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Running-Head: STRESS, SUBJECTIVE APPRAISALS AND ANTICIPATION

Stress, Subjective Appraisals and Anticipation
in the Context of Breast Cancer Screening

© Lisa Sweet (#544019)

University of Ottawa

Ph. D. Thesis in Psychology



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Acknowledgments

In the beginning, I made a conscious decision to save these acknowledgments as my very last task. This way, it would represent the culmination of five years of hard work, and undoubtedly lead to a great sense of joy, pride and relief. However, as I prepare to write these acknowledgments I find myself confronted with a great sense of ambivalence. To my surprise, along with the inevitable sense of relief that I now feel comes a certain sense of loss and fear of the unknown as I “anticipate” what the future may hold for me.

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Abstract

The study of stress related to real-life potential future events is sparse. Evidence suggests that future events can be meaningfully appraised and generate consequential levels of psychological stress as they are anticipated. The goals of this study were to investigate changes in stress and appraisals over time in a prospective way and to test a novel formulation of anticipation, within the context of a true stressor. Participants were women undergoing routine breast cancer screening as part of a provincially funded program. From the original sample ($n=606$), women were divided into normal (negative, $n=541$) and abnormal (false-positive, $n=65$) groups and completed measures of stress and cognitive appraisals at four critical time points: 1) prior to the screening, 2) one day after the screening, 3) 20 days after screening and 4) at a three-months post-screen follow-up. A comparison group ($n=119$) of women not currently undergoing screening was also included in the study. Anovas revealed a significant decrease in stress for negatives and false-positives reported more stress than negatives at Time 2. As for appraisals, manovas showed that for negatives perceived impact and perceived uncertainty decreased while perceived mastery increased throughout the process. For false-positives, there was an increase in perceived impact from Time 1 to Time 2, then a decrease from Time 3 to Time 4. False-positives reported more perceived impact and perceived uncertainty than negatives at Time 2 and Time 3. In terms of anticipation, we showed that women seemed to appraise the potential event more negatively at the outset and then experienced a decrease in stress. Additional analyses also revealed that the Clinical Breast Exam results can have a profound impact on women's experience of screening. The research and clinical implications of these findings, as well as the strengths and limitations of the present study are reviewed in the discussion.

Stress, Anticipation and Subjective Appraisals in the Context of Breast Cancer Screening

Numerous researchers have been interested in the effects of stress on our lives, in the ways people cope with stress and in the determinants of their adjustment to it. Most psychosocial theories acknowledge the close relationship between well-being and stressful life circumstances, the importance of how such stressors are appraised, and the relevance of personal and social resources to deal with them (Moos & Swindle, 1990). This thesis will examine some temporal aspects of stress in the natural setting of breast cancer screening.

For some theorists, stress is expressed as a purely autonomic physiological response (e.g., Selye, 1954) while for others stress is present in the form of life events and difficulties (e.g., Brown & Harris, 1978). Another approach is to regard stress as the interplay between both the individual and the environment (e.g., Lazarus & Folkman, 1984). That is, individuals must evaluate the situations they encounter and it is this appraisal process that determines the stress response which manifests itself in cognitive-affective, behavioral, and physiological terms (Lazarus, 1993b). For the purpose of this study, *stress* will be considered a non-clinical psychological state, expressed in terms of cognitive-affective, behavioral and somatic indices of tension (Lefebvre & Sanford, 1985; Lemyre, 1986). *Cognitive appraisal*, for its part, will be viewed as the individual's evaluation of a situation in terms of its meaning for one's personal well-being (Lazarus & Folkman, 1984).

The quest to understand the phenomenon of stress has, for the most part, neglected the importance of future events and their anticipation. As such, the potentially crucial role of anticipation has not been adequately assessed by stress researchers (Thoits, 1983). The present study goes beyond previous research investigating appraisals by longitudinally studying conceptually distinct cognitive appraisals from the anticipation of the stressor to its resolution, and by clarifying

the association between anticipatory appraisals and psychological stress. *Anticipation* will be defined here as the forecast of a possible life event.

This project is carried out within the context of a real-life stressor, breast cancer screening, and as such, certain clinical implications follow from working within this applied setting. In a general sense, this study will help us to advance our understanding of the psychological implications of breast cancer screening. More specifically, findings related to stress and appraisals will shed light on the subjective experience of women undergoing screening, and how this experience differs as a function of the results of the screening.

The thesis is comprised of four chapters. The first chapter provides the reader with the theoretical foundation of the research project. The second chapter describes the research methodology. The third chapter presents results from both preliminary and main analyses. Finally, the fourth chapter is a discussion of the main results of the study, as well as the general conclusions and recommendations which ensue.

CHAPTER 1

THEORETICAL CONTEXT

Stress is a topic which has generated much interest and a review of its evolution as a concept may be useful to situate the Lazarus and Folkman model of cognitive-appraisal from which notion of anticipation can be expanded. In addition, since this research is carried out in the context of breast cancer screening a review of previous research in this area may help to become familiar with the psychosocial implications of diagnosis, treatment and population-based screening reported so far and how the notions of appraisals and anticipation can further enhance our understanding of the screening experience.

1.1 Conceptions of Stress: A Historical Review

The term stress has evolved to encompass a wide range of phenomena. Generally, the notion of stress has been regarded in one of three ways: stress as a response, stress as a stimulus, or stress as an interaction between the individual and the environment. The aim of the following review is to briefly document the main theoretical and methodological advances in stress research.

1.1.1 Stress as a Response

Selye (1954) first introduced the notion of stress in terms of the General Adaptation Syndrome. He described it as a non-specific physiological reaction pattern that mobilized the body's resources to fend off a threatening agent. Relying on animal models, he defended that when exposed to noxious circumstances, organisms exhibited similar physiological responses including adrenal enlargement, gastro-intestinal ulcers and thymicolymphatic shrinkage (Selye, 1993). In a similar vein, Frankenhaeuser and her colleagues centered their research on the sympathetic-adrenal medullary response system. By studying stressful person-environment transactions, it was demonstrated that catecholamines play important adaptive functions (Frankenhaeuser, 1980).

As interest grew in the adaptation of humans to environmental demands came a shift in the conceptualization of stress towards the inclusion of the organism's psychological response to stressors. These psychological models of stress focused primarily on the quality of the individual's functioning in terms of clinical mood and affect (Derogatis & Coons, 1993). Although the original focus was on pathological processes, the notion of a more "normal psychological stress" response slowly developed as researchers and clinicians realized that all beings were sensitive to their environment and reacted in idiosyncratic ways. Thus, stress began to be conceptualized as an adaptive response, expressed in psychological and physiological terms, and present to varying degrees in all members of the general population.

The measurement of psychological stress varied in tandem with the theoretical perspectives. With a focus on mood and affect, some researchers relied on measures of clinical state and diagnostic assessment tools. However, this method was criticized for its focus on the experiences of a very limited and skewed sample of the population. Researchers who advocated the study of more normal processes then developed tools such as the Strain questionnaire (Lefebvre & Sandford, 1985), the Psychological Stress Measure (Lemyre, 1986; Lemyre, Tessier & Fillion, 1990), the Perceived Stress Scale (Cohen, Kamark, & Mermelstein, 1983). From this perspective, the phenomenological experience of stress is considered to be a normal process allowing researchers to evaluate the idiosyncratic and non-pathological responses to stressful situations experienced by most of us (Lemyre, Tessier & Fillion, 1990).

In contrast to the response-based approach to stress outlined above, other researchers have centered their formulations on the implication of life events in the onset of illness. This stimulus-based orientation has attempted to identify stimuli or situations that disturb the organism and relate their occurrence to personal well-being.

1.1.2 Stress as a Stimulus

A number of researchers focused their research on events or situations external to the individual which were presumed to be stressful. As such, stress was not an individual's reaction to a situation but rather, it was the event itself. Acute life events, chronic difficulties (Brown & Harris, 1978; Holmes & Rahe, 1967) and daily hassles (Kessler, Price & Wortman, 1985; Kohn & Macdonald, 1992) have all been associated with adverse health and psychological outcomes (Kanner, Feldman, Weinberger & Ford, 1991), although their precise role has not yet been understood (Lemyre, 1986; Moos & Swindle, 1990).

From this perspective, assessment techniques range from checklists to interviewing participants at length about events they have experienced. The Social Readjustment Rating Scale (Holmes & Rahe, 1967) lists a series of life events, positive and negative, that require various degrees of adaptation. Numerous empirical studies have established a connection between life events and various measures of physical and psychiatric health (Derogatis & Coons, 1993), suggesting that people exposed to stressful life events are more vulnerable to health problems than those who are not faced with stressful situations (Kessler, Price & Wortman, 1985; Thoits, 1983). Despite the apparent consistency of such an association, critics have argued that the correlational designs used by most of these studies preclude the establishment of a causal relationship between life events and health (Bakal, 1992; Monroe & Roberts, 1990; Sarason, Sarason, & Johnson, 1985). Moreover, many agree that the correlations found between life events and well-being are only modest, at best (Rodin, 1985; Taylor, 1986; Thoits, 1983; Zimmerman, 1983). The reliability, the validity, and the content of traditional checklist measures have also come under fire (Brown & Harris, 1978; Johnson & Saranson, 1978; Thoits, 1983). It has been argued that these checklists cannot be exhaustive and that they often do not differentiate between undesirable events and long-term strains (Moos &

Swindle, 1990); that they disregard the person's personal context (Moos & Swindle, 1990), and that the items presented are not specific (Sarason, Johnson & Siegel, 1978; Thoits, 1983), leaving them open to interpretation (Monroe & Roberts, 1990) and vulnerable to the respondent's mindset (Brown & Harris, 1978). Moreover, such checklists often confound symptoms of stress (the effects) with the stressors or events (the cause) themselves (Dohrenwend, Dohrenwend, Dodson & Shrout, 1984).

It has been suggested that if researchers are interested in establishing a causal relationship between life events and illness, the temporal sequence of events must be considered by using more involved measurement methods, such as the Life Events and Difficulties Schedule (LEDS; Brown & Harris, 1978). This is a semi-structured interview assessing 12 domains of the person's life (Work, Education, Reproduction, Housing, Money/Possessions, Crime/Legal, Health/Accidents, Marital/Partner Relationships, Other Relationships, Miscellaneous and Death) and requires the investigator to gather a comprehensive account of factual details for each event reported. These events are then rated on various descriptive scales such as short and long term threat, relation to illness, independence from the participant, loss, danger, goal attainment, overall positivity, and goal provision.

Brown and his colleagues report strong relationships between life events measured using the LEDS approach and mental and physical health outcomes (Brown & Harris, 1989). Moreover, the LEDS is considered to be the most effective method in controlling various biases and contamination effects (Wethington, Brown & Kessler, 1995). Nonetheless, the empirical approach developed by Brown and his colleagues at Bedford College is not without its limitations. The principal weakness, paradoxically hailed as its most prominent feature, is that the degree of threat from an event is determined solely by the researcher. By discounting the person's subjective experience, critical

information contained may be lost. In addition, any researcher interested in using the LEDS must be trained to do so and administration is lengthy (i.e., 1.5 to 2 hours) (Brown & Harris, 1978).

The LEDS and other measures of life events, have been used most often in the hopes of identifying the cause of psychological disorders. Evidence does indeed suggest that life events are somehow implicated in the onset of depressive disorders (Brown & Harris, 1978) as well as other psychological problems in adaptation (Thoits, 1983) and physical disorders (Brown & Harris, 1989). However, the relations between life events and psychological well-being are typically small (Kessler, Price & Wortman, 1985) suggesting that other aspects, like event characteristics such as loss (Brown & Harris, 1978), danger (Finlay-Jones & Brown, 1981) and undesirability (Vinokur & Selzer, 1975) may also be involved (Zimmerman, 1983).

1.1.3 Stress as a Process of Appraisal

As more was learned about stress, the overall goal of research shifted from clarifying the etiology of disorder towards understanding the stress process. The notions of individual differences, cognition and appraisal gained importance and became the focus of more contemporary theories of stress (Lazarus, 1993b) and the importance of the transaction between the individual and his/her environment was highlighted (Lazarus & Folkman, 1984).

Of the transactional theories of stress, one of the most prominent is the cognitive-appraisal model developed by Lazarus and Folkman (1984). This more subjective viewpoint of stress hinges on the concept of cognitive appraisal which is considered "the process of categorizing an encounter, and its various facets, with respect to its significance for well-being" (Lazarus & Folkman, 1984, p.31). Appraisal is the mediating process between the demands of the environment and the individual who comes complete with his/her own set of goals and beliefs (Lazarus, 1993a). In other words, by appraising a situation, people evaluate how a particular stressor will impact upon their

own personal state (Lazarus & Folkman, 1984). Based on this evaluation, they will either experience stress or not.

Lazarus and his colleagues have more recently considered stress as a subset of emotions (Lazarus, 1993b). As such, their work has shifted from the traditional use of stress as an outcome measure to the use of more varied emotional states as indicators of well-being. He and his colleagues have explored the 'relational meaning' of the event through the process of appraisal. The relational meaning of an encounter is essentially the person's interpretation of the situation in terms of potential harm or benefit (Lazarus, 1993b). As such, the notion of appraisal has been underscored as the crux of the theory and empirical findings have lent support to the relationship between appraisal (or relational themes) and emotions (Smith & Lazarus, 1993). There remains however, some debate about the details of the appraisal patterns and link to emotions (Smith & Lazarus, 1993). Thus, the use of psychological stress as a source of information about an individual's adaptation to environmental conditions remains an important consideration.

The evaluation of stakes has mostly focused on aspects of threat, challenge, harm and benefit (Scherer, Coleman, Drumheller & Owen, 1994). Many researchers (e.g., Dewe, 1991; Folkman, et al., 1986a; Folkman, et al., 1986b; MacNair & Elliott, 1992) have relied on the approach adopted by Folkman and Lazarus (1985) by asking participants to rate on a 5-point Likert scale items pertaining to threats to self-esteem and to a loved one's well-being. Research has also focused on the rating of various coping options available to the individual. As the subdivision between Primary and Secondary was clearly established, other researchers have developed appraisal measures which tap a wider range of appraisal dimensions. For instance, Lemyre (1986) developed the Subjective Appraisal Rating Scale which consists of a short list of 10 appraisal items representative of perceptions of Impact, Mastery and Uncertainty, thus touching upon both primary and secondary

aspects of appraisal. Similarly, Peacock and Wong (1990) presented the Stress Appraisal Measure which surveys primary appraisals of threat, challenge and centrality as well as secondary appraisals focusing on perceived control. They have also incorporated into their questionnaire a scale designed to index the overall perceived stressfulness of the situation.

In summary, the conceptualization of stress as well as its measurement have evolved considerably over the years to include the responses, the stimuli and their psychological interface via appraisal. By attending to the three components, on both their objective and subjective aspects, researchers have come to recognize the complexity of the relationship between stress and people's well-being. Research has shown that both environmental factors as well as individual factors are involved in the stress process. For an integration of these elements into a comprehensive framework, we rely on Lazarus and Folkman's cognitive-appraisal model of stress which is described next. Also outlined in the following section are the conceptual and empirical foundations for the identification of the major cognitive dimensions associated with stress.

1.2 Lazarus and Folkman's Cognitive-Appraisal Model of Stress

As stated above, one of the most prominent theoretical models of stress is the cognitive-appraisal model developed by Lazarus and Folkman (1984). Whereas, in the past, stress has been defined as either a response (e.g. Frankenhaeuser, 1980; Selye, 1954) or a stimulus (e.g. Holmes & Rahe, 1967), for Lazarus and Folkman (1984) the interaction between the stimulus from the environment and the response of the person create a unique dynamic which defines stress.

Lazarus and Folkman (1984) describe two forms of appraisal in their model: primary and secondary appraisals. Primary appraisal refers to an individual's evaluation of the implications of an event, and secondary appraisal entails the determination of what can be done to deal with the situation. Lazarus and Folkman (1984) have further distinguished among three stress-related primary

appraisals: threat, challenge and loss. According to their model, threat refers to the potential harm of the stressor, challenge reflects the opportunity for growth or gain, and loss appraisals involve the damage resulting from the stressor. In short, primary appraisals define what is at stake and secondary appraisals represent the individual's estimate of coping options (Lazarus & Folkman, 1984). As shown in Figure 1, their model suggests that an event or stressor is related to the stress response through appraisals. If the stakes involved are appraised as greater than the available resources, the person will experience a stress response. Previous research has documented the interaction between appraisals and coping, and the effects on health status: High stakes, coupled with low coping ability are associated with poorer health (Anderson, 1995; Folkman, et al., 1986b; MacNair & Elliott, 1992).

