regularly scheduled visit to report her symptoms to a physician. scheduling delay was assigned a value of zero. Total patient delay was defined as the sum of these stages of delay.

PCT variables. Directed by the principles in Table 1, three sets of constructs were operationalized. These included descriptions of symptoms experienced and inferences about these symptoms as indicators of illness.

(a) *Symptom description.* Subjects were asked to recount all signs or symptoms they noticed on each of the five identified dates. Responses were recorded verbatim and symptoms for the entire sample were later content analysed to determine major types. Types included: bleeding, pain, epithelial (skin) signs (e.g. open sore, lump) and symptoms (e.g. burning sensation, swelling), gastrointestinal or urinary symptoms, and general/diffuse health signs (e.g. weight loss) and symptoms (e.g. decreased appetite, fatigue). Frequencies for each type and the total number of symptoms/signs were obtained for each subject for each day.

(b) *Environmental distractions.* Each woman rated on four nine-point scales (1 = 'not at all' to 9 = 'extremely') how boring, busy and challenging her life was on each critical day, and how many responsibilities she felt she had at that time (1 = 'none' to 9 = 'many'). The mean response to these scales served as an index of external distraction which might affect attention available to detect and interpret symptoms.

(c) *Illness inferences.* Five types of illness inferences were assessed for each critical date.

Negative affect. Sets of nine-point scales (1 = 'not at all' to 9 = 'extremely') were used to assess the fear, anxiety and depression in response to symptoms on each date. Fear was defined as the mean of responses to questions of how fearful, scared and afraid their symptoms made them feel. Similar computations were made for the affects of anxiety (worried, anxious, nervous) and depression (sad, down-hearted, blue), and an overall measure of negative affect for each critical date was defined as the grand mean of the nine scales.

Symptom salience. Women rated on nine-point scales (1 = 'not at all' to 9 = 'extremely') how 'painful', 'attention-getting', 'noticeable' and 'difficult to ignore' their symptoms were. Salience was defined as the mean of these four ratings.

Motivation to determine the cause of symptoms. Women were provided with exemplars indicative of strong motivation (e.g. 'I talked to someone about it', 'I looked for other symptoms') and were asked to rate their motivation to determine the cause of their symptoms. Ratings were made on a nine-point scale (1 = 'I couldn't have cared less' to 9 = 'I was extremely motivated to determine the cause'). One such rating was obtained for the set of symptoms experienced on each date.

Explanations considered for symptoms. The interviewer elicited the subject's explanations for her symptoms. In addition to these explanations, an 'uncertain' category was added by the experimenter if the patient did not express complete certainty for her explanations. Following data collection for all subjects, content analysis yielded the following categories of explanations: (a) normal life circumstances; (b) medical side-effects; (c) benign illness; (d) benign gynaecological changes; (e) benign gastrointestinal or urinary changes; (f) cancer; (g) uncertain. In this analysis the measures extracted were the number of explanations listed in each category and the total number of explanations. In addition, subjects rated the extent to which they believed a particular explanation applied and the extent to which they were uncertain by partitioning 100 per cent across all explanations for each critical date.

Perceived seriousness. Each explanation for symptoms was rated on a nine-point scale (1 = 'this is a healthy/normal life experience' to 9 = 'this is a very ill/life-threatening condition'). In addition, each patient provided a global rating of the perceived seriousness of her physiological condition (which would include the entire symptom picture) using a nine-point scale (1 = 'It was a healthy/normal life experience' to 9 = 'It was a very ill/life-threatening condition').

Other potential moderators of delay. Two areas were assessed.

Linkage with the health care system. Factors reflecting medical habits and medical care resources included: distance from the patient's home to the medical professional first seen for her symptoms, type of health professional seen, number of consultations with a physician in the last two years, time in months since last physician visit, and the availability of medical insurance for the patient.

Demographic variables. Age, marital status, number of adults and children residing in the home, religious affiliation, education, employment, occupation, and income were obtained.

Procedure

Following informed consent, interviews were scheduled for the day of the physical examination or the day before the beginning of treatment. All women were interviewed individually for approximately one hour. Complete data were not obtained from three subjects because of illness at the first visit and scheduling difficulties before treatment was begun (information on linkage with the health care system). The interview consisted of questions regarding the dates of the delay stages and the symptom interpretation variables. Patients were instructed to remember each date, one at a time, when recalling their interpretation of their symptoms. The order in which the dates were reviewed was randomized between forward and reverse chronological order to avoid systematic anchoring effects. Finally, demographic, diagnostic and medical information was obtained from participants, hospital charts and physicians.