Researchers have studied a myriad of appraisals (e.g., threat, challenge, loss, control or mastery, desirability, predictability, uncertainty and impact) and explored their relationship to physical or mental well-being (Anderson, 1995; Deadman, Dewey, Owens, Leinster & Slade, 1989; Folkman, Lazarus, Gruen & DeLongis, 1986; Gall & Evans, 1987). A major weakness in this field of study was that most investigations concentrated on one particular appraisal (usually threat) based on a heterogeneous set of individual stressors and neglected the concurrent role of other cognitive evaluations. This kind of fragmented approach has neglected the multifaceted nature of cognitive appraisals and made it difficult to compare and integrate research findings on the subjective evaluation of stressors. Researchers wishing to remain faithful to the assumption that appraisal is a complex process have adopted a more comprehensive assessment of cognitive appraisals (e.g., Gall & Evans, 1987; Lemyre, 1986; Peacock & Wong, 1990). To accomplish this, investigators must rely on a more refined conceptualization of appraisal that focused on the major cognitive dimensions identified throughout the literature (Karasawa, 1995).

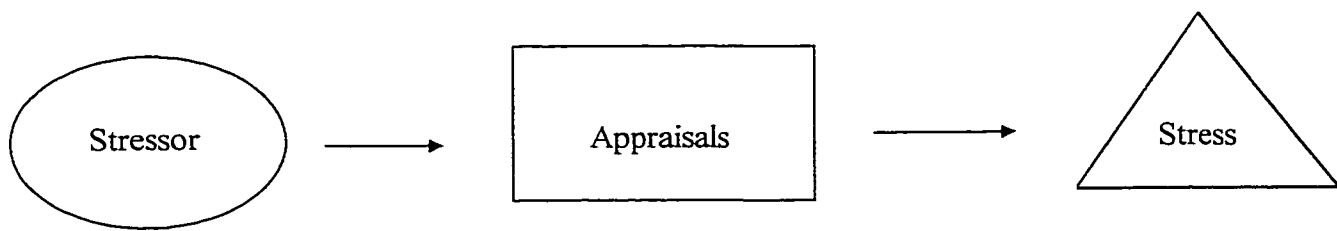


Figure 1. Lazarus and Folkman's cognitive-appraisal model

1.2.1 Identifying Major Cognitive Dimensions

The identification of major cognitive dimensions can be done on both theoretical (conceptual) and empirical (statistical) levels. In reviewing the theoretical definitions of various appraisals, the presence of conceptual overlap becomes evident.

1.2.1.1 The Conceptual Basis

The perceived importance of a situation is a crucial element in the experience of stress. Lazarus and Folkman (1984) state that the importance of a situation is often based on the individual's commitments or goals. They explain that an individual's commitments can influence the perception of threat, challenge, and loss by making the person more or less vulnerable to a stressor. Karasawa (1995) outlines the many cognitive dimensions of emotions which have since been studied. These include dimensions such as “goal significance”, “importance”, “pleasantness”, and “valence”. According to Karasawa (1995) the notions of goal relevance and importance represent the significance of the stressor to one's goals in terms of relevance, expectation, and conduciveness. Lazarus and Smith (1988) also suggest that the pleasantness or valence of a situation is also a function of the presence or absence of goal impediments. The common theme seemingly underlying each of these dimensions is the determination of the impact of the stressor on the person's current life situation or future expectations. Therefore, it seems as if the dimensions tapping the relevancy of a situation can functionally be classified as perceived impact.

A second dimension, that of “control”, has been studied by numerous researchers who have used terms like “control”, “mastery” and “self-efficacy” to represent the notion of being able to influence certain aspects of a situation. The notion of control has a long tradition in psychology and is considered by some theorists (e.g. Pearlin & Schooler, 1978) to be a more stable personality trait that is generalizable to most life circumstances. In this case, those individuals with an internal locus of control believe that life circumstances are controlled by their own actions, whereas individuals with an external locus of control

believe that outcomes are controlled by external forces such as luck, fate or powerful others (Brosschot, Gebhardt & Godaert, 1994; Reed, Taylor & Kemeny, 1993). In contrast to the personality-based definitions of Control, other theorists (e.g., Folkman, 1984) describe Control as an appraisal unique to each encounter.

Closely related to this idea is the notion of Mastery. In fact, these terms are often used interchangeably in the literature (e.g., Hobfoll & Walfisch, 1986; Prince-Embury, 1992), are sometimes reviewed jointly (e.g. Felsten, 1991), and theorists often include one in their definition of the other. For example, Pearlin and Schooler (1978) regard Mastery as the extent to which one is convinced that one can control one's own life instead of letting it be determined by fate. Similarly, Lazarus and Folkman (1984) consider beliefs about personal control to be associated with feelings of mastery and confidence. They add that situation-specific control appraisals refer to the extent to which a person believes that he or she can affect a particular stressful situation. This idea is not unlike Bandura's (1977) concept of self-efficacy referring to the person's perceived ability to execute the behaviors necessary to produce desired outcomes. The more contemporary notion of empowerment which is generally described as the process by which individuals are able to influence elements within their environment also seems to relate to the person's sense of mastery (Gibson, 1991). In a similar vein, some researchers (e.g., Gignac & Gottlieb, 1996) have begun to take interest in people's appraisals of coping efficacy which are essentially their evaluations of their coping efforts. Thus, a person's perceived ability to handle a situation, whether labeled as Control or Mastery, is an integral part of many theories. However, whereas the term, "Control", has been used within both personality and situationally-based frameworks, the term, "Mastery", is traditionally recognized as situationally specific, and is therefore a more fitting label.

Event uncertainty is the third dimension of appraisal which has received considerable attention (Lazarus & Folkman, 1984). To investigate the relationship between uncertainty and well-being,

researchers have been interested in dimensions like expectedness (Kiser, et al., 1993), predictability (Katz & Wykes, 1985), certainty (Anderson & Lyon, 1987), and familiarity (Gardner, Ostrowski, Pino, Morrell & Kochevar, 1992). According to the Uncertainty in Illness theory developed by Mishel (1988), the perception of uncertainty can result from a lack of information, unclear outcomes, or the unfamiliarity of a situation. Wineman (1990) also proposes that the individual's perception of a situation as ambiguous constitutes perceived uncertainty. Therefore, on a conceptual level, the notions of expectedness, predictability, certainty, familiarity and ambiguity are all characteristics of what we will call perceived uncertainty.

1.2.1.2 The Empirical Basis

The importance of conceptually distinct major cognitive dimensions is also supported by empirical findings. Gall and Evans (1987) investigated the underlying structure of cognitive appraisals. Using a total of 19 dimensions identified in the literature (undesirability, threat, positive perception of event, potential for positive outcome, long term threat, gain, challenge, controllable, positive, ambiguous, need for information, stressfulness, ambiguous, need to inhibit action, familiar, as expected, meaningful, needs to be accepted), they presented a five-factor solution accounting for about 60% of the variance. The factors they identified were: Undesirability/Threat, Gain/Challenge, Need for information, Familiarity and Need to accept. Similarly, Peacock and Wong (1990) have identified six relatively independent appraisal dimensions of which only three (threat, challenge and centrality) were significant predictors of stressfulness. Lemyre and her colleagues have also analyzed a set of appraisals and developed a more parsimonious model that included three factors. The dimensions studied by this group included the evaluation of negative and positive consequences, personal competence, loss, danger, challenge, threat, unknown and importance. Factor analyses have consistently extracted three factors: a) Perceived Impact, covering the notions of severity, importance, and negativity; b) Perceived Uncertainty, comprising elements

unknown, and unpredictability; and c) Perceived Mastery, representing the dimensions of personal competence and control (Biron, Truchon & Lemyre, 1993; Fillion, 1993; Lemyre, 1986; Lemyre & Tessier, submitted). Together, these factors explained approximately 60% of the variance (Fillion, 1993; Lemyre, 1986) and all have been related to psychological stress (Fillion, 1993).

As can be seen, the topic of cognitive appraisal has generated considerable interest. As a result, many particular appraisal dimensions have been identified and singled out for study. This collection of minor dimensions appears to be well reflected, conceptually and empirically, by three major cognitive dimensions: perceived impact, perceived mastery, and perceived uncertainty. The following section is presented as a review of the literature examining the relationship between appraisals (perceived impact, perceived mastery and perceived uncertainty) and stress and the ways in which these appraisals change as the stress process unfolds.

1.2.2 Cognitive Appraisals and Stress

1.2.2.1 Perceived Impact and Stress

The first cognitive dimension to be discussed is perceived impact. Within the context of adaptation to chronic health-related stressors, perceived impact is generally operationalized as the interference with life (Turk, Okifuji & Scharff, 1995), with daily routines (Goreczny, Brantley, Buss & Waters, 1988) and with social interactions (Ireys, Werthamer-Larsson, Kolodner & Shapiro Gross, 1994). Evidence suggests that the perception of a negative impact mediates the relationship between characteristics of the stressor to psychological difficulties such as low self-esteem (Ireys, Gross, Werthamer-Larsson & Kolodner, 1994) and depressive symptomatology (Turk, Okifuji & Scharff, 1995). Similarly, perception of negative impact may exacerbate the physiological symptoms of the illness (Goreczne, et al., 1988).

Investigators studying threat, loss and challenge have suggested that an individual's cognitive evaluation of a situation may be influenced by individual characteristics, such as commitment, which

determine the stakes involved in the encounter (Folkman, 1984), and the person's vulnerability to the stressor (Lazarus & Folkman, 1984). The more a person feels committed to an outcome, the more vulnerable he/she is to a stressor that can impede the attainment of that goal (Brown & Harris, 1978; Paterson & Neufeld, 1987). In fact, Lemyre (1986) showed that an individual considers the importance of an event as well as the related threat when ascertaining the impact of a stressor. Events perceived as stressful typically comprise elements of threat and undesirability (Vinokur & Selzer, 1975), whereas the conceptualization of an event as an opportunity is associated with reduced emotional distress (Mishel & Sorenson, 1991). Furthermore, when a threatening event is reinterpreted by the person as a challenge, he/she deals with the problem more effectively (Davey, 1993) and thus experiences less stress (Tomaka, et al., 1993) and more positive affect (Crocker & Bouffard, 1992).

Even though findings suggest that past events perceived as threatening or implying an element of loss lead to increased stress, the cognitive appraisals related to an anticipated event are not well documented in the literature. Tomaka, Blacovich, Kelsey, and Leitten (1993) examined the applicability of Lazarus and Folkman's (1984) cognitive-appraisal model in the context of anticipated laboratory tasks. When asking for students' appraisals prior to a mental arithmetic task, they found that those who reported threat experienced significantly greater self-reported stress than those who reported feeling challenged by the task. Similarly, Taylor and Scogin (1992) randomly assigned participants to threat, challenge or benign conditions, then asked them to evaluate the importance of the event and rate their ability to deal with the stressor. Individuals faced with a threatening stressor felt that the event held more importance and experienced more stress than those expecting a challenge.

Others, like Deadman, et al. (1989) have investigated threat and loss appraisals in the context of a more threatening real life-stressor. Using a sample of women undergoing surgery for breast cancer, they found that concern for appearance (a measure said to influence the degree of threat to body image) and

loss were significant predictors of self-reported anxiety prior to surgery. Similarly, threat appraisal was a strong mediator between self-esteem and mood disturbance in a group of asymptomatic HIV-infected individuals who can live many years with the threat of AIDS, thus anticipating the onset of the disease (Anderson, 1995).

Briefly, research on perceived impact suggests that, as with past events, the threat and loss appraisals generated while anticipating a stressor seem strongly related to increased stress, anxiety and other mood disturbances experienced prior to the occurrence of the event. If a person currently perceives a potential event as threatening and thus as having more impact, he/she will experience more concurrent distress. Nonetheless, how the appraisal of threat (or more globally, perceived impact) changes as the process continues and how these changes relate to stress remains unknown.

Only one study addressing the changes in threat appraisals and related stress was found. In this study, Scherer, Drumheller & Owen (1993) determined that negative appraisals of threat decreased from the anticipatory to outcome phases of a college examination transaction. Although interesting, these findings do not provide sufficient empirical evidence for the nature and direction of changes in threat appraisals throughout an encounter. As such, we must consider other areas of research in our efforts to capture a more complete picture of these changes.

As mentioned above, an individual's perception of his/her susceptibility to a stressor is associated with the estimated impact of this stressor (Lazarus & Folkman, 1984). As such, to better understand the fluctuations in perceived impact over time, we can refer to the notion of risk perception. There is evidence to suggest that as people become more aware of a potential stressor, they perceive themselves to be more easily affected by it (Wardle & Pope, 1992). Such an elevated perception of susceptibility has been related to increased worry (Lerman, et al., 1991), and this may lead to an increased sense of impact.

Briefly then, it appears that the perceived threat of an event, past or anticipated, is related to a rise in stress and negative affect as well as an increased sense of impact. Data also suggest that as the stressor becomes more imminent, the perceptions of threat and impact are probably enhanced, but diminish as the outcome clarifies.

1.2.2.2 Perceived Mastery and Stress

An individual's sense of mastery or competence (Hobfoll & Walfisch, 1986) has also received considerable attention in the literature. Because it seems that perceptions of control are likely to be more situationally specific (Dohrenwend & Martin, 1979; Litt, 1988), they need to be examined in the context of specific stressful encounters (Morgan, Owen, Miller & Watts, 1986). This is in order to determine the personal meaning of control in relation to what is at stake for the individual, as well as identifying the costs and the benefits of exercising control (Folkman, 1984).

It is generally assumed that the perceived control of aversive outcomes is stress-reducing and that perceiving little control leads to an increase in stress. That is, stressful events are more harmful when they are perceived as uncontrollable (Prince-Embury, 1992). Friedland, Keinan & Regev (1992) argue that when faced with a loss of control, an individual will strive to regain both actual and perceived control over the situation. In fact, overestimating our control over a situation, or, in other words, succumbing to an illusion of control may protect us against negative affect, discouragement, and depression (Alloy & Clements, 1992).

There can be times when an increased sense of control is related to increased distress (Averill, 1973). The variables that seem to influence the beneficial or detrimental effects of control include the fit between the person's preferred style of coping and perception of control (Forsyth & Compas, 1987), and the costs related to the control of the particular stressor (Burger, 1989; Folkman, 1984). Nevertheless, it

seems that, overall, control can enhance a person's ability to adapt, even in cases where control is related to a rise in perceived stress (Vinokur & Caplan, 1986).

Perceptions of control have been related to adjustment in terms of health status and psychological symptoms in the context of more common stressors (Felsten, 1991; Folkman, Lazarus, Gruen & DeLongis, 1986) as well as in more serious life circumstances (Hobfoll & Walfisch, 1986; Lowery, Jacobsen & DuCette, 1993). Based on these findings, researchers have put forth perceived mastery as a potential mediator of the stress experience (Mishel & Sorenson, 1991). Krause (1985) found that the relationship between stress and depressive symptomatology was buffered by locus of control beliefs. Individuals with an external locus of control were significantly more affected by stress than those with an internal sense of control. Turk, Okifuji and Scharff (1995) also found that the effect of pain intensity on depressive symptomatology in a group of chronic pain sufferers was mediated by perceived life control. Similarly, Robichaud-Ekstrand and Dupuis (1992) found that perceived self-efficacy was an important factor in the recovery of myocardial infarction patients.

The mediating effect of control is also apparent when anticipating a stressor. An investigation by Morgan et al. (1986), focusing on individual differences in the perception of anticipated stress, suggests that the individual's experience of an event may be mediated by expectations about the ability to control the event. Similarly, Vitaliano, Russo and Maiuro (1987) have found that stressors involving personal mastery are more threatening to those with an external sense of control than for those with an internal sense of control.

Folkman (1984) has noted that, from a process perspective, appraisals of personal control are susceptible to change throughout a stressful encounter. Even though little research has investigated the changes in perceived control over time, there is some support for this notion from studies such as the one done by Folkman and Lazarus (1985) which found significant differences between the various stages of the

transaction in both direction and magnitude of appraisal. Further, some researchers (e.g. Scherer, Drumheller & Owen, 1993) have found significant differences between various stages of an academic encounter for both positive and negative appraisals. Lazarus and Folkman (1984) have suggested that the more a situation is ambiguous, the less likely an individual is to experience a sense of control. Thus, feelings of mastery are more apparent when circumstances are unambiguous and the use of personal resources may be hampered when the situation is unpredictable or unclear (Mishel & Sorensen, 1991).

Additional data supporting the fluctuations in control is available from other studies having examined the adaptability of various types of control at different points throughout the stressful encounter. A review by Thompson (1981) indicated that during the anticipatory period both behavioral control (belief that one has a behavioral response available that can affect the aversiveness of an event) and cognitive control (belief that one has a cognitive strategy available that can affect the aversiveness of an event) were effective in reducing physiological and self-reported levels of stress. At the impact period, cognitive control was again found to be a stress-reducing factor, however behavioral control has not been found to be as reliably effective. Finally, when looking at the post-event period, both behavioral and cognitive control demonstrate favorable effects on well-being (Litt, 1988; Thompson, 1981).

Overall, the literature on perceived control over a stressful situation suggests that an increased sense of control is related to lower levels of psychological stress and symptomatology. Furthermore, as the event unfolds and more information is available, feelings of mastery or control are more readily experienced by the individual.

1.2.2.3 Perceived Uncertainty and Stress

Mishel (1988) defines uncertainty as "the cognitive state of the person when an event cannot be adequately structured or categorized because sufficient cues are lacking" (p.48). Conditions with a high degree of uncertainty seem quite stressful; the person is unable to predict the impact of the stressor or

determine how to cope with it (Ham & Larson, 1990; Tomaka, et al., 1993). As an individual gains more information, he or she can modify his or her initial appraisal of a situation (Lazarus & Folkman, 1984).

Researchers have considered uncertainty on either a temporal level or an informational level. Temporal uncertainty refers to not knowing when an event will take place. In line with this view, Ham and Larson (1990) undertook a study to determine whether the expectation of daily events moderated the affective responses to those events. In a sample of adolescents, it was found that individuals who were prewarned of potentially stressful events experienced those events as less stressful. On an informational level, situations appraised as creating a need for information have been found to be associated with a greater level of depression (Gall & Evans, 1987). Edwards and Endler (1989) examined the correlations between situation appraisals and state anxiety responses and found that appraisals of ambiguity were correlated inter and intra individually, but individual differences in anxiety were not related to reported appraisals (perceptions) of situations. This led them to conclude that both individual differences and situational variables are associated with appraisals of stressful events as well as state anxiety responses.

A growing body of research evidence is suggestive of a strong relationship between event uncertainty and psychological stress. Studies have shown that being unable to foretell the future, not feeling secure and safe from danger, being in doubt and being undecided are related to negative emotions (Hilton, 1988). In contrast, when the situation is more clearly patterned, predictable, familiar and congruent the person will experience less uncertainty (Lemaire & Lenz, 1995; Mishel, 1988) and more positive emotions (Hilton, 1988). It has also been found that illness uncertainty has been strongly associated with problems in adjustment (Christman, 1990) and high levels of stress (Mishel, 1981). Similarly, Mishel (1984) found that the ambiguity of the situation was a significant predictor of stress and that many variables have a path to stress mediated through uncertainty. Results of additional studies support the mediating role of uncertainty (Mishel & Braden, 1987; Wineman, 1990).

Some researchers have suggested that uncertainty may help an individual to be hopeful (e.g., Mishel, Hostetter, King & Graham, 1984), allowing him or her to maintain some sort of optimistic bias hence suppressing the sense of vulnerability (Weinstein, 1987). Others, however, have not found evidence that uncertainty fosters hope and suggest that the more positive effects of uncertainty may only operate once treatment for the illness has been completed (Christman, 1990).

Briefly, situations that are perceived as unclear, and thus uncertain, often generate meaningful levels of psychological stress. In contrast, more positive emotions are experienced by an individual when the contextual aspects of the situation in which he or she is involved become more certain. Further, it seems as though the degree of uncertainty reported by individuals is related to the availability of information regarding the predictability of a stressor and its specific characteristics. Therefore, the person will experience less uncertainty as he or she acquires the information needed to clarify the situation.

To summarize this section on appraisals, Lazarus and Folkman's cognitive-appraisal model integrates the notions of appraisal and stress into a comprehensive framework suggesting that the way individuals perceive a stressor will fluctuate with time and be a deciding factor in their stress response. Specifically, in terms of the major cognitive dimensions identified earlier (perceived impact, perceived mastery, perceived uncertainty) the perception of impact likely increases as the stressful event becomes more imminent and then diminishes once the event has occurred (Scherer, Drumheller & Owen, 1993). With regards to uncertainty, it seems as though the degree of uncertainty reported by individuals is related to the availability of information regarding the predictability of a stressor and its specific characteristics (Hilton, 1988; Mishel, 1988; Mishel & Braden, 1988). Therefore, the person will experience less uncertainty as he or she acquires the information needed to clarify the situation. Finally, as the event unfolds, and more information is available, feelings of mastery are more readily experienced by the individual (Folkman, 1984; Mishel & Sorensen, 1991). As each of these appraisals changes throughout the

process, so to does the experience of stress. When appraisals are prominently negative (i.e., high perceived impact, low perceived mastery, high perceived uncertainty) there seems to be increased psychological stress which appears to decrease as appraisals become more positive (Scherer, Drumheller & Owen, 1993).

1.3 The Notion of Anticipation

The above review of the literature has shown how the conceptualization of stress has evolved over time, how the dimensions of Impact, Mastery and Uncertainty have become important factors in our understanding of psychological stress and how these appraisals can vary throughout an encounter. Nonetheless, certain important limitations of these studies merit consideration, notably regarding the time process.

Lazarus and Folkman (1984) argue that appraisal is a process that can be divided into three stages: a) the anticipatory or warning period; b) the actual impact or confrontation period; and c) the post-impact phase. During the anticipation phase the event has not yet occurred and the individual must consider if the event will occur and what effects it may have (Lazarus & Folkman, 1984). In addition, the person evaluates to what extent and in what way he/she will manage the stressor. Once an event has taken place and more information is acquired, a person may need to reappraise the situation. This appraisal and re-appraisal process continues through to the post-impact period (Lazarus & Folkman, 1984).

Despite the fact that the transactional theory of cognitive appraisal suggests that appraisals can vary through the different stages of an encounter and should be investigated longitudinally, most earlier studies have adopted retrospective research designs or have assessed appraisal and stress at only one point in time (e.g., Anderson, 1995; Folkman, et al., 1986b; MacNair & Elliott, 1992). These studies informed us about the relationship between cognitive evaluations and stress but do not adequately document the notion of anticipation nor the appraisal process pertaining to events that have not yet occurred. As stress becomes recognized as a multi-stage process (McGrath & Beehr, 1990), researchers must head the challenge of

charting the temporal course of appraisals and stress (Cohen, Kessler & Gordon, 1995). Only the use of a truly prospective research design can allow us to study the entire process (Scherer, Drumheller, & Owen, 1993).

A second issue is the fact that most earlier research has been driven by the desire to understand the etiology of various psychological and physiological illnesses. Consequently, investigators have especially studied the effects of present or past events and their concurrent relationship with a person's welfare, despite preliminary evidence to suggest that anticipated stressors can also be strongly related to stress, anxiety and other mood disturbances (Abel & Larkin, 1990; Patterson & Neufeld, 1987; Taylor & Scogin, 1992; Tomaka, Blacovich, Kelsey & Leitten, 1993). In order to fully grasp the relationship between life events, appraisals and stress, one must not only study past events and how people perceive them, but also those events of the future and how they are anticipated.

Before presenting empirical findings relative to anticipation, it is first essential to discuss the notion of anticipation within the cognitive-appraisal model (Lazarus & Folkman, 1984). Lazarus and his colleagues have outlined what they believe are the required conditions for a stimulus to bring about negative emotions or difficulties in adaptation. They postulate that an event must be perceived as presenting a threat for it to become stressful (Lazarus & Folkman, 1984). That is, the person must perceive that his/her goals or beliefs are in peril to experience psychological stress. Lazarus (1966) explains that threats are negative events that announce impending negative future consequences and Lazarus and Folkman (1984) have added that threat "concerns harms or losses that have not yet taken place but are anticipated" (p.32). According to their model, it is not the objective nature of the threat that determines emotion or stress response, but rather the person's perception of it, whether correct or not.

Lazarus and Folkman (1984) also discuss the notion of temporal imminence which refers to the amount of time before an event occurs is described as "the interval during which an event is anticipated"

(p.101). They specify that the more imminent an event, the more intensely it is appraised, especially when there are cues signaling its impending occurrence. To them, another important factor is temporal uncertainty which refers to not knowing when an event will occur. A relationship between temporal uncertainty and increased arousal has also been demonstrated (Lazarus & Folkman, 1984).

The following review of the literature will demonstrate the importance of anticipation in the understanding of the stress response. At the same time it will become clear that the empirical foundation on which is developed the notion of anticipation can be enhanced by the validation of a conceptually sound operational definition of anticipation using a longitudinal and prospective research design.

1.3.1 Empirical Foundations of Anticipation

The idea of studying the anticipation of an event is not new. In a now classic study, Frankenhaeuser (1980) has found increased catecholamine secretion in individuals who were anticipating a parachute jump. Similarly, Mechanic (1962) has found increased negative mood in graduate students anticipating their doctoral examination. Investigators have since continued to study anticipatory stress within both laboratory and more natural settings.

1.3.1.1 Laboratory Investigations of Anticipation

The notion of anticipation is supported by a number of laboratory studies investigating the threat of unpleasant events using physiological stress markers. The experimental conditions of these studies generally involve the anticipation of shocks, loud noises and ice-cold stressors, as well as the expectation of difficult cognitive tasks. An overview of the laboratory studies investigating anticipation is presented in Table 1. Abel and Larkin (1991) demonstrated that heart rate increases once participants have been warned that a stressful event will soon begin. Spacapan & Cohen (1983) showed that participants expecting a stressful event were less tolerant to frustration and had higher blood pressure when compared to participants expecting a non-stressful event.

Table 1

Summary of Findings from Laboratory Investigations of Anticipation

Author(s)	Participants	Design/Task	Measures	Findings
Abel & Larkin (1991)	n=29 undergrad.	Experimental/ mathematical & musical jury	BP and HR	-Higher SBP for Hi anticipatory reactors -HR increased as time of stressor onset approached
Andersen & Lyon (1987)	n=48 undergrad.	Experimental/ Personal confrontation	Mood scales (MAACL, SDS, SAS, POMS)	-100% probability of negative event is related to increased depression -Participants perceiving less than 100% probability of stressor experienced less depression, anxiety and hostility
Buntrock & Reddy (1992)	n=61 undergrad.	Experimental/ mathematical	PSS & BP	-Subj. and physio. indicators of distress varied with time and coping

Note. BP=Blood pressure; HR=Heart rate; MAACL=Multiple Affect Adjective Checklist; SDS=Self-Rating Depression Scale; SAS=Self-Rating Anxiety Scale; POMS=Psychiatric Outpatient Mood Scale; PSS=Perceived Stress Scale; SRTS=Self-reporting Tension Scale; TSS=Temporary Threshold Shifts; SBP=systolic blood pressure.

Table 1 (continued)

Summary of Findings from Laboratory Investigations of Anticipation

Author(s)	Participants	Design/Task	Measures	Findings
Carr & Wilde (1988)	n=44 volunteers	Experimental/ burst of noise	SRTS Elec.dermal Cardiac Activity	-Actual and potential control led to reduced anticipatory physiological stress -Self-report measures unaffected
Katz & Wykes (1985)	n=80 volunteers	Experimental/ elec. shock	Self-report ratings of anticipatory aversiveness	-Unpredictable shocks are associated with more aversiveness at impact
LeFave & Neufeld (1980)	n=36 undergrad.	Experimental/ loud tone	HR, Skin conductance and subjective disturbance	-Increased threat was related to greater autonomic responding which suggests preparedness

Note. BP=Blood pressure; HR=Heart rate; MAACL=Multiple Affect Adjective Checklist; SDS=Self-Rating Depression Scale; SAS=Self-Rating Anxiety Scale; POMS=Psychiatric Outpatient Mood Scale; PSS=Perceived Stress Scale; SRTS=Self-reporting Tension Scale; TSS=Temporary Threshold Shifts; SBP=systolic blood pressure.

Table 1 (continued)

Summary of Findings from Laboratory Investigations of Anticipation

Author(s)	Participants	Design/Task	Measures	Findings
Singh (1984)	n=480 undergrad.	Experimental/ shock	Vigilance	-Vigilance was greater with anticipated high shock conditions
Spacapan & Cohen (1983)	n=63 undergrad.	Experimental/ hand in ice water	Frustration, Physical symptoms BP	-Expecting a stressful condition led to less tolerance of frustration & higher BP -Perceived control led to increased tolerance
Thompson, et al.(1981)	n=60 undergrad.	Experimental/ loud noise	Cortisol TSS	-The use of psycho coping efforts reduced cortisol levels and increased threshold shifts (i.e. less stress)

Note. BP=Blood pressure; HR=Heart rate; MAACL=Multiple Affect Adjective Checklist; SDS=Self-Rating Depression Scale; SAS=Self-Rating Anxiety Scale; POMS=Psychiatric Outpatient Mood Scale; PSS=Perceived Stress Scale; SRTS=Self-reporting Tension Scale; TSS=Temporary Threshold Shifts; SBP=systolic blood pressure.

Similar findings were reported by Buntrock and Reddy (1992) who found variations in blood pressure in response to a threat and Singh (1984) who found increased vigilance on behalf of participants expecting a higher aversive shock. Another study (Carr & Wilde, 1988) found that the anticipation of a loud burst of noise was related to anticipatory physiological stress as measured by electrodermal and cardiovascular activity. Finding that people react more while anticipating a negative event has also led some researchers to suggest that greater autonomic responding leads to increased preparedness (LeFave & Neufeld, 1980). The beneficial effects of control and the use of psychological and behavioral coping efforts on anticipatory physiological stress have been documented (Carr & Wilde, 1988; Thompson, 1981; Otto, 1990).

Other laboratory investigations have studied the relationship between the probability of occurrence of a stressor and physiological and psychological arousal. Combined, these findings suggest that people are more distressed when they perceive that a negative event will certainly occur (Anderson & Lyon, 1987) and events for which the onset cannot be predicted are associated with more anticipatory distress (Katz & Wykes, 1985).

1.3.1.2 The Anticipation of Real-Life Stressors

In recent years there has been a growing interest in the differential responses afforded by natural and artificial settings. Although some authors (e.g., Fenz, 1988) argue that laboratory responses are analogous to results manifested in real-life experiences, others who have explicitly investigated the generalization of responses have not found complete support for this statement. For example, Abel and Larkin (1991) who examined the heart rate and blood pressure reactions of individuals across laboratory challenges (mental arithmetic & verbal concept challenges) and a challenge in the natural environment (musical performance jury), showed that cardiovascular reactivity was not stable across settings. This

attests to the importance of examining the reactions to stressful situations found in a person's natural environment (Hootman & Baker, 1987).

Some researchers examined, *a posteriori*, whether a real-life event had been anticipated or unanticipated. A summary of their findings is presented in Table 2. Vinokur and Caplan (1986) asked participants to identify past life events and to rate these events in terms of anticipation, stress and adjustment. They found that events that were anticipated were associated with better adjustment and lower stress than those that were unexpected. Results from Ham and Larson (1990) showing that expected events elicited a less negative response than events that were unexpected corroborated these findings. It also seems that desirable events are more often anticipated and require less adaptation than unanticipated events (Fontana, Marcus, Hughes & Dowds., 1979) and that unanticipated events are associated with a higher number of health problems (Gardner, et al., 1992; Matheny & Cupp, 1983).

Other investigators have studied the stress experienced by people prior to the actual occurrence of a true life event. Table 3 provides an overview of these studies. To illustrate, Scherer, Drumheller & Owen (1993) conducted a study to determine whether differences in cognitive appraisal and coping emerged when comparing all stages of an environmental transaction. Cognitive appraisals were measured in terms of negative appraisal (harm and threat) and positive appraisal (challenge and benefit) two days prior to exam, five days after exam and again five days after the results were known. Findings showed that positive appraisal significantly increased and negative appraisal significantly decreased from the anticipatory to outcome stages of the college examination transaction. Similarly, on a physiological level, Fenz (1988) found that heart rate increased during a sequence of events leading up to a parachute jump.

Table 2

Summary of Findings from Studies Investigating a Posteriori the Anticipation of Real-Life Events

Author(s)	Participants	Design/Stressor	Measures	Findings
Fontana, et al. (1979)	n=50 med.patients	Correlational Retrospective	Life events Subjective (Anticipation, Adjustment, Desirability Control) PARS	-Desired events are anticipated and require less adaptation -Events that require most adaptation are those that could not be anticipated -non-sign.correlation between anticipation and psych. state
Gardner, et al. (1992)	n=79 undergrads	Correlational Retrospective	LES Predictability Onset Duration	-For negative life events, the more unanticipated the event the more likely it was to predict the number of health problems

Note. PARS=Personal Adjustment and Role Skills; LES=Life Experience Survey; SIRS=Seriousness of Illness Rating Scale; SRE=Schedule of Recent Experiences; ADJ=Adjustment; MH=Mental Health.