Results and discussion

Stages of delay

A logarithmic transformation of the delay measures was conducted to normalize distributions.³ Following Safer *et al.* (1979), stage delays of zero were assigned a transformed value of zero, and total delays of more than one year were truncated to one year before transformation to further attenuate the effects of two extreme scores. Mean total patient delay was 97 days, comprised of appraisal, 77 days; illness, 10 days; behavioural, five days; and scheduling, five days. Calculations of proportions revealed, as expected, that the appraisal delay accounted for significantly more of the total patient delay than any other component ($F(4,96) = 10.49, p < .01$) and constituted an overwhelming 79 per cent of the total delay in seeking a diagnosis of gynaecological cancer. Examination of the independence of the four stages of total patient delay revealed that none of the delay intervals covaried significantly.

Psychophysiological comparison processes

Before proceeding to the test of the psychophysiological comparison principles, two types of preliminary analyses were conducted. The first determined whether the structured interview tapped the underlying constructs. A principal component factor analysis with varimax rotation of the interview data was conducted. Three major factors emerged. Factor 1, *negative affect*, loaded highly only on the nine measures of fear, anxiety and depression (loadings ranged from .70 to .87, with the next highest loadings being less than half these loadings). Factor 2, *salience*, was comprised of the four measures specified for indexing salience (loadings ranged from .91 to .61, with the next highest loadings being .53 and .43 for the measures of fear and worry, respectively). Factor 3, *distraction*, comprised the four measures specified for indexing extant distraction (loadings ranged from .73 to .93, with the next highest loadings being less than a third of these values). Hence, the original definitions of these measures were retained.

³ A logarithmic transformation is not linear and could potentially affect the magnitude of correlations and F ratios. Hence, parallel analyses were performed on untransformed scores to determine whether the transformation produced potentially spurious results (see Cacioppo & Tassinari, 1990). Results from these analyses were consistent with those reported.

The second preliminary analyses examined other potential correlates of delay. Measures of linkage to the health care system were not significantly correlated with delay. Of the demographic variables assessed, only age covaried significantly with appraisal ($r = -.42$, $p < .05$) and total patient delays ($r = -.52$, $p < .01$), while income covaried significantly with behavioural delay ($r = -.42$, $p < .05$). For the PCT hypotheses, the appraisal delay was the focus. Therefore, partial correlations were computed between the psychophysiological comparison variables of interest and age. The predictor of interest accounted for significant variance in the specific criterion after accounting for age in all of the analyses reported below with only two exceptions: older individuals were (a) more certain and less motivated to continue their search for an explanation for their symptoms, and (b) more likely to select innocuous interpretations for their symptoms and be less motivated to search for an explanation.

Principle 1: Does the emergence of unexplained symptoms lead to an evaluative need? The first principle predicts that the appearance of an unexpected symptom(s) can be aversive, and accordingly, that a motive is aroused to evaluate the symptom(s). Consistent with this prediction: (1) the total number of cancer symptoms noticed initially by patients—all of which were unexpected—predicted the total number of explanations for these symptoms generated by the patients ($r = .47$, $p < .01$); (2) the less certain patients were in the veracity of at least one of the explanations they had considered on that day, the more explanations they generated ($r = -.43$, $p < .01$); (3) the less certain patients were in the veracity of at least one of the explanations they had considered on that day, the more they tended to report being motivated to continue their search for an explanation for their symptoms ($r = .30$, $p < .10$, n.s.); (4) the less certain patients were in the veracity of at least one of the explanations, the more patients reported being depressed ($r = .53$, $p < .01$); and (5) patients' reported motivation to evaluate their symptoms covaried with the level of reported fear, anxiety and depression reportedly experienced on this day ($r_s = .68$, $.60$ and $.46$, respectively, $p_s < .01$).