Table 2 (continued)

Summary of Findings from Studies Investigating a Posteriori the Anticipation of Real-Life Events

Author(s)	Participants	Design/Stressor	Measures	Findings
Ham & Larson (1990)	n=243 adolescents	Correlational Retrospective	Life events Affective Expectation Chronicity Valence	-Events that were expected elicited a less negative affective response -Events rated as negative were less likely to be expected
Matheny & Cupp (1983)	n=126 adults volunteers	Correlational Retrospective	-SIRS -SRE -Control -Desirability -Anticipation	-lack of control, undesirability, and unanticipation, were related to stress and illness
Vinokur & Caplan (1986)	n=440 adults volunteers	Correlational Retrospective	-Life events -Pleasantness -Responsible -Anticipation -Stress -ADJ -MH -Role/emot. functioning	-Pleasantness was most important predictor of mental health status -Anticipation of events was associated with better adjust- ment and lower stress

Note. PARS=Personal Adjustment and Role Skills; LES=Life Experience Survey; SIRS=Serious of Illness Rating Scale; SRE=Schedule of Recent Experiences; ADJ=Adjustment; MH=Mental Health.

Table 3

Summary of Findings from Studies Prospectively Investigating the Anticipation of Real-Life Events

Author(s)	Participants	Design/Stressor	Measures	Findings
Fenz (1988)	n=24 adults volunteers	Longitudinal Prospective/ Parachuting	Heart Rate	Significant increase in basal HR as parachute jump approached.
Kemeny, et al. (1989)	n=36 adults volunteers	Longitudinal Prospective/ Various stressors	Life change, residual, and anticip. stress Hassles	Residual and anticipated life were significantly correlated with immunological parameters (CD4 count).
Kiser, et al. (1993)	n=553 children & adolescents	Longitudinal Prospective/ Earthquake	Trauma Interview Anticip. stress	Significant decrease in anxiety from before to after predicted date of earthquake Less PTSD-like symptoms after predicted date
Lemyre (1986)	n=210 adult volunteers	Prospective Various stressors	Psychological stress	Appraisals related to future stressors were better predictors of current stress than those for past events.

Table 3 (continued)

Summary of Findings from Studies Prospectively Investigating the Anticipation of Real-Life Events

Author(s)	Participants	Design/Stressor	Measures	Findings
Scherer, et al. (1993)	n=138 undergrads	Longitudinal Prospective/ Exam	Positive & Negative appraisals	Positive appraisal increased and negative appraisal decreased from the anticipatory to outcome stages of the encounter.

More serious life stressors have also been studied. Hobfoll and Walfisch (1986) studied a small group of women preparing to undergo exploratory surgery for suspected cancer. They found that state depression was significantly more elevated before surgery than three months later. Likewise, Kiser, et al. (1993) found an overall decrease in anxiety symptoms subsequent to the date of an expected earthquake and that duration of the stress reaction was highly associated with perceptions of continued threat.

Others have examined the effects of anticipated events on psychological and physiological well-being. Lemyre (1986) found that the cognitive appraisals related to upcoming stressors were better predictors of current psychological stress than those related to past events. On an immunological level, Kemeny, Cohen, Zegans, and Conant (1989) found that anticipated life stress was highly correlated with the CD4+ (helper inducer cells) count which have important functions in responding to viral infections.

The idea of anticipation is also indirectly evident from studies investigating cognitive coping strategies showing that the use of denial in the face of upcoming stressors is related to low physiological and psychological arousal during the anticipation phase (Buntrock & Reddy, 1992). Similarly, it appears that other cognitive strategies such as optimism and pessimism are related to well-being while anticipating a stressor (Alloy & Clements, 1992; Showers, 1992). In fact, it has been noted that while anticipating a stressor, efforts to minimize the negative effects of a stressor may protect against depression (Taylor, 1991). Thus, a more explicit investigation of individual's expectations about the future may be an important key to better understanding the effects of life events on well-being (Dixon, Heppner, Burnett & Lips, 1993).

The above results lend support to the central idea of the transactional model, that stress and appraisals vary throughout a stressful encounter. So far, conceptualizations of anticipating

have been limited to the idea of impending threat brought about by the occurrence of a stressor (Lazarus & Folkman, 1984). No clear or substantive definition of anticipation has yet been given. Besides, as it stands, the model described by Lazarus and Folkman (1984), although sound, is short of a comprehensive description of the cognitive appraisals related to the anticipation of an event and does not provide a more involved analysis of the associations among anticipatory appraisals, changes in appraisal and psychological stress.

From a transactional standpoint, anticipation can be regarded as changes in the subjective appraisal of a stressor while nothing is happening in terms of observable circumstances. "Objectively" an event has not occurred, but "subjectively" the person is already appraising it. This blending of subjective and objective factors provides a more complete picture of the stress process and gives researchers the opportunity to operationalize anticipation in such a way that it can be empirically tested.

In summary, although the notion of anticipation and the stress associated with the period preceding an event was recognized some time ago, its study has not, as of yet, been fully pursued. Relatively little is known about the nature of appraisals experienced during the anticipatory period, the nature of the appraisal process in the absence of contextual changes, and the relationship between changes in appraisal and stress. Further investigation of anticipatory appraisals, their fluctuations and the related stress response is necessary to clearly define their theoretical implications and clinical characteristics.

It is useful to study these issues within the context of a substantive and natural stressor that is not experimentally induced so as to truly test the idea of anticipation within a real-life situation. The stressor must unfold over a period of time which is sufficient to prospectively investigate the changes in stress and appraisals. Moreover, to be feasible and relevant, this

situation must be recognized as a normally occurring stressor and be readily experienced by a large number of situationally homogeneous individuals. With our ever increasing awareness of the occurrence of breast cancer and the threat of its serious implications, the context of breast cancer screening offers an interesting and challenging opportunity to investigate the relationships among stress, anticipation and appraisals.

1.4 The Context of Breast Cancer

Breast cancer is in and of itself an important area of study primarily because of its high rate of incidence and related mortality. Since cancer is generally viewed as a potentially fatal disease, its diagnosis represents a crisis for most individuals (Scott & Eisendrath, 1986; Vauhkonen, Achte, Lehtonen, Slokar, Lindfors & Holsti, 1986). Consequently, an increasing number of researchers have become interested in the psychosocial aspects related to breast cancer. Due to their proposed effects on psychological functioning and quality of life, diagnosis, treatment options and more recently, screening procedures have been targeted for debate.

Before discussing the psychosocial aspects of breast cancer, a brief review of epidemiological findings related to this disease is warranted. According to recent incidence and mortality rates, breast cancer will continue to be the most diagnosed cancer for women in Canada. In 1994 there were an estimated 57,500 new cancer cases in Canadian women and 30% of these cases were breast cancer (Statistics Canada, 1994). As such, an estimated 17,000 new cases of breast cancer were identified for that year. In Canada in 1994 an estimated 5,400 deaths in women will be attributed to breast cancer.

The average woman is faced with a 1 in 9 probability of developing breast cancer (Baron-Faust, 1995). Although the exact etiology of breast cancer remains uncertain, researchers have identified several primary risk factors that increase the likelihood of developing breast cancer.

The risk seems higher for women who have a family or personal history of breast cancer (Sattin, et al., 1985; Slattery & Kerber, 1993); for those who have a history of breast cell abnormalities and for those who have never had children or who were older when their first child was born (Baron-Faust, 1995; Gail, et al., 1989; Ingram, 1989).

1.4.1 The Impact of Diagnosis and Treatment on Psychosocial Adjustment

Considerable attention has been directed towards the impact of the diagnosis and the effects of subsequent treatment for the disease on the emotional adjustment and quality of life of victims (Ingram, 1989). The diagnosis of breast cancer has been shown to induce stress mainly as a function of the woman's perception of the disease, of its potentially fatal outcome, and of the possibly disfiguring effects of treatment (De Souza, Hegg, De Aguiar & Kessler, 1987; Massie & Holland, 1991).

The reaction to a diagnosis of breast cancer can take on many forms. Pettingale, Burgess and Greer (1988) identified fighting spirit, denial, stoic acceptance and helplessness as possible reactions to the diagnosis of cancer. The perception of control over the disease has been associated with better adjustment following diagnosis (Taylor, Rosemary, Lichtman & Wood, 1984) and the use of more problem oriented coping strategies (Hilton, 1989). More passive responses are associated with poorer outcome (Grassi & Molinari, 1988) whereas active coping strategies are positively associated with more favorable adjustment (Friedman, Baer, Lewy, Lane & Smith, 1989). Greer (1991) even suggested that the individual's psychological response to cancer has even been found to be a significant predictor of the course of the disease, independently of biological prognostic factors (e.g. age, menopausal status, clinical stage, type of operation, post-operative radiotherapy, tumor size, and histological grade).

Difficulties related to psychosocial functioning (e.g. psychological morbidity, diminished sexual interest) following different types of treatment (e.g. surgery, chemotherapy and radiotherapy) for breast cancer have also been documented (Glanz & Lerman, 1992; Vauhkonen, et al., 1986). According to Margolis and Goodman (1987), a number of studies have shown that women treated by mastectomy experience more post-treatment psychological distress than women treated by less radical interventions. Conversely, Maunsell, Brisson and Deschenes (1989) showed that women having a partial mastectomy experienced greater psychological distress three months after surgery than women having a total mastectomy. In this study, the age of participants seemed to modify the relationship: partial mastectomy had a protective effect on younger women. It also seems as though when the patient is permitted to play a part in deciding which treatment to have, one form of treatment may not have an advantage over the other (Wilson, Hart & Dawes, 1988).

In summary, it is known that women can react to the diagnosis of breast cancer in various ways, that some reactions are more likely to be related to adjustment than others and that the choice of treatment and its course can have a profound psychosocial impact on breast cancer victims. Although these findings are of empirical and clinical interest, they cannot be extended to the entirety of experiences with breast cancer. Screening is another type of experience to which a large number of women are exposed.

1.4.2 The Early Detection of Breast Cancer: Population-Based Screening

At this time there is no way to prevent the occurrence of breast cancer, but early detection through screening mammography, clinical breast exam (CBE) and breast self-examination (BSE) can reduce the risk of mortality due to this disease (Fine, Rimer & Watts, 1993). Health practitioners and lay persons alike have campaigned in Canada to encourage the practice of breast

self-examination and adherence to recommended mammography guidelines (Margolis & Goodman, 1987). A review by Rimer (1992) revealed that the use of mammography has increased over the last 15 years; however, utilization rates remain below optimal levels. Some of the barriers identified throughout the literature include socio-demographic characteristics (e.g. age, minority, lower income and education), breast cancer related knowledge and beliefs, access to mammography and physician input. Factors enabling mammography utilization are physician recommendation, regular medical visits, the presence of risk factors, perceived vulnerability to the disease and belief in the benefits of screening (Aiken, West, Woodward & Reno, 1994; Schartz & Lerman, 1993; Rimer, 1992).

Despite the widespread promotion of screening practices, a number of professionals have become skeptical of their benefits (e.g. Green, 1990) and some have warned against their possible detrimental psychological effects (e.g. Roberts, 1989). Since many women access mammography with some degree of anxiety and express some concern about the results of their mammograms (Fine et al., 1993), a number of studies have evaluated the psychological impact of screening results. A summary of the findings from these studies is presented in Table 4.

1.4.2.1 The Impact of False-Positive Results

One of the main criticism made of screening procedures is their often high rate of false-positive results (Skrabanek, 1985) and their effects on emotional well-being and health related practices (Wardle & Pope, 1992). The findings of studies investigating the impact of false-positive results are equivocal. Lerman, et al. (1991) found that three months after screening, there was a significantly higher prevalence of anxiety in women who had received a false-positive screen result. Further, the psychological responses, in terms of the impact of worries on mood, impact of worries on functioning, and anxiety about getting mammograms were more pronounced

Table 4

Overview of Studies Investigating the Psychological Impact of Breast Cancer Screening

Authors	Design	Sample	Measures	Findings
Dean et al. (1986)	longitudinal (pre & 6 months post screening)	n = 132 SN n = 117 C	GHQ PAS	•no sign. differences between pre & post GHQ •no sign. differences in psych. morbidity rates
Bartolucci, et al. (1989)	longitudinal (pre screen & post results)	n = 50 SN n = 20 FP	SQ IAS	•decrease in symptoms following pos. & neg. thermography results •decrease in symptoms after negative mammogram
Ellman et al. (1989)	longitudinal (pre & 3 months post screening)	n = 295 RS n = 271 FP n = 134 SB n = 38 NDC n = 14 PTC	GHQ	•Anxiety higher in FP and SB than RS •Prevalence of psychiatric morbidity of screened women is the same as in the general population

Note. BC=Breast cancer; SN=Screen Negative; SP=Screen positive; C=Control; FP=false-positives; +FP= high suspicion; RS=Routine Screened; SB=Symptomatic Benign; NDC=Newly Detected Cancer; PTC=Previously Treated Cancer; NA=Non-attenders; GP=General Pop.; INV=Invited; UL=Ultrasound; BIO=Biopsy; GHQ=General Health Quest.; PAS=Psychiatric Assessment Schedule; SQ=Symptom Quest.; IAS=Illness Attitude Scale; BSE=Breast Self-Exam; HAD=Hospital Anx. & Dep. Scale; PCQ=Psych. Consequences Quest.; POMS=Profile of Mood States; STAI=State Trait Anxiety Inventory.

Table 4 (continued)

Overview of Studies Investigating the Psychological Impact of Breast Cancer Screening

Authors	Design	Sample	Measures	Findings
Gram, Lund & (1990)	retro./long. (6,18 months post-screen)	n = 209 SN n = 160 FP n = 259 NA n = 165 GP	Attitudes. BC anxiety	•increased prevalence of Slenker anxiety in FP and a decreased prevalence of anxiety in SN •at 18 mo. no sign.differences in quality of life
Bull & Campbell (1991)	cross-sectional (6 weeks after normal results) n = 49 BIO	n = 541 INV n = 331 SN n = 204 UL screening	BSE Impressions of HAD	•+ exposure to screening procedures is related to increased BSE and confidence in screening program •anxiety and depression not raised following screening
Lerman et al. (1991)	cross-sectional (3 months post- screening)	n = 120 SN n = 120 FP n = 68 +FP	BC worry Mood & Func Anxiety Intentions	•+ suspiciousness of abnormal mammo. was associated with anxiety and BC worry •women with mod. levels of impairment in mood and funct. more likely to practice BSE

Note. BC=Breast cancer; SN=Screen Negative; SP=Screen positive; C=Control; FP=false-positives; +FP= high suspicion; RS=Routine Screened; SB=Symptomatic Benign; NDC=Newly Detected Cancer; PTC=Previously Treated Cancer; NA=Non-attenders; GP=General Pop.; INV=Invited; UL=Ultrasound; BIO=Biopsy; GHQ=General Health Quest.; PAS=Psychiatric Assessment Schedule; SQ=Symptom Quest.; IAS=Illness Attitude Scale; BSE=Breast Self-Exam; HAD=Hospital Anx. & Dep. Scale; PCQ=Psych. Consequences Quest.; POMS=Profile of Mood States; STAI=State Trait Anxiety Inventory.

Table 4 (continued)

Overview of Studies Investigating the Psychological Impact of Breast Cancer Screening

Authors	Design	Sample	Measures	Findings
Gram & Slenker	cross-sectional retrospective (1 year post- screening)	n = 164 GP n = 160 FP n = 209 SN n = 210 NA	Perceptions. BSE BC anxiety	•SN and NA groups reported (1992) sign. lower BC anxiety at follow-up than the FP group •NAs recalled being less anxious one year before than FPs
Fine et al. (1993)	retrospective (immediately post-screening)	n = 255	Predisp. to mammo. Reinf. of pain and anxiety	•majority of women reported some degree of anxiety about mammo. and concerns re: results •most did not find it embarrassing and would return for another mammo.

Note. BC=Breast cancer; SN=Screen Negative; SP=Screen positive; C=Control; FP=false-positives; +FP= high suspicion; RS=Routine Screened; SB=Symptomatic Benign; NDC=Newly Detected Cancer; PTC=Previously Treated Cancer; NA=Non-attenders; GP=General Pop.; INV=Invited; UL=Ultrasound; BIO=Biopsy; GHQ=General Health Quest.; PAS=Psychiatric Assessment Schedule; SQ=Symptom Quest.; IAS=Illness Attitude Scale; BSE=Breast Self-Exam; HAD=Hospital Anx. & Dep. Scale; PCQ=Psych. Consequences Quest.; POMS=Profile of Mood States; STAI=State Trait Anxiety Inventory.