Principle 3: What features of symptoms influence the motivation to find an explanation for them? We postulate that the motive to search for an explanation for symptoms is a function of the unexpectedness, salience, perceived consequences (seriousness) and personal relevance of the symptoms. All symptoms in the present study were unexpected and personally relevant, but measures of salience and perceived seriousness were obtained. Consistent with expectations, the patients' reported motivation to evaluate their symptoms was predicted by both the rated salience of the symptoms ($r = .69$, $p < .01$) and the perceived consequences of their explanations for the symptoms ($r = .37$, $p < .05$). Additionally, total delay was predicted by patients' reported motivation to evaluate their symptoms ($r = -.42$, $p < .05$). It is noteworthy that patients' reported motivation on this day, although predictive of the stage of delay for which it marked the onset, was neither significantly related to any of the individual difference variables or health beliefs (e.g. the frequency with which these individuals had previously sought health care) nor was it significantly related to any other delay stage. Hence, the support obtained for this principle is unlikely to be due to initial differences in medical beliefs or to a response bias.

Principle 5: Are illness inferences guided by processes of logical consistency? One notion underlying PCT is that patients compare their symptoms with prototypes of the physiological effects of various internal (e.g. diseases) and external (e.g. stressors) events. Principle 5 posits further that illness inferences result not because of the perceptual salience of physical symptoms *per se*, but because of the relative *match* between the symptoms and the prototype for a disease. The greater the similarity between the symptoms and the expectations about the effects of a disease (e.g. cancer), the greater should be the likelihood that the patients' attributions for the symptoms are to the disease and, consequently, the shorter the appraisal patient delay. Conversely, the greater the similarity between the symptoms and expectations about the effects of a transient or innocuous possibility (e.g. side-effects of medication, fatigue, normal life-events), the less likelihood that the patients' attributions for the symptoms are to a disease and consequently, the longer the appraisal delay.

Evidence bearing on these predictions includes the explanations considered by patients on the day they detected their initial symptoms. Each explanation patients reported on the first day on which they noticed their symptoms was recorded. Explanations across the sample were later coded, and they included the following categories (ordered in terms of per cent of patients reporting at least one of the particular type): (1) normal life-events (e.g. overwork, exercise) (48.4 per cent); (2) benign gynaecological disorder (e.g. menopause, vaginal infection) (22.6 per cent); (3) benign illness (e.g. stomach flu) (12.9 per cent); (4) medical side-effects (e.g. side-effects of medication) (9.7 per cent); (5) benign urinary disorder (e.g. bladder infection) (9.7 per cent); (6) cancer (6.5 per cent). In all cases the explanations generated by patients were plausible. In large part, women initially hypothesized non-cancer—normal or benign—causes associated with symptoms.

More importantly, as the cancer symptoms continued or changed in magnitude and time, the discrepancy between the patients' symptomatology and their initial transient or innocuous environmental accounts increased, and the discrepancy between their symptomatology and disease explanations decreased. To determine if this changing symptom picture had corresponding effects on the patients' illness inferences, a 2 (explanation: normal life, cancer) \times 2 (date: symptom detection, illness inference) repeated measures analysis of variance was conducted. A significant main effect for explanation ($F(1,30) = 10.28, p < .01$) indicated that patients more often considered their symptoms to be caused by normal life circumstances than by cancer. Further, a significant interaction indicated that over the course of the appraisal interval the number of cancer explanations increased, whereas the number of explanations of normal life circumstances decreased ($F(1,30) = 9.35, p < .01$). This shift from normal life explanations to cancer explanations, shown in Fig. 2, can be viewed as reflecting the rational side of psychophysiological comparison processes, a zeroing-in on the correct but lower base rate account 'cancer', as the experience of symptoms which are inconsistent with the initial attribution leads to the rejection of these 'normal' accounts.

To examine whether the patients' inferences about their symptoms were actually related to their delay in seeking a cancer diagnosis, an index was calculated subtracting the number of normal life explanations from the number of cancer explanations. This index, which reflects the relative dominance of cancer inferences when symptoms were first detected, was then correlated with the appraisal and total patient delay intervals. As