Table 4 (continued)

Overview of Studies Investigating the Psychological Impact of Breast Cancer Screening

Authors	Design	Sample	Measures	Findings
Lightfoot et al.	longitudinal (before & immediately after)	n = 276 SN n = 39 SP	PCQ POMS	•PCQ are low and POMS (1995) decreased from pre- to post-screening •no sign. differences between SN and SP groups
Sutton et al. (1995)	contemporaneous and retrospective (Baseline, pre & 9 months post)	n = 296 SN n = 10 FP	STAI GHQ	•concurrent measures of state and trait anxiety varied according to group or time •sign. decrease in GHQ over time •FP recall more anxiety at results and afterwards

Note. BC=Breast cancer; SN=Screen Negative; SP=Screen Positive; C=Control; FP=false-positives; +FP= high suspicion; RS=Routine Screened; SB=Symptomatic Benign; NDC=Newly Detected Cancer; PTC=Previously Treated Cancer; NA=Non-attenders; GP=General Pop.; INV=Invited; UL=Ultrasound; BIO=Biopsy; GHQ=General Health Quest.; PAS=Psychiatric Assessment Schedule; SQ=Symptom Quest.; IAS=Illness Attitude Scale; BSE=Breast Self-Exam; HAD=Hospital Anx. & Dep. Scale; PCQ=Psych. Consequences Quest.; POMS=Profile of Mood States; STAI=State Trait Anxiety Inventory.

as the suspiciousness of screening results increased. When Sutton, Saidi, Bickler and Hunter (1995) asked women to rate how anxious they were when opening the letter informing them of their screening results, women with a false-positive result recalled feeling significantly more anxious than those who had received a negative result. Retrospective accounts by women with false-positive suggested that they perceived the experience as more painful than women with a negative result.

Conversely, other studies are suggestive of only a slight (Ellman, Angeli, Chistians, Moss, Chamberlain & Maguire, 1989) or non-significant (Gram & Slenker, 1992) increase in the prevalence of distress in women with false-positive screen results. Further, when an initial increase in anxiety is detected, it is not always sustained (Ellman, et al., 1989). Other studies have not detected any post-screening differences between women receiving an abnormal result and those receiving a normal result on several indices of mood disturbance (Lightfoot, Steggles, Wilkinson, Bissett, Bakker, Darlington, Erola & Miller, 1994). In fact, many women having experienced a false-positive mammography result rated the stressfulness of this experience as being similar to that of other minor stressful events in their lives (Gram & Slenker, 1992).

Many researchers agree that the receipt of false-positive results does not seem to affect women's intent to consult with health care professionals, to perform breast self-examination, and to attend subsequent screening mammograms (Gram & Slenker, 1990). In fact, women with abnormal mammograms have reported significantly stronger intentions to obtain future mammograms (Gram & Slenker, 1990; Lerman, et al., 1992).

1.4.2.2 The Impact of Negative Results

Even though most women screened are notified of normal results, few investigations have focused on the psychological effects of negative results. Dean, Roberts, French and Robinson (1986) found that six months after screening, only 8% of women reported that the screening had

made them more anxious about developing breast cancer. Further, almost 40% of the sample reported the advantage of an increased awareness about breast cancer. Sutton et al. (1995) followed a cohort of women through the screening process measuring anxiety at many key points: before their being invited to the screening (baseline), at the clinic and nine months after screening. Although they did not report any significant change in state or trait anxiety from baseline to follow-up, they did find that anxiety as measured by the General Health Questionnaire significantly decreased over time. Similarly, Lightfoot, et al. (1994) found that being advised of a normal screen result can result in a decrease in anxiety, whereas Bartolucci, et al. (1989) reported decreases in depression, somatic symptoms, hostility, worry about illness, concern about pain and fear of dying. Thus, a healthy screen result (negative) may lower the prevalence of anxiety as compared to the general population (Gram & Slenker, 1990).

1.4.3 Cognitive Appraisal in Breast Cancer Screening

In light of the importance attributed to appraisals within the transactional theory of stress developed by Lazarus and Folkman (1984), it is striking that no studies have considered the role of appraisals in the stress response of women undergoing screening. The notions of threat and loss, control, and uncertainty have received limited attention in women diagnosed with breast cancer. Findings suggest that the threat posed by a diagnosis of breast cancer is related to anxiety, whereas the loss resulting from mastectomy is associated with depressive affect (Deadman, Dewey, Owens, Leinster & Slade, 1989; van Heering, Van Moffaert & de Cuypere, 1989). The perceived loss of control following diagnosis has also been identified by patients as a major concern (Hack, Degner & Dyck, 1994), and has been shown to be an important predictor of adjustment to breast cancer (Lowery, Jacobsen, & DuCette, 1993; Taylor, Lichtman & Wood, 1984). As for "uncertainty", Hilton (1988) reported that more negative emotions are associated with feelings of uncertainty (e.g.,

not feeling secure and safe from danger, being in doubt, being undecided, and perceptions of vagueness).

When it comes to screening, the cognitive factor that is most commonly assessed is the woman's perceived risk of breast cancer. Generally, results show that women with a family history of breast cancer feel that they are more vulnerable to breast cancer than women without a family history of the disease, and thus in most cases, overestimate their actual breast cancer risk (Fine et al., 1993; Lerman, Kash & Stefanek, 1994; Wellisch, Gritz, Schain, Wang & Siau, 1991). It has also been found that false-positive results from mammograms are also related to increased risk perception (Lerman, Trock, Rimer, Jepson, Brody & Boyce, 1991). Furthermore, Lerman, Kash and Stefanek (1994) suggest that young women at risk for breast cancer report breast cancer worries that could potentially impinge on their daily functioning.

As of yet, no study has empirically investigated how women appraise their risk of breast cancer as a stressor in and of itself. To what extent do they feel that the risk of breast cancer impacts on their lives? Do they feel that they can master the risk of breast cancer? Do they feel more or less uncertain about their personal risk? These are all questions that remain unanswered. Certainly an understanding of the screening experience of women at risk for breast cancer could be enriched by answers to these questions.

1.4.4 Anticipation in Breast Cancer Screening

Any woman undergoing breast cancer screening is taking the risk of detecting an abnormality (Wardle & Pope, 1992). Thus, there may be an element of threat even before the results are known. No studies with the stated purpose of investigating the wait from screening to results or the appraisals relative to the risk of breast cancer throughout the screening process were found. Nonetheless, the importance of anticipatory stress in the face of screening can be derived from the

studies suggesting that a number of women report feeling anxious while awaiting screening results and even more are anxious while anticipating the results of the diagnostic mammogram (Gram & Slenker, 1990).

Similarly, Sutton et al. (1995) found significant changes in anxiety over time. Specifically, retrospective anxiety was lowest when women were at the clinic and increased as they were waiting for results. Further, significant decreased levels of anxiety, depression, worry about illness, and fear have been reported following screening (Bartolucci, et al., 1989; Lightfoot, et al., 1994). In studying the expectations about the impact of genetic testing, Lerman, Daly, Masny and Balshem (1994) found that 68% of women with a family history of cancer would feel more in control even when the results of genetic testing were positive (abnormal).

Indirect support for the presence of anticipation is also provided by research examining the psychosocial implications of other health-screening endeavors. For instance, Croyle and Lerman (1995) report that when looking at the effects of amniocentesis, anxiety levels have been found to peak prior to the procedure and again immediately before receipt of results. Among women in whom a heightened risk is signaled, anxiety increases but then decreases to normal levels once subsequent normal results have been received. It also seems that undergoing cervical and ovarian cancer screening can increase worries about cancer, that these fears change throughout the process, and that psychological distress is reduced once women are informed of a normal screen (Lerman & Rimer, 1995). Screening for Huntington's disease is more recent, yet preliminary findings suggest that after disclosure of the results, both gene-carriers and noncarriers reported decreased psychological distress (Tibben, et al., 1994). Like those related to breast cancer screening, these results support the idea of anticipation, although none of these studies have explicitly examined this issue.

Overall, the studies on breast cancer screening suggest that screening results can influence a woman's psychological well-being and her perception of personal risk of breast cancer. For women informed of a negative result, the effect can be positive. Yet, those informed of an abnormal result may experience some distress. Despite the fact that these studies have undoubtedly enhanced our understanding of women's experiences of screening, little is known about their cognitive evaluation of the risk of breast cancer and within the existing body of research there are a number of methodological issues that need to be addressed. More specifically, many of these studies have used retrospective designs (e.g. Fine et al., 1993; Gram et al., 1990; Gram & Slenker, 1992; Sutton et al., 1995), have not included a control group in their design (e.g. Bartolucci, et al., 1989; Bull & Campbell, 1991; Fine, et al., 1993; Lerman et al., 1991; Sutton et al., 1995), have used non-validated measures (e.g. Fine, et al., 1993; Gram, et al., 1990) and in some cases, have relied on small samples (e.g. Bartolucci et al., 1989; Bull & Campbell, 1992; Lightfoot, et al., 1995; Sutton, et al., 1995). In addition, the early detection methods studied in the investigations presented above have been restricted to mammography. The use of a more thorough screening procedure, such as that involving a clinical breast exam in addition to a mammogram, may be related to different psychological outcomes.

Certainly these issues merit consideration and more research is needed to better evaluate the psychosocial effects of breast cancer screening for women informed of normal as well as abnormal results using larger samples and community comparison groups of women not presently undergoing the screening process. In addition, the inconsistent findings relative to the occurrence of clinical anxiety and depression following screening is suggestive of the presence of a more normal process, such as psychological stress. The use of a validated measure of this concept could help clarify this issue.

1.5 Goal of the Study

The studies reviewed throughout this theoretical chapter demonstrate the utility of the cognitive-appraisal model for predicting subjective reactions to past and potential events. However, the missing elements in the current state of knowledge concerning anticipatory stress and related cognitive evaluations have also been highlighted. Although not a new concept, anticipation has yet to be explicitly incorporated into a theoretical framework. Therefore, the goal of this study is to expand the existing cognitive-appraisal model in order to more explicitly consider the cognitive appraisals of anticipated events and the psychological stress related to these evaluations. Although this will be done in the context of a specific situation (breast cancer screening), it is hoped that the knowledge gained will be useful to understanding anticipation in the face of other encounters.

A model which explicitly includes the anticipation concept and its link to core appraisals is presented in Figure 2. As originally suggested by Lazarus and Folkman (1984), it is proposed that cognitive appraisals mediate the relationship between life stressors and psychological stress. However, in addition to the process involving the stressor, appraisal and stress response originally proposed by Lazarus and Folkman (1984), the element of anticipation is explicitly integrated and linked directly to appraisal to show that the process of appraisal can be initiated without the actual occurrence of the stressor. As the contextual situation is expected to change (i.e., anticipation), the appraisal process is initiated, leading to a corresponding degree of psychological stress.

As the name implies, "anticipation" occurs before the expected event, but at what point does anticipation become measurable? In their review, Paterson and Neufeld (1987) proposed that the anticipatory effects of an aversive event were most evident (peak anticipation) when a) the occurrence of the event seemed imminent and b) the individual had been faced with a lengthy time period between the cues signaling the imminent stressor and the resolution of this situation. Thus,

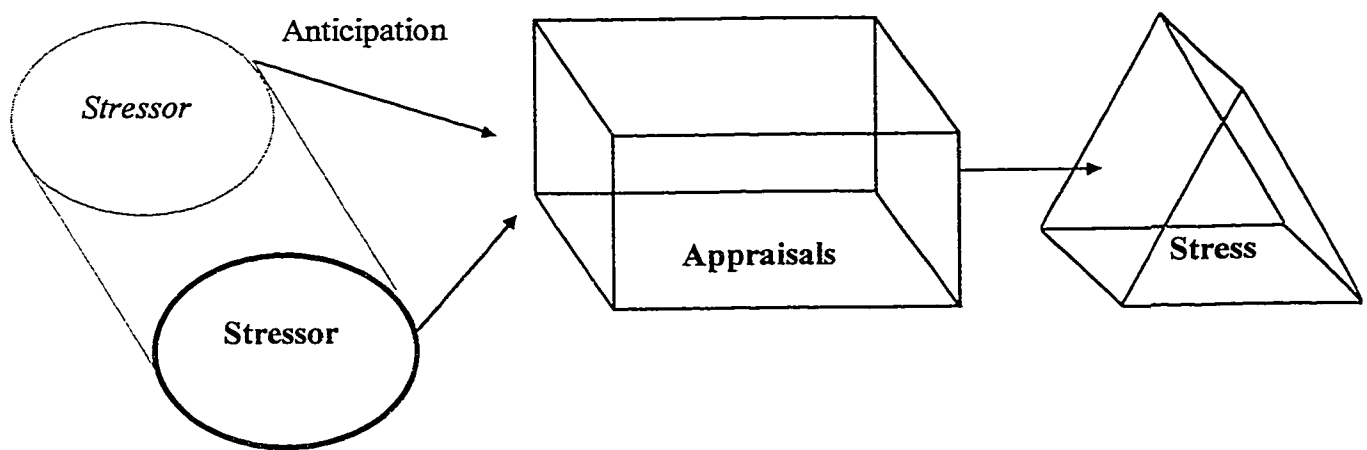


Figure 2. Model of stress, appraisal and anticipation

prominent differences can be expected when the appraisals of the risk when it is most salient are compared to the appraisals of this risk once the non-occurrence of the anticipated event is confirmed.

1.6 Objectives and Hypotheses

Keeping in mind the broader goal of developing a better understanding of anticipations in an unfolding experience of stress, the objectives are 1) to prospectively investigate psychological stress experienced from the anticipation of an event until its resolution; 2) to empirically describe the cognitive appraisals generated by individuals as a stressor unfolds; and 3) to relate the change in cognitive appraisals from anticipation to resolution to psychological stress. Within each objective, general conceptual hypotheses are formulated and then operationalized as more specific or statistical hypotheses.

To reach the objectives, women undergoing breast cancer screening will be seen before they undergo screening (Time 1), while awaiting the results (Time 2), shortly after they are informed of the results (Time 3) and three months later (Time 4). Women undergoing screening will comprise two groups: normal (negative) and abnormal (false-positive). Their reports will be compared to another group of women not currently undergoing screening. Table 5 contains an overview of the study design and Figure 3 provides a more detailed illustration of the anticipation model which incorporates the elements of our study. In Figure 3, it is shown that the concurrent relationships among stressor, appraisals, and stress are ongoing throughout the transaction. It can also be seen that the appraisal process is initiated even prior to the occurrence of the event. In addition to these concurrent associations, relationships across times are also expected. More specifically, appraisals at Time 1 are related to the expected objective nature of the stress at Time 2. Likewise, appraisals at Time 2 are associated with the contextual situation at Time 3.

Table 5

Study Design Overview

Group	Pre-screen	Post-screen	Post-results	Follow-up
	Day 1	Day 2	Day 20	Day 90
Negative Screen	O1 screen	O2	O3	O4
False-positive Screen	O1 screen	O2	O3	O4
Comparison No screen	O1			O2

Note. O=Observation.