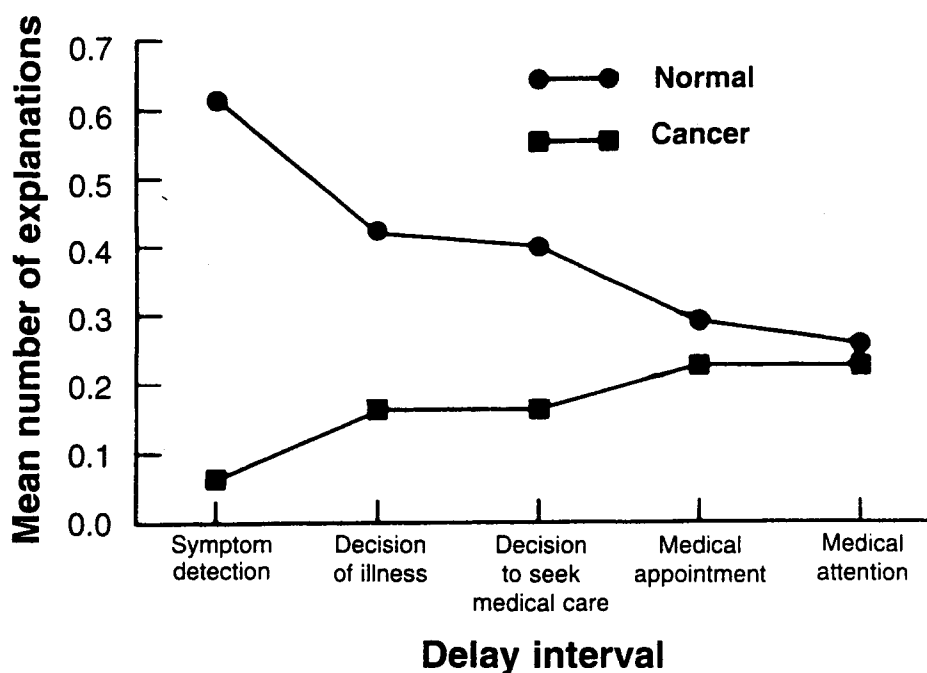


Figure 2. Mean number of 'normal' vs. 'cancer' explanations generated for disease signs and symptoms by women newly diagnosed with gynaecological cancer.

expected, this index predicted appraisal delay ($r = -.60, p < .01$) and total patient delay ($r = -.55, p < .01$).⁴

Principle 6: Are illness inferences (mis)guided by an optimistic bias? Evidence bearing on this question examined the relationships between the patients' reported motivation to search for an explanation for their symptoms and the nature of the explanations generated initially. Results revealed that the more innocuous the accounts selected to explain the symptoms (e.g. normal life circumstances), the less the reported motivation to search for an explanation ($r = -.34$, n.s. when adjusted for age). Conversely, the more highly threatening the accounts for symptoms (e.g. cancer), the higher the reported motivation to search for an explanation ($r = .38, p < .05$). These results are consistent with laboratory studies on hedonic consistency in studies of syllogistic reasoning (e.g. McGuire, 1981) and on misattribution showing that the threshold for accepting a non-threatening expla-

⁴ Corresponding analyses using the logarithmic transformation for appraisal and patient delays produced similar results (i.e. $r_s = -.41$ and $-.35, p < .01$, for appraisal and total patient delay, respectively). One might also calculate an index of illness inference by subtracting the number of wellness explanations (e.g. normal life-events, medical side-effects) from the number of 'illness' explanations (e.g. cancer, benign gynaecological disorder, urinary disorder) considered when symptoms were first detected, and correlating this 'illness index' with appraisal and total patient delays. Such an analysis was performed and yielded results parallel to those reported in the text ($r_s = .50$ and $-.42, p < .01$, for appraisal and total patient delay, respectively). This result further supports a rationality in illness inferences and patient delay: the more dominant are normal-life explanations for symptoms when first detected, the longer the patient delay.

nation for an unexpected bodily response is lower than the threshold for accepting a personally threatening account (e.g. Fries & Frey, 1980).

Principle 7: Are diffuse symptoms more amenable to multiple interpretations? The final principle examined postulates that the less specific the detected symptom, the greater the number of potential explanations and the greater the number of incorrect explanations generated. Thus, we predicted that appraisal would be longer with symptoms which were 'indiscriminate'. Consistent with this reasoning, the number of general/diffuse symptoms (e.g. fatigue) detected initially predicted: (1) the total number of explanations generated ($r = .45$); (2) the number of (erroneous) explanations of normal life circumstances generated for the symptoms ($r = .46, p < .01$); and (3) the length of appraisal delay ($r = .43, p < .01$).