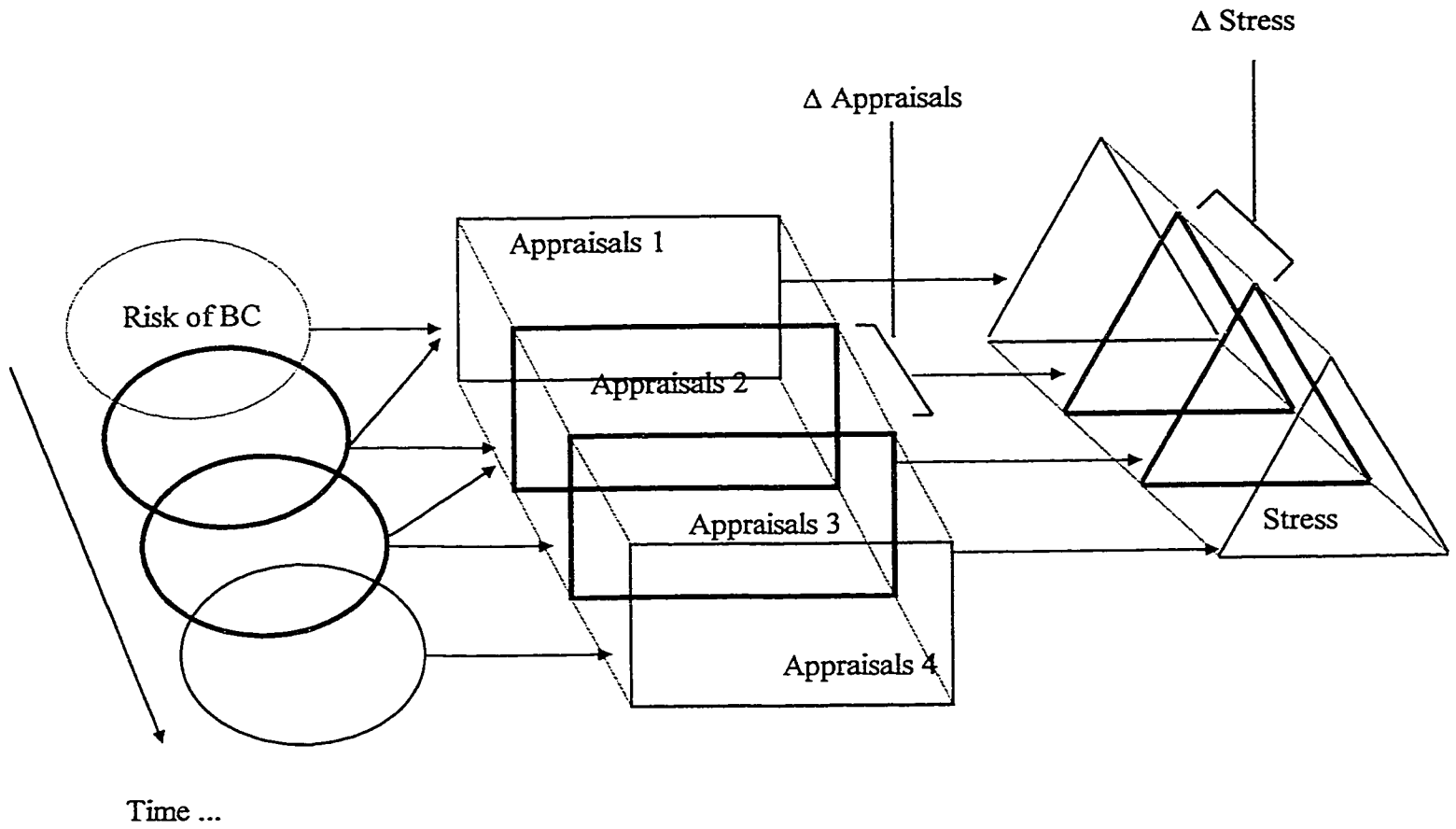


Figure 3. Conceptual model of stress, appraisal and anticipation

Significant changes in appraisals (Δ appraisals) and stress (Δ stress) are expected to occur between Time 2 and Time 3, and are thus illustrated in bold.

Objective 1: Prospectively investigate psychological stress experienced from the anticipation of an event until its resolution

The first objective consists of prospectively investigating the course of psychological stress experienced by an individual from when she anticipates a potentially negative life event (i.e., the detection of breast cancer) until the resolution of the situation (i.e., negative for breast cancer).

Using laboratory simulations, researchers have demonstrated the physiological manifestations of anticipatory stress (e.g. Arthur, 1987; Buntrock & Reddy, 1992; Carr & Wilde, 1988). Also, research in natural settings suggests that more negative affect is present during the period preceding an event than in the period following the event (Dunne, 1981; Hobfoll & Walfisch, 1986; Kiser, et al., 1993; Scherer, et al., 1993). Furthermore, the perceived probability of occurrence for an event is positively related to the level of anticipatory stress produced (Paterson & Neufeld, 1987). These conclusions are largely based on retrospective research designs and few researchers have investigated more consequential life events like breast cancer screening. Thus, additional research is needed to better understand the shifts in psychological stress in people faced with a real-life stressful encounter.

Hypothesis 1: Psychological stress will vary throughout the encounter. The most crucial contrast is expected to be between pre-result and post-result (Time 2 and Time 3).

On an operational level, the following is predicted:

Hypothesis 1.1 Psychological stress will increase during the anticipation phase, that is from T1 to T2, and decrease from T2 through to T4 for women who are informed of a normal screen.

Hypothesis 1.2 Those informed of an abnormal screen will experience a rise in psychological stress at T3, then return to pre-test levels at follow-up (T4).

Hypothesis 1.3 There should be no changes in psychological stress for the comparison group.

Therefore, the within-group comparisons would be:

for negatives (N): $\text{stress1} < \text{stress2} > \text{stress3} > \text{stress4}$

for false-positives (FP): $\text{stress1} < \text{stress2} < \text{stress3} > \text{stress4}$

for the comparison group (C): $\text{stress1} = \text{stress2}$

and the between-group comparisons would be:

$\text{stress1 (N)} = \text{stress1 (FP)} > \text{stress1 (C)}$

$\text{stress3 (N)} < \text{stress3 (FP)}$

Objective 2: Empirically describe the cognitive appraisals as a stressor unfolds

As mentioned, there is a lack of studies prospectively investigating cognitive appraisals throughout a stressful encounter and most studies focus exclusively on one appraisal. Therefore, a second objective is to empirically qualify in terms of perceived impact, perceived mastery and perceived uncertainty, the cognitive appraisals as a life event unfolds, from anticipation to resolution. Findings suggest that events characterized by a high degree of threat are perceived as having more impact (DeLongis, Folkman & Gruen, 1985; Lemyre, 1986) and that the degree of threat or impact increases as the event becomes more salient (Lerman, et al., 1994a; Wardle & Pope, 1992). Empirical data also indicate that uncertainty decreases as an event becomes more clearly defined (Mishel, 1988) and an individual is more likely to experience a sense of mastery if a situation is less ambiguous (Lazarus & Folkman, 1984; Mishel & Sorenson, 1991). Changes in cognitive appraisals are also suggested within the context of breast cancer screening by studies showing that the risk of breast cancer can seem more salient for women informed of a positive screen, thus leading to an increased sense of Impact (Gram & Slenker, 1992). It also seems that

feelings of uncertainty diminish and a sense of control is gained, once results of screening are known (Cockburn, DeLuise, Hurley & Clover, 1992).

When undergoing breast cancer screening, the period when women are waiting to be screened is the time when the least information is available about the procedure itself and the results. As such, this time is likely characterized by the highest level of perceived uncertainty, the lowest level of perceived mastery, and a moderate degree of perceived impact. Once the procedure has been carried out, the focus shifts from the actual screening to the anticipation of results. Since information has been gained, perceived uncertainty and perceived mastery will be moderate; however, perceived impact will increase as a result of the increased saliency of the risk of breast cancer. Once results are known, perceived uncertainty will diminish, perceived mastery will increase, but perceived impact could peak, depending on the screening results. For the negative group, the perceived impact should be at its lowest, whereas for those informed of suspicious or abnormal findings (false-positives) perceived impact should be at its highest. When the procedure is over, women have been provided with all available information. Thus, perceived uncertainty should reach its lowest point, perceived mastery its highest point and perceived impact should stabilize at a low to moderate level. The largest difference in appraisals will be between Time 2 and Time 3, that is between the time when the potential for abnormal results is most salient (peak anticipation) and the time when results are revealed. There should be no changes in the appraisals of the comparison group who are not undergoing screening.

Hypothesis 2: For women undergoing screening, appraisals will fluctuate significantly throughout the encounter.

This hypothesis can be expressed operationally for each major cognitive dimension:

Hypothesis 2.1. Perceived impact will increase as the potential stressor becomes more imminent.

For negatives, perceived impact will increase from the time they present for screening (T1) to the period when they are waiting for results (T2), diminish once results are known (T3) and then remain stable (T4).

For false-positives, perceived impact will increase from the outset of the screening (T1), as they wait for results (T2) and again once results are known (T3). Perceived impact will decrease once the occurrence of cancer is disconfirmed (T4) and be similar to that reported by negatives.

Therefore, within-group comparisons will be:

for negatives (N): $\text{Impact1} < \text{Impact2} > \text{Impact3} = \text{Impact4}$
 for false-positives (FP): $\text{Impact1} < \text{Impact2} < \text{Impact3} > \text{Impact4}$
 for the comparison group (C): $\text{Impact1} = \text{Impact2}$

and between-group comparisons will be:

$\text{Impact1 (N)} = \text{Impact1 (FP)} \neq \text{Impact1 (C)}$
 $\text{Impact3 (N)} < \text{Impact3 (FP)}$

Hypothesis 2.2 Perceived mastery will increase as the situation moves closer to resolution.

For all women screened as the situation unfolds from the time preceding screening (T1), through to follow-up (T4) when future course of action is known.

Therefore, within-group comparisons will be:

for the screened group (S): $\text{Mastery1} < \text{Mastery2} < \text{Mastery3} < \text{Mastery4}$
 for the comparison group (C): $\text{Mastery1} = \text{Mastery2}$

and between-group comparison will be:

$\text{Mastery1 (S)} = \text{Mastery1 (C)}$
 $\text{Mastery3 (N)} = \text{Mastery3 (FP)}$

Hypothesis 2.3 Perceived uncertainty will decrease as more information is gained.

For women informed of a negative screen, perceived uncertainty will diminish from the time they present themselves for screening (T1) through to follow-up (T4).

In contrast, perceived uncertainty should increase for false-positives when they are informed of abnormal screen results (T3) and should subsequently decrease as follow-up diagnostic tests are carried out (T4).

Therefore, within-group comparisons will be:

for negatives (N): $\text{Uncertainty}_1 > \text{Uncertainty}_2 > \text{Uncertainty}_3 > \text{Uncertainty}_4$
 for false-positives (FP): $\text{Uncertainty}_1 > \text{Uncertainty}_2 < \text{Uncertainty}_3 > \text{Uncertainty}_4$
 for the comparison group (C): $\text{Uncertainty}_1 = \text{Uncertainty}_2$

and the between-group comparisons will be:

$\text{Uncertainty}_1(\text{N}) = \text{Uncertainty}_1(\text{FP}) \neq \text{Uncertainty}_1(\text{C})$
 $\text{Uncertainty}_3(\text{N}) < \text{Uncertainty}_3(\text{FP})$

Objective 3: Relate the change in cognitive appraisals from anticipation to resolution with psychological stress.

Numerous studies have shown a relationship between concurrent cognitive appraisals and psychological stress (Folkman, et al., 1986b; MacNair & Elliott, 1992; Vinokur & Selzer, 1975). Yet, no attempts have been made to quantify the fluctuations in appraisals over time and to relate these differences to psychological stress with respect to an anticipation process. The third objective of this project is threefold. First, it is necessary to evaluate the degree of the change in cognitive appraisals as a stressful encounter unfolds. Second, it is possible to quantify the relationship between the degree of this change and psychological stress found at peak anticipation. Thus, future appraisals serve as indicators of current anticipation. Third, the association between change in appraisal and change in stress can also be investigated.

Lazarus and Folkman (1984) consider appraisal as a process, but if there are changes in the subjective appraisals without any changes in the contextual situation (i.e. the non-occurrence of the anticipated negative event), this may indicate the presence of anticipation. That is, the individual has generated in the present, the cognitive appraisals based on what she is expecting in

the future and has experienced a corresponding degree of stress. Therefore, if a woman is anticipating a change in her situation (i.e., abnormal results from the breast cancer screening), her appraisals of the risk of breast cancer at anticipation will be different from her appraisals once it is announced that the anticipated event will not occur (i.e., the woman is informed of normal results). These changes in appraisals should be related to anticipatory stress and changes in stress over time. The most prominent changes in appraisals and stress are expected between the pre-result and post-result time points (Times 2 and 3). Thus, these changes will be the main focus of analyses.

Hypothesis 3: Changes in appraisals are related to anticipatory stress and changes in stress.

For women whose contextual circumstances remain constant (negatives), changes in appraisals (Δ appraisals T2-T3) will be significantly related to: a) peak anticipatory stress (stress T2) and b) changes in psychological stress (Δ stress T2-T3) over time.

Therefore, Δ appraisals T2-T3 r stress-T2
and Δ appraisals T2-T3 r Δ stress T2-T3

In summary, the hypotheses will test the changes over time, and across groups of negatives, false-positives, and comparisons on psychological stress and appraisal. This will first be done concurrently and then in an anticipatory fashion.

CHAPTER 2

METHODOLOGY

The objectives and hypotheses having been specified, this next chapter is dedicated to presenting the methodology used for the project. Included is a detailed description of participants, measures and procedures.

2.1 Participants

Participants were recruited as they attended a provincial screening program, the Ontario Breast Screening Program (OBSP). Clients can either refer themselves to this program or be referred by their family physician or gynecologist. Screening in the OBSP involved a clinical breast exam (i.e., a manual palpation of the breast) by a trained nurse examiner and a mammogram.

To be eligible for the OBSP, women had to be residents of Ontario, be aged 50 years and over, with no history of breast malignancy or artificial breast augmentation, not have had a mammogram within the past 12 months and show no acute breast symptoms. In addition, to partake in the study, women had to be proficient in either official language (English or French).

During the six month recruitment period about 6219 women underwent screening, 3698 of whom received letters informing them of our study. A total of 824 women participated in the study, which represents almost 15% of the clients seen at the clinic. Of the women who agreed to participate in the study, 75% ($n=618$) completed all three initial questionnaires. Analyses showed that women who did not return all three initial questionnaires ($n=148$) were somewhat younger ($M=59$ years) than those women who did return all questionnaires ($M=60$ years) ($t_{(764)}=2.47, p<.05$). However, they were not significantly different on marital status ($\chi^2_{(5,788)}=3.21, p=.67$), family income level ($\chi^2_{(7,662)}=6.2, p=.52$) and level of education ($\chi^2_{(2,655)}=1.37, p=.50$).

Due to ethical constraints, data from non-participants were unavailable. However, archival data gathered by OBSP helped to confirmed that our sample was representative of the women who attend the screening clinic. According to statistics provided by the OBSP, the median age of women screened at the clinic is 60 years. With regards to education, 6.7% report primary school education, 17.1% report having done some high school, 24.6% report having completed high school, whereas 45.7% report having post-secondary education. Most clients screened at OBSP expressed a preference for English (91%) with only 6% identifying French as their preferred language. Information pertaining to income and marital status was unavailable. Frequencies for age, education and language categories, for all OBSP clients and our sample as well as results of non-parametric analyses are provided in Table 6. Results showed that the median age for both groups were the same (Mdn OBSP=60 and Mdn sample=59) and the percentage of women expressing a preference for French was also the same ($\chi^2_{(1)}=.53$, $p<.46$). However, the age distribution of the sample was slightly different from that of overall OBSP clients as was the distribution of number of years of education. Therefore, as is the case for most studies that must rely on volunteers, our sample seemed slightly younger and more educated than the overall group of clients seen at OBSP, a limitation that will be considered in discussing the findings.

Both Anglophones and Francophones were welcomed as participants. As a first step, it was ascertained that both groups were equivalent on demographics such as age, marital status, income and education. Only 37 participants requested the use of French questionnaires. Analyses showed that in our sample Francophones were not different from Anglophones on age and education (Wilks'=.99, $p=.24$), nor on income level ($\chi^2_{(1,47)}=1.62$, $p<.20$). The groups were also not significantly different from one another on any dependent variables at Time 1 (Wilks'=.99, $p=.95$), Time 2 (Wilks'=.99, $p=.71$) and Time 3 (Wilks'=.99, $p=.74$). With respect to marital status,

Table 6

Frequencies for Age, Education and Language Categories for All OBSP Clients and Recruited Sample

	OBSP	Recruited sample	χ^2	p
	%	%		
Age			10.15	.04
50-54 years	26.4	21.12		
55-59 years	21.1	27.48		
60-64 years	26.4	20.34		
65-69 years	21.1	14.75		
70+ years	26.4	16.3		
Education			17.71	.01
Primary school	6.7	0.0		
Some High school	17.1	9.9		
High School grad	24.6	25.3		
Post-secondary	45.7	64.8		
Language			.53	.46
English	91.1	95.5		
French	5.8	4.8		

however, certain minor differences between Francophones and Anglophones were revealed ($\chi^2_{(1,53)}=5.85, p<.02$). In contrast to Anglophones who were mostly all married or cohabiting, the Francophone group was divided, with half the sample reportedly married or cohabiting and the other half living alone (separated, divorced or widowed). Since the Anglophone and Francophone groups were relatively homogeneous, their data were pooled.

2.1.1 Screened Sample

Socio-demographic characteristics of the recruited OBSP sample are given in Table 7. This group consisted of women between the ages of 50 and 83 years. Since the program actively targets women between the ages of 50 and 75 years, women aged over 75 years were not included in the analyses. The mean age for our OBSP group was 60 years ($sd=6.6$). Of these women 74% were married or living with a partner, 11% were divorced, 6% were single and 9% were widowed. Participants reported an average of 14 years of education with a range of 7 to 29 years. In all, about 14% of women had less than a high school education, 34% had completed high school, 49% had post-secondary education (college and university) and 3% had some graduate training.

Data on screening results were available for 606 women and are shown in Table 8. The protocol set forth by the screening program dictates that any abnormality detected on either the clinical breast exam, the mammogram or both constitutes a positive finding (i.e., abnormal result). Of the women screened, 541 (89%) reported normal findings on both the clinical breast exam and the mammogram (negative results). In all, 65 women (11%) reported some form of abnormality: twenty-eight women (5%) reported an abnormal clinical breast exam with a normal mammogram, 18 (3%) reported an abnormal clinical breast exam as well as an abnormal mammogram that warranted further testing, only 7 women (1%) reported an abnormal clinical breast exam with an abnormal mammogram

Table 7

Socio-demographic Characteristics of OBSP Study Sample.

Variable/Categories	Mean/Frequencies
Mean age (years)	59.8
Mean education (years)	14
Family Income	
<= 14,999\$	3.02%
15,000 to 24,999\$	7.99%
25,000 to 39,999\$	15.38%
40,000 to +50,000\$	73.60%
Marital Status	
Married/partner	72.9%
Divorced	10.5%
Single	6.1%
Widowed	9.9%

Table 8

Reported Screening Results of Participants

Mammogram	Clinical Breast Exam	
	Normal	Abnormal
Normal	541 (89.3%)	28 (4.6%)
Abnormal (with subsequent testing)	10 (1.7%)	18 (2.9%)
Abnormal (without subsequent testing)	2 (.33%)	7 (1.2%)

Note. The negative screen group=541/606. The (false)-positive screen group=65/606.

breast exam but of an abnormal finding on the mammogram, for 10 of whom further testing was warranted. From the pool of women reporting abnormalities, only 2 were diagnosed with a malignant which did not require subsequent examination, 12 (2%) women were informed of a normal clinical tumor and were thus excluded from further analyses. All other abnormal findings were disconfirmed with further testing, and were therefore considered to be false-positive results.

Based on these results, the OBSP sample was subdivided into two groups: a normal-result group (negative group) and an abnormal-result group (false-positive group). Women informed of both a normal clinical breast exam and a normal mammogram comprised the negative group. Women reporting either an abnormal clinical breast exam, an abnormal mammogram, or both, were considered false-positive. Therefore, the sample comprised 541 negatives (i.e., normal on both clinical palpation and mammography) and 65 false-positives (i.e., suspicion on either clinical palpation or mammogram).

Multivariate analyses of variance showed that women reporting the various types of abnormalities (clinical breast exam) were not significantly different on any demographic or study variable, at any time, and thus their data were pooled. A summary of the results from the preliminary analyses testing subgroup differences are reported in Table 9.

Therefore for Time 1, Time 2 and Time 3 the screened sample comprised 606 women, 541 of whom were negatives and another 65 who were false-positives. At Time 4 an interview was requested, all women in the false-positive group ($n=65$) were invited. A total of 61 women with false-positive results agreed to be interviewed. A balanced or equivalent sample of negatives was also interviewed. In all, 85 women with normal screen results were approached for the interview. Of these, 66 (78%) agreed to participate; the others could not be reached or declined for various reasons including travel, death of a family member, or "bad timing". Therefore, analyses at Time 4 were based on a final sample of 61 false-positives and 66 negatives.

Table 9

Frequencies and Means on Demographics, Stress, and Appraisals for Women Reporting Various Types of Abnormal Results

	false-positive screen group				
Dependent Variable	CBE+/MAM+	CBE+/MAM-	CBE-/MAM+	F/Wilks'/ χ^2	p
	n=25	n=28	n=12		
Demographics					
Age	61.7 years	61.8 years	61.4 years		
Education	14.0 years	14.13 years	13.1 years	.97	.88
Marital status				6.46	.59
Married	87%	74%	75%		
Divorced	0%	13%	8%		
Single	5%	9%	0%		
Widow	8%	4%	17%		
Family Income				5.99	.40
0-14,999\$	4%	0%	0%		
15-24,999\$	9%	14%	8%		
25-39,999\$	26%	5%	25%		
40-50,000+\$	61%	81%	67%		

Note: +CBE represents an abnormal clinical breast exam; -CBE represents a normal clinical breast exam; +MAM represents an abnormal mammogram; and -MAM represents a normal mammogram.

Table 9 (continued)

Frequencies and Means on Demographics, Stress, and Appraisals for Women Reporting Various Types of Abnormal Results

	false-positive screen group				
Dependent Variable	CBE+/MAM+	CBE+/MAM-	CBE-/MAM+	<u>F</u> /Wilks'/ χ^2	p
	n=25	n=28	n=12		
Time 1					
Stress	64.73	73.68	74.50	.86	.43
Appraisals				.91	.43
Prcvd Impact	2.72	2.74	3.50		
Prcvd Mastery	4.88	4.48	4.00		
Prcvd Uncertainty	3.24	3.93	4.17		
Time 2					
Stress	63.09	71.34	76.75	.88	.42
Appraisals				.85	.19
Prcvd Impact	3.77	3.87	3.50		
Prcvd Mastery	5.05	4.17	4.33		
Prcvd Uncertainty	3.68	4.35	4.67		

Note: +CBE represents an abnormal clinical breast exam; -CBE represents a normal clinical breast exam; +MAM represents an abnormal mammogram; and -MAM represents a normal mammogram.

Table 9 (continued)

Frequencies and Means on Demographics, Stress, and Appraisals for Women Reporting Various Types of Abnormal Results

Dependent Variable	Group			<u>F</u> /Wilks'	p
	+CBE/+MAM	+CBE/-MAM	-CBE/+MAM		
	n=25	n=28	n=12		
Time 3					
Stress	66.17	64.69	76.00	.80	.46
Appraisals				.95	.83
Prcev'd Impact	4.00	3.72	4.27		
Prcev'd Mastery	4.50	4.64	4.91		
Prcev'd Uncertainty	4.36	3.84	3.91		
Time 4					
Stress	62.32	62.82	69.58	.34	.70
Appraisals				.94	.79
Prcev'd Impact	2.86	3.28	3.00		
Prcev'd Mastery	5.27	4.56	5.00		
Prcev'd Uncertainty	3.14	3.92	3.58		

Note: +CBE represents an abnormal clinical breast exam; -CBE represents a normal clinical breast exam; +MAM represents an abnormal mammogram; and -MAM represents a normal mammogram.

2.1.2 Comparison Sample

A comparison sample of convenience was also recruited. It is crucial to note that these women are not presently undergoing screening, and will serve to evaluate the equivalency of groups at the initial stage and the effect of repeated measurement. These women were recruited by random telephone requests as well as from a variety of community organizations such as a group of volunteers from a local hospital (Monfort Hospital), a local walking group ("Les passionnés de la marche"), various church groups (e.g., Les Filles d'Isabelle), and local community centers (Le centre communautaire du centre-ville and Le centre communautaire Vanier). This comparison group consisted of 119 women aged between 50 and 84 years ($M=66$ years; $SD=9.2$). As with the OBSP sample, women over the age of 75 years were excluded from analyses. Of the remaining sample ($n=110$), 60% were married, 8% were divorced, 10% were single. Participants reported an average of 13 years of education ($SD=3.1$; range=7 to 20 years). In all, about 28% of women had less than a High School education, 36% had completed High school, and 36% had post-secondary education (college or university).

To ensure the equivalence of samples, an effort was made to balance (post-hoc) groups on four socio-demographic factors (age, marital status, family income level and education level) for all subsequent between-group analyses. The specific sample characteristics as well as tests of their comparability are presented as preliminary analyses in the next chapter.

2.2 Measures

The questionnaire used in the study incorporated two pre-validated psychological scales: the Psychological Stress Measure (PSM; Lemyre, Tessier & Fillion, 1990) and the Subjective Appraisal Rating Scale (SARS; Lemyre, 1986). The questionnaire also incorporated some more general questions regarding health, attitudes towards mammography, perception of risk and general demographics. Samples of all questionnaires used in the study are provided in Appendix A.

2.2.1 Psychological Stress

Psychological stress was assessed with the Psychological Stress Measure (PSM) a self-report instrument which evaluates the subjective experience of feeling stressed. The PSM is designed for use with a normal population and provides information on the physiological, cognitive-affective and behavioral aspects of the participants' perceptions of their stress state (Lemyre, et al., 1990). This instrument has been used in numerous studies and its psychometric soundness has been documented. Findings from the various studies show that the PSM has a convergence validity of $r=0.76$ with the Brief Symptom Inventory, of $r=0.75$ with the Beck Depression Inventory and of $r=0.73$ with Spielberger's anxiety scale (Dion, 1988). In addition, compared to psychopathology assessment tools, the PSM has a normal distribution (Lemyre, et al., 1990). The original PSM consists of 49 items, however the developers also provide for two short versions of the PSM, which have been validated and have the same psychometric qualities as the long version. The internal consistency of the PSM is reported to be .93 and .92 for both short versions A and B, respectively and .96 for the original 49-item version (Lemyre, 1986). In addition, Lemyre (1986) reports that the PSM has a unidimensional factorial structure. Test-retest reliability for the short versions has been deemed satisfactory at $r=0.56$ and $r=0.65$ over 6 month period for versions A and B respectively (Lemyre, 1986; Lemyre, et al., 1990). Both shortened versions A and B are significantly correlated with the original PSM ($r=.98$ for both versions) (Lemyre, et al., 1990). Concomitant validity between the original PSM and salivary immunoglobulin ($r = -0.25$, $p < 0.05$) and serum immunoglobulin ($r = -0.22$, $p < 0.08$) has also been demonstrated by Fillion et al. (1989). Construct validity for the PSM was also verified by determining the PSM's capability of distinguishing between high and low stress periods (Fillion et al., 1989). The PSM has been validated both in French and in English.

The short version of the PSM (version A) was used for this study. Participants completed all 25 items which tapped cognitive/affective, somatic and behavioral dimensions of the stress experience. All items

were answered on an 8-point Likert scale. The stress score is derived from the sum of unidirectional raw scores. As the content of certain items is reversed these must first be re-coded by reversing the Likert response (see Appendix A).

2.2.2 Subjective Appraisal of Stressors

Subjective appraisals of the stressors are measured using the Subjective Appraisal Rating Scale (SARS) (Lemyre, 1986). This instrument consists of 10 items rated from 1 to 8 (Likert scale) designed to assess participants' appraisals of a specific stressful event in terms of negative consequences, positive consequences, loss, danger, failure, challenge, control, coping capability, unknown and importance. Test-retest reliability for the SARS is satisfactory with test-retest correlations for items ranging from $r=0.61$ to $r=0.81$ (Fillion, 1993). Factor analyses have consistently extracted three factors: a) Perceived Impact, covering the notions of severity, importance, and negativity; b) Perceived Uncertainty, comprising elements unknown, and unpredictability; and c) Perceived Mastery, representing the dimensions of personal competence and control (Biron & Lemyre, 1993; Fillion, 1993; Lemyre, 1986; Lemyre & Tessier, submitted). Together, these factors explain approximately 60% of the variance (Fillion, 1993; Lemyre, 1986) and past studies have shown test-retest reliability values of .83, .79 and .78 for the dimensions of Perceived Impact, Perceived Mastery and Perceived Uncertainty (Fillion, 1993).

For the present study, one main stressor "risk of breast cancer" was chosen as the target situation to be appraised. A second one that was common to all participants ("financial situation") was also used to test the reliability of the appraisal measure since appraisals related to this situation were expected to remain stable throughout the study period. In addition, participants were asked to identify and appraise their "worst current stressor". This was done in an effort to control for other potentially highly stressful events in the person's life which is an issue often neglected in research protocols. Participant's evaluation of each situation was assessed using an abridged version of the SARS which was comprised of three items each representing

one of the three factors identified in earlier studies as well as the three major cognitive dimensions identified in the literature. Thus, women were asked to appraise their personal risk of breast cancer, their financial situation and their worst current stressor in terms of perceived impact, perceived mastery and perceived uncertainty (see Appendix A). Each item asked participants how they perceived the situation currently and was rated on an 8-point Likert scale. The choice of these three items was based on statistical findings which indicated that the items of the original SARS consistently yielded three factors which were representative of the three major cognitive dimensions identified in the literature. Although it is recognized that each dimension is more complex than may be reflected by a single item, the items selected are similar to items formulated in other studies (e.g. Dewe, 1991; Folkman & Lazarus, 1985; Folkman, et al, 1986a; Folkman, et al., 1986b; MacNair & Elliot, 1992; Scherer, et al., 1994; Tomaka, et al., 1993) and such an approach has been adopted in the past (e.g. Forsyth & Compas, 1987; Prince-Embury, 1992; Santiago-Rivera, Bernstein, & Gard, 1995; Vitaliano, Russo, Maiuro, 1987).

2.2.3 Breast Screening Survey

A breast screening survey was developed for this study to assess breast cancer related knowledge, personal information relating to family and personal history (risk factors, gynecological and medical history), the practice of health behaviors, as well as concerns relating to mammograms and screening in general. Of particular interest for this study were questions addressing Perceived Susceptibility which were adapted from those of O'Connor (1993) and those of Lerman and her colleagues (1991a). Women answered the question "What do you think are the chances that you yourself will have breast cancer someday?" by indicating their response on a scale of 1 to 100% and on a four-point Likert scale ranging from 1 (Not at all likely) to 4 (Very likely). To contrast this more personal risk appraisal with a more general appraisal of populational risk, women estimated the probability that any woman would someday have breast cancer in the same manner (see Appendix A).

2.2.4 Contextual Severity of Life Events

In addition to the pencil and paper questionnaires, all 61 false-positives and a subsample of 66 negatives participated in a one-hour personal interview that sought to objectively evaluate the severity of the risk of breast cancer. The factual evaluation of their financial situation also served as a comparative item. The factual severity was measured with the "Life Events and Difficulties Schedule", (LEDS.; Brown & Harris, 1978) a semi-structured interview which allows the researcher to identify the stressful events in the participant's life.

Essentially, contextual facts surrounding the event are gathered from the participant, following which the severity of events is rated by a team of investigators on scales of negative dimensions such as Threat, Loss and Danger, and positive dimensions such as Positivity, Relief, a Fresh Start, Anchoring and Challenge. In this study, interview questions were limited to pre-identified stressors (risk of having cancer, financial situation, and worst current stressor).

Interviewers were given 45 hours of training in the use of the LEDS. The training given to interviewers includes a didactic component and a more applied component where interviewers were asked to rate interview transcripts, videotaped interviews and subsequently an interview that they themselves had conducted. Interviews took place at the participant's home, at the screening clinic or at the university, whatever was most convenient for the participant. Interviews were conducted individually and were audio-recorded. The interviewer first reviewed demographic information and then asked the participant for a narrative account of each situation identified. Interviewers then rated their own interviews, but for reliability purposes a minimum team of three other members of the research team (trained in the use of the LEDS) were also asked to rate the situations and a consensus was reached as to the most accurate contextual rating. A rating of contextual severity was given for each time point (Times 1, 2, 3, and 4) and thus allowed for the monitoring of contextual or objective changes in circumstances.

Inter-rater reliability regarding the identification of events has been shown to be 92% for severe events and 79% for events overall (Brown & Harris, 1978) and inter-spousal agreement for identification of events is found to be 84% (Biron, Truchon & Lemyre, 1993). Test-retest reliability is found to be satisfactory by demonstrating a fall-off rate of reported events of about 3% per month for a period of 12 months (Brown & Harris, 1982). In our sample, inter-rater reliability for the contextual severity for the three pre-identified stressors (i.e., risk of breast cancer, financial situation, and worst current stressor) was above .80 at all time points.

2.3 Procedure

As a natural-setting study, the procedure had to respect the usual course of action of the OBSP clinic. The study should not reduce compliance or interfere with the efficiency of the screening program and should meet stringent ethical considerations. Consequently, women who had made an appointment at the screening clinic were sent a letter that briefly outlined the study and invited those who were interested in participating to present themselves about 30 minutes earlier than their scheduled appointment.

The measures described above were assembled to comprise four questionnaires: *The clinic questionnaire (Q1)* which consisted of socio-demographic information, the Psychological Stress Measure, and the Subjective Appraisal Rating Scale for each of the three situations. *The second questionnaire (Q2)* comprised socio-demographic information, the PSM, the SARS for each situation, and the complete socio-medical questionnaire. *The third and fourth questionnaires (Q3 and Q4)* were as the previous two, in that they requested socio-demographic information, the PSM, and the SARS for each situation as well as important socio-medical questions.