Summary

Analysis of the delay process support the conceptualization of the five component stages of total patient delay. It was found that the processes of symptom interpretation (i.e. appraisal delay) accounted for the majority of the time in the delay for women newly diagnosed with gynaecological cancer. In the test of the PCT principles support was found across multiple measures of symptom descriptions, the context in which the symptoms arose, and the inferences people made about the symptoms. Analyses documented the motivation to evaluate and understand one's symptoms (principles 1 and 3), including the rational (principle 5) and optimistic (principle 6) sides of decision making, and the difficulty of interpreting bodily states when the symptoms are general or diffuse (principle 7). These findings are in contrast to the relatively low predictive value found for variables examined in previous delay studies, e.g. socio-demographic variables, linkage to the health care system.

STUDY 2

Method

Subjects

Subjects were consecutive referrals to an out-patient clinic of a large tertiary care hospital who were being evaluated for a potential breast cancer diagnosis. To be eligible for participation women had to have self-detected symptoms, sought medical treatment on their own initiative, but not yet have received their diagnosis. Of 70 women approached, 63 agreed to participate (90 per cent). Most subjects were white (92 per cent) and ranged in age from 17 to 70 years ($M = 35.9, SD = 11.9$). Most had at least a high school education (82 per cent), were currently married (52 per cent), and were employed outside the home (67 per cent). Average family income was in the \$20 000–30 000 range. Six women eventually received a cancer diagnosis (10 per cent), whereas the remainder received diagnoses of benign disease. This socio-demographic distribution as well as the incidence of malignant diagnoses following breast symptomatology reflects national epidemiological data (Scanlon, 1991).

Measures

All delay, psychophysiological comparison and miscellaneous variables were identical to those collected for Study 1. Because of the difference in disease sites, descriptions of symptoms and explanations for the symptoms were, of course, different. The descriptions of these two PCT variables are provided below.

Symptom description. Subjects recounted all signs or symptoms they noticed on each of the five identified dates. Responses were recorded verbatim and symptoms for the entire sample were content analysed. Types

included: breast lump or thickening, breast surface changes (e.g. skin dimpling, warmth), nipple change or discharge, pain, other breast sensations, and general/diffuse health signs (e.g. weight loss) and symptoms (e.g. decreased appetite, fatigue). Frequencies for each type and the total number of symptoms/signs were obtained.

Explanations considered for symptoms. The interviewer elicited the patient's explanations for her symptoms. In addition to the woman's explanations, an 'uncertain' category was added by the experimenter. Following data collection for all subjects, content analysis yielded the following categories of explanations: (1) normal life circumstances; (2) medical side-effects; (3) benign illness; (4) benign breast disease; (5) normal breast changes (e.g. menstrual or pregnancy related); (6) physical trauma (blow or bump to breast); (7) cancer; (8) uncertain. In this analysis the measures extracted were the number of explanations listed in each category and the total number of explanations. In addition, subjects rated the extent to which they believed a particular explanation applied and the extent to which they were uncertain by partitioning 100 per cent across all explanations for each critical date.

Procedure

Informed consent was obtained and interviews were conducted before patients were examined by a physician. All women were interviewed individually for approximately one hour. The interview consisted of questions regarding the dates of the delay stages and the symptom interpretation variables. As in Study 1, women were instructed to remember each date, one at a time, when recalling their interpretation of their symptoms; the order in which the dates were reviewed was again randomized. Finally, demographic, diagnostic and medical information was obtained from the women, hospital charts and physicians.

Results and discussion

Stages of delay

A logarithmic transformation of the delay measures was conducted to normalize distributions.³ Following Safer *et al.* (1979), stage delays of zero were assigned a transformed value of zero, and total delays of more than one year were truncated to one year before transformation to further attenuate the effects of two extreme scores. Mean total patient delay was 46 days, comprising appraisal, 27 days; illness, seven days; behavioural, six days; scheduling, six days. Calculations of proportions again revealed that appraisal delay accounted for significantly more of the total patient delay than any other component ($F(4,248) = 36.6, p < .01$) and constituted 59 per cent of the total delay in seeking a diagnosis of breast disease. Also, examination of the independence of the four stages of total patient delay revealed that none of the delay intervals covaried significantly.

Psychophysiological comparison processes

Preliminary analyses were again conducted to determine if socio-demographic or health practice variables were significantly correlated with delay. Only education was significantly associated with behavioural delay ($r = -.28, p < .05$) and time since the last visit to a physician covaried with illness delay ($r = .51, p < .01$). No variables covaried with appraisal or total delay.

³ A logarithmic transformation is not linear and could potentially affect the magnitude of correlations and F ratios. Hence, parallel analyses were performed on untransformed scores to determine whether the transformation produced potentially spurious results (see Cacioppo & Tassinary, 1990). Results from these analyses were consistent with those reported.

Principle 1. This principle predicts that the appearance of an unexpected symptom(s) can be aversive and a motive is aroused to evaluate the symptom(s). Tests of this principle were partially supported. Consistent with this prediction: (1) the less certain patients were in the veracity of at least one of the explanations they had considered on a day, the more explanations they generated ($r = -.71, p < .01$); and (2) patients' reported motivation to evaluate their symptoms covaried with the level of reported fear, anxiety and depression reportedly experienced on that day ($r_s = .59, .68$ and $.31$, respectively, $p_s < .01$). Inconsistent with this principle, the total number of symptoms noticed did not predict the number of explanations generated, and certainty of explanations of symptoms did not predict motivation to search for explanations for the symptoms.

Principle 3. Consistent with principle 3, the patients' reported motivation to evaluate their symptoms was predicted by both the rated salience of the symptoms ($r = .44, p < .01$) and appraisal ($r = -.63, p < .01$) and total ($r = -.61, p < .01$) delays. Again, patients' reported motivation was related to appraisal, but was not related to any other potential moderating variables (e.g. frequency of health care visits) or any other delay stage.

Principle 5. In testing principle 5, we examined the explanations considered by patients on the day they detected their initial symptoms. Explanations that patients considered when they initially noticed their symptoms were coded into the following categories (ordered in terms of per cent of patients reporting at least one of the particular type): (1) cancer (39.7 per cent); (2) benign breast disease (31.7 per cent); (3) normal breast changes (18.5 per cent); (4) physical trauma (12.7 per cent); (5) normal life-events (e.g. overwork, exercise) (6.3 per cent); (6) medical side-effects (4.8 per cent); (7) benign illness (4.8 per cent). In all cases the explanations generated by patients were plausible.

Analyses also examined the change in illness inferences. To determine if this changing symptom picture had corresponding effects on the patients' illness inferences, a 2 (explanation: normal life, cancer) \times 2 (date: symptom detection, illness inference) repeated measures analysis of variance was conducted. A significant main effect for explanation was found ($F(1,62) = 10.97, p < .01$), and indicated that patients more often considered their symptoms to be caused by normal life circumstances than by cancer. Further, a significant interaction indicated that over the course of the appraisal interval the number of cancer explanations increased, whereas the number of explanations of normal life circumstances decreased ($F(1,62) = 10.19, p < .01$). The index, reflecting the relative dominance of cancer inferences (e.g. subtraction of the number of normal life explanations from the number of cancer explanations), was calculated and was then correlated with the appraisal and total patient delay intervals. Again, this index predicted appraisal delay ($r = -.40, p < .01$) and total patient delay ($r = -.32, p < .01$).

Principle 6. In testing principle 6 we examined the relationships between the patients' reported motivation to search for an explanation for their symptoms and the nature of the explanations generated initially. Results revealed that the more innocuous the accounts selected to explain the symptoms (e.g. normal life circumstances), the less the reported motivation to search for an explanation ($r = -.27, p < .05$). Conversely, the more highly threatening the accounts for symptoms (e.g. cancer), the higher the reported motivation to search for an explanation ($r = .38, p < .01$).

Principle 7. Lastly, we attempted to test the hypothesis that the less specific the detected symptom, the greater the number of potential explanations and the greater the number of incorrect explanations generated. However, it was impossible because of the differences in symptoms (i.e. breast lumps, for the most part), as no women reported general/diffuse symptoms (e.g. fatigue).

Summary

As with Study 1, the five-component model of total patient delay was supported. Women experiencing breast symptoms, but as yet unaware of their clinical significance, indicated that the processes of symptom interpretation (appraisal delay) accounted for the majority of the time (approximately 60 per cent of the time in days) in their delay to seek medical evaluation. These data were gathered during the evaluation prior to diagnosis, and so the assessment was not confounded by the emotional turmoil which accompanies cancer diagnosis (Andersen *et al.*, 1989). Also, this disease site had greater symptom specificity and more 'common knowledge' about the importance of the symptoms (breast lumps) as potentially indicative of cancer. In this context, these data replicate the findings from Study 1 and support the PCT principles. Analyses documented the motivation to evaluate and understand one's own symptoms is a function of the salience of the symptoms (principle 3) and that the symptom interpretation process is governed by both logical (principle 5) and optimistic (principle 6) views.

General discussion

The present research was designed to examine the behavioural and psychological processes involved in patient delay and to test an attributional conceptualization of symptom appraisal processes. An important medical problem, delay in seeking evaluation of symptoms potentially indicative of cancer, served as a specific methodological context, although we suggest that both the model of delay as well as PCT should be applicable to other conditions. Regarding cancer, we chose the more prevalent sites of disease for women, collectively accounting for 44 per cent of all annual diagnoses (Boring, Squires, Tong & Montgomery, 1994). Because of the high incidence for both sites, extensive publicity is provided by the American Cancer Society and other health groups to urge women to have 'unexpected bleeding' or 'breast lumps' evaluated immediately to rule out gynaecological and breast cancers, respectively. This situation potentially provided a more difficult context to examine the role of behavioural and psychological factors, as women might have more readily come to 'cancer' self-diagnoses.

Conceptualizing the delay interval in terms of stages for inferences (illness inference), decisions (seeking medical care), behaviours (making an appointment) and events (seeing a physician), as illustrated in Fig. 1, appears to be a useful heuristic. Extending Safer *et al.*'s (1979) model of delay, the distinction between behavioural and scheduling delays provides important new information. More relevant for the present analysis is, however, the examination of the appraisal delay interval. Data from both studies reveal that the days during which individuals are attempting to discern their bodily state and make an inference about an illness accounts for the majority of the delay time. In comparing the magnitude of the effect across the two studies, for the disease sites with greater variety in the symptom pre-

sentation (i.e. gynaecological), the interval was approximately 80 per cent of the total, whereas for breast, which has a narrower range of symptom diversity, the interval accounted for 60 per cent of the delay. Further, the initial symptom picture associated with gynaecological cancer often changes (e.g. a vaginal discharge becomes bloody) and may become more general, making the interpretation of symptoms at any given time even more difficult.

Data from the two studies provide support for the postulated psychophysiological comparison principles. While the design is a correlational one, the addition of the not yet diagnosed sample addresses the major hurdle in studying cancer delay—gathering data following symptom interpretation but prior to diagnosis. While one of the principles could not be examined because of the differences in symptom presentation across sites (principle 7), all other tests were in large part replicated. Consistent with the notion that unexpected symptoms can be aversive and motivate a search to determine their cause, all patients recalled trying to think of explanations for the symptoms they experienced. Moreover, this motivation was found to covary with the specificity, salience and perceived consequences of patients' symptoms, and predicted appraisal and total delay intervals. The more general/diffuse the bodily symptoms, the greater number of explanations generated, the more erroneous inferences drawn, and the longer the delay. Finally, evidence consistent with the operation of logical processes and an optimistic bias when formulating illness inferences was obtained. Research suggests that defensive functions operate to keep painful, unpleasant experiences out of consciousness or awareness (e.g. Baumann, Cameron, Zimmerman & Leventhal, 1989; Ditto, Jemmott & Darley, 1988).

Illness cognitions may have important health consequences, as these data suggest that they may influence the likelihood of seeking professional help. Despite their importance, it may be practically impossible to study such phenomena in a more rigorous manner than the methodology used here (e.g. use of a prospective design) for low probability important health conditions, such as life-threatening illnesses. An obvious limitation of the data provided here is that they consisted of retrospective reports of illness attributions. As such, it may be more accurate to consider these data as representing the individual's *schema* for the symptom episode. A major concern, however, with much of the data from newly diagnosed individuals with a life-threatening condition (and exactly the kinds of conditions for which delay may be extremely important) is that the emotional crisis which surrounds diagnosis may impact the accuracy of recall. Yet the data from Study 1 and Study 2 suggest that the rest of the delay model and the PCT principles were robust to such variation in emotional state. Field tests of these principles is an important first step, and the data suggest that prospective designs which are possible when 'normal' symptomatic conditions occur in healthy individuals (e.g. see Cameron, Leventhal & Leventhal, 1993, or Lau, Bernard & Hartman, 1989, for elegant examples) would be important to elaborate the generality of PCT. The model of delay and PCT had utility in describing patterns of delay and testing hypotheses about the symptoms of an important health problem—cancer. At this point, both remain as heuristics for further testing of delay and symptom interpretation processes.

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