A detailed outline of the study design is given in Table 10. The questionnaires were administered: (T1) immediately prior to screening (Q1); (T2) one day later, before patients learned of the official screen results (i.e., letter from the clinic outlining clinical breast exam and mammogram findings) (Q2); (T3) twenty

days after screening, after all the patients had learned of their mammography results (Q3); and (d) 90 days after screening, as a follow-up to any further diagnostic testing (Q4). The one-day post-screen assessment was necessary to ensure that all women were unaware of their results. The official protocol of the clinic is to notify women of results from both the clinical breast exam and the mammogram simultaneously in writing. However, some women could potentially be informed of results sooner than would normally be expected as the clinic does make an effort to contact all women with abnormal findings (positives) within 48 hours. Similarly, it was necessary to wait 20 days for the third assessment to make sure that all women would have been informed of their results as the clinic sends a letter to inform women with healthy screens (negatives) of their results. The 90-day follow-up period was selected to allow for sufficient time for diagnostic follow-up to exclude actual breast cancer (true positives).

Upon arrival at the clinic, before undergoing screening, each participant was asked to complete Q1. This initial questionnaire was kept as brief as possible (15 minutes). The women were given the second and third questionnaires along with self-addressed stamped envelopes so that they could be completed at home and returned to the researchers by mail. The researchers contacted the participants on the days that they were to complete each subsequent questionnaires to ensure they were filled in on the proper day and mailed. Women were again contacted approximately 90 days after screening to schedule the final interview. Once an interview date had been set, the fourth questionnaire was mailed to the participants and they were instructed to complete it on the day of the interview. The personal interviews took place at the respondent's location of choice, usually her home, and lasted about one hour. The return rate of questionnaires was over 90% for Questionnaire 2 and 75% for Questionnaire 3.

Table 10

Study Design

Group	Assessments			
	Time 1	Time 2	Time 3	Time 4
	Pre-screen	Pre-results	Post-results	Follow-up
	Day 0	2 days	20 days	90 days
Negative	O1 <i>screen</i>	O2 ...20 days.....(-)	O3	O4
n=541	PSM SARS	PSM SARS	PSM SARS	PSM SARS LEDS (sub- sample n=66)
False-positive	O1 <i>screen</i>	O2 ..5 days..(+)	O3	O4
n=65	PSM SARS	PSM SARS	PSM SARS	PSM SARS LEDS (sub- sample n=61)
Comparison	O1			O2
n=110	PSM SARS			PSM SARS

Note. O=observation; (-) =negative screen result; (+) =abnormal screen result; PSM=Psychological Stress Measure; SARS=Subjective Appraisal Rating Scale.

CHAPTER 3

RESULTS

3.1 Preliminary Analyses

Before undertaking the analyses designed to test the study hypotheses, a number of preliminary analyses were conducted to ensure that groups were equivalent on socio-demographic variables, to examine the psychometric properties of the instruments used in this study, and to describe and compare group on socio-medical characteristics.

3.1.1 Group equivalency

All women from the false-positive group ($n=65$) were invited to partake in an interview 90 days after screening. Of these, 61 agreed to be interviewed. Certain analyses required specific comparisons between false-positives and negatives. To ensure the equivalency of both groups on socio-demographic factors, each of the false-positive cases was balanced on an individual basis with a negative counterpart selected from the original pool of negatives. Cases were selected based on age, marital status, income and education. For analyses involving the three groups (i.e., negative, false-positive and comparison), each false-positive interviewed was individually balanced on the same four demographic variables specified above with both negative and comparison counterparts. Depending on the hypothesis being tested, between-group analyses were run on either dyads (false-positive and negative) or triads (false-positive, negative and comparison). With respect to within-group comparisons, analyses were run on the original samples of negatives and positives (i.e., those who had been found to have a corresponding counterpart in other samples + those who did not have similar counterparts in the other samples) so as to have access to the largest sample size available. A flow chart depicting sample and subsample sizes is provided in Appendix B. Because only a small portion of the original sample of negatives was interviewed, and used for balancing purposes, analyses were conducted to verify that the subsamples of negatives chosen for equating groups were not significantly different from the original sample of negatives on socio-demographic factors or any of the dependent variables. Means, standard deviations and significance tests are given in Appendix C. These analyses were not performed for the false-positive and comparison groups since the number of non-selected cases was too small, thus precluding any meaningful comparisons.

A total of 59 *dyads* (one false-positive subject and one negative screen subject) were created from the original samples of 61 false-positives and 66 negatives. Group analyses confirmed that false-positives ($\bar{M}$ age=61 years, $\bar{M}$ education=14 years) and negatives ($\bar{M}$ age=61 years, $\bar{M}$ education=14 years) were not significantly different from one another on years of age and years of education (Wilks'=.99, p =.98). Moreover, groups were not different from one another on five age categories ($\chi^2_{(4,120)}=1.82$, p <.80) nor on three education categories ($\chi^2_{(2,101)}=3.28$, p <.19). Both groups were also comparable on marital status ($\chi^2_{(4,120)}=.42$, p <.98) and family income level ($\chi^2_{(3,109)}=1.27$, p <.74). Frequencies for age, education, marital status and family income categories for both groups are shown in Table 11. In all, 71% of the dyads ($n=42$) were perfectly equated on an individual basis on all of the four socio-demographic variables. Thirteen dyads (22%) were successfully equated on three of the four variables (age, marital status, and income); the remaining four dyads (7%) were equated on age and marital status.

A total of 50 *triads* (one negative screen subject, one false-positive subject and one comparison subject) were created from the negative screen participants ($n=66$), false-positives ($n=61$) and comparison participants ($n=119$). For the triads, 50 of the false-positives were individually equated with negative and comparison counterparts. Analyses confirmed that false-positives ($\bar{M}$ age=61 years, $\bar{M}$ education=14 years), negatives ($\bar{M}$ age=59 years, $\bar{M}$ education=15 years) and comparison participants ($\bar{M}$ age=62 years, $\bar{M}$ education=13 years) were not significantly different from one another on years of age and years of education (Wilks'=.95, p <.08). Moreover, groups were not different from one another on five age categories ($\chi^2_{(8,153)}=7.32$, p <.50) and three education categories ($\chi^2_{(4,127)}=2.72$, p <.61). All groups were comparable on marital status ($\chi^2=3.01$, p =.90) and family income level ($\chi^2_{(6,146)}=10.43$, p =.11). Frequencies for age, education, marital status, and family income level for all three groups are shown in Table 12. Of these cases, 38% ($n=19$) were perfectly equated on the four socio-demographic variables. Twelve triads (24 %) were equated on three of the four variables (age, marital status, and income); another 12 triads (24%) were equated on age and marital status. The remaining seven (7) false-positive cases (14%) were equated on at least two of the variables with negative and comparison cases.

Table 11

Frequencies for Age, Educational, Marital Status, and Family Income Categories for Equated Dyads (False-positive and Negative)

	False-positives Frequency (%)	Negatives Frequency (%)	χ^2	p
Age Category (years)			1.82	.76
50-55	11(19)	8 (13)		
56-60	22 (37)	24 (39)		
61-65	6 (10)	10 (16)		
66-70	11 (19)	12 (20)		
71-75	9 (15)	7 (12)		
Education Category			3.28	.19
High school	21 (41)	21 (42)		
Post-secondary	30 (59)	26 (52)		
Graduate	0 (0)	3 (6)		
Marital Status			.42	.98
Married	46 (79)	50 (82)		
Co-habiting	2 (4)	2 (3)		
Separated/Divorced	4 (6)	3 (5)		
Single	3 (5)	3 (5)		
Widowed	4 (6)	3 (5)		
Family Income			1.27	.74
<=14,999\$	1 (2)	0 (0)		
15,000 to 24,999\$	4 (8)	5 (9)		
25,000 to 39,999\$	9 (18)	9 (16)		
40,000 to +50,000\$	37 (73)	44 (76)		

Table 12

Frequencies for Age, Educational, Marital Status, and Family Income Categories for Equated Triads (False-positive, Negative, and Comparison)

	False-positives Freq. (%)	Negatives Freq. (%)	Comparisons Freq. (%)	χ^2	p
Age Category (years)				7.32	.50
50-55	11(21)	17 (33)	12 (23)		
56-60	19 (37)	15 (29)	12 (23)		
61-65	6 (12)	10 (19)	10 (20)		
66-70	8 (16)	6 (11)	6 (11)		
71-75	7 (14)	4 (8)	10 (23)		
Education Category				2.72	.61
High school	20 (43)	17 (37)	17 (49)		
Post-secondary	26 (57)	28 (61)	18 (51)		
Graduate	0 (0)	1 (2)	0		
Marital Status				3.01	.93
Married	40 (78)	41(78)	39 (76)		
Co-habiting	2 (4)	2 (4)	0 (0)		
Separated/Divorced	3 (6)	4 (8)	4 (8)		
Single	2 (4)	2 (4)	3 (6)		
Widowed	4 (8)	3 (6)	5 (10)		
Family Income				10.43	.11
<=14,999\$	0 (0)	1 (2)	0 (0)		
15,000 to 24,999\$	5 (10)	2 (4)	5 (11)		
25,000 to 39,999\$	5 (10)	8 (16)	14 (30)		
40,000 to +50,000\$	39 (80)	39 (78)	28 (60)		

3.1.2 Psychometrics

The main dependent variables were psychological stress and appraisals. The test-retest reliability and the internal consistency of these measures were examined based on the data collected in the present sample. Test-retest reliability of the appraisal items was evaluated by examining those relative to a stressor that was expected to remain unchanged throughout the study period, that is, the participants' "financial situation". Test-retest reliability was assessed for the OBSP sample as a whole and for each group separately. Coefficients are provided in Table 13. They range from .40 to .68. The test-retest reliabilities for perceived impact, perceived mastery and perceived uncertainty related to the risk of breast cancer are provided in Appendix D.

Test-retest reliability for the PSM was evaluated based on reports from the comparison group, for whom stress was expected to remain relatively constant. The correlation between psychological stress at test and psychological stress at retest was .82. Using Cronbach's alpha, the internal consistency of the PSM was examined for each group and each time separately. For negatives, internal consistency was above $\alpha=.90$ at all time points. For false-positives, internal consistency ranged from $\alpha=.89$ (Time 1) to $\alpha=.94$ (Time 2). Similarly, internal consistency of the PSM at the first test was $\alpha=.93$ and $\alpha=.91$ at retest for the comparison group.

These preliminary findings and previous validation studies indicate that, overall, the psychometric properties of the measures were acceptable. The PSM was highly reliable and internally consistent. Certain reliability coefficients for the appraisal items, especially those pertaining to perceived mastery, were low.

Table 13

Coefficients of Test-retest Reliability Over 90 days on Appraisals of Financial Situation

	OBSP sample	Negatives	False-positives	Comparison sample
Percvd Impact	.50 ***	.50 ***	.50 ***	.60 ***
Percvd Mastery	.40 ***	.46 ***	.34 **	.68 ***
Percvd Uncertainty	.61 ***	.63 ***	.61 ***	.45 ***

Note. ** $p < .01$, *** $p < .001$

3.1.3 Reliability of findings

Analyses were also done to evaluate the reliability of findings. First, it was ascertained that there were no group differences or changes across time on the appraisals related to the financial situation. The results of this analysis are presented in Appendix E. This lends support to the idea that any changes in the appraisals for the risk of breast cancer are in fact specific to that situation and most likely a result of the screening process.

In addition, the confound of other potentially highly stressful events co-occurring in the person's life is often neglected in research protocols. For this reason, we reviewed the contextual severity rating for all the worst current stressors identified by the participants. Although, it was found that many women reported situations which were contextually more threatening than the risk of breast cancer, these situations had remained stable throughout the study period and therefore, could not account for any variations in psychological stress. A small number of women were found to have changes in the contextual severity of the identified worst current stressor. However, analyses showed that eliminating these cases did not change the outcome of the principal analyses.

3.1.4 Socio-medical information

It was also deemed important to provide some details on various socio-medical characteristics of the samples. A summary of these characteristics is given in Table 14. Analyses showed that groups were not different from one another in terms of having a mother ($\chi^2_{(2,191)}=2.41, p<.30$) or a sister ($\chi^2_{(2,184)}=.66, p<.72$) diagnosed with breast cancer. Groups were also not significantly different from one another in terms of nulliparity ($\chi^2_{(2,181)}=2.12, p<.35$), the monthly practice of breast self-examination ($\chi^2_{(4,196)}=8.35, p<.08$), average age of onset of menses ($F_{(2,187)}=.27, p<.76$) or average age of onset of menopause ($F_{(2,163)}=1.36, p<.54$).

Table 14

Socio-medical Characteristics of Negatives, False-positives and Comparisons

	Negatives	False-positives	OBSP	Comparisons	Sign.
Family history					n.s.
Mother	7%	13%	10%	5%	
Sister	8%	8%	8%	11%	
Personal history					n.s.
Mean age at menses	13 yrs	13 yrs	13 yrs	13 yrs	
Menses <12 yrs old	15%	18%	18%	16%	
Mean age at menopause	47 yrs	49 yrs	48 yrs	48 yrs	
Menopause >55 yrs old	9%	6%	7%	8%	
Nulliparity	11%	11%	11%	5%	
Behavioral aspects					n.s.
Monthly BSE	47%	33%	41%	41%	
Self-detection of lump	23%	33%	28%	17%	

3.2 Results for Study Hypotheses

3.2.1 Objective 1: Psychological Stress in Time

The first objective of this study consisted of prospectively investigating the course of psychological stress experienced by an individual as she anticipates a potential negative life event, until the resolution of this situation. The changes in psychological stress were expected to be different based on the results from the screening. For women informed of a normal screen, it was postulated that stress would increase from the time when they presented themselves for screening to the time when they were waiting for results and then decrease once results were known and through to the 90-day follow-up. For those women informed of an abnormality, stress would increase once results were known and then return to pre-test levels at follow-up only. The most crucial changes were therefore, expected to occur between Time 2 and Time 3. No changes were expected in the psychological stress reported by the comparison group.

3.2.1.1 Within-Group Differences on Stress

Access to relatively small sample sizes limited the power of a full 2x4 (group by time) design. Therefore, it was deemed appropriate to test only the most interesting comparisons using planned comparisons. For the analyses presented below, alpha levels were controlled on an analysis-wise basis. Since data were grouped, the assumptions inherent to analysis of variance were tested for all cells separately. For each cell, results of evaluation of assumptions of normality, homogeneity of variance/covariance, and linearity were satisfactory. No univariate outliers were identified. A more detailed description of these tests is given in Appendix F.

3.2.1.1.1 Time changes on psychological stress for negatives. The means and standard deviations of stress for the negatives at all four time points are presented in Table 15 and illustrated

Table 15

Means (Standard Deviations) on Psychological Stress for Equated Negatives and False-positives at Times 1, 2, 3 and 4

Group	Time			
	Time 1	Time 2	Time 3	Time 4
	Pre-screen	Pre-results	Post-result	Follow-up
Negatives (n=40) *	64.53 (25.35)	57.56 (23.72)	58.17 (22.24)	56.04 (29.41)
False-positives (n=49)	71.59 (30.18)	71.35 (33.62)	67.54 (28.44)	65.17 (31.13)

Note. * For negatives, stress at Time 2 was significantly lower than stress at Time 1.

in Figure 4. Planned contrasts were carried out to test for differences between Time 1 and Time 2, Time 2 and Time 3, and Time 3 and Time 4 on stress. Results indicate that the difference between stress at Time 1 and stress at Time 2 was significant ($F_{(1,53)} = 8.97, p < .004$). The difference between stress at Time 2 and Time 3 ($F_{(1,53)} = 3.20, p < .08$), as well as the difference between stress at Time 3 and stress at Time 4 ($F_{(1,53)} = .26, p < .61$), were not significant. So, for negatives, stress did not decrease from pre-results to post-results, as we had expected. However, there was a reduction in stress the day after the screen when compared to the initial assessment.

3.2.1.1.2 Time changes on psychological stress for false-positives. The means and standard deviations of false-positives on psychological stress from Time 1 through to Time 4 are also presented in Table 15 and illustrated in Figure 4. Planned contrasts revealed that stress at Time 1 was not significantly different from stress at Time 2 ($F_{(1,59)} = .18, p < .67$), stress at Time 2 was not significantly different than stress at Time 3 ($F_{(1,59)} = .51, p < .48$) and that stress at Time 3 was not significantly different than stress at Time 4 ($F_{(1,59)} = 1.91, p < .17$). The power of these planned comparisons is estimated at .25 ($\alpha = .05, \eta^2 = .03$).

3.2.1.1.3 Time changes on psychological stress for comparisons. For the comparison group, variations in stress were examined across time (test-retest) using the same statistical approach. The original sample of participants was reduced to 59 with the elimination of cases with missing data. Results indicate that psychological stress was unaffected by time ($F_{(1,58)} = .12, p < .74$). The means and standard deviations are presented in Table 16. Figure 5 shows that psychological stress did not seem to fluctuate over the three month period for this group.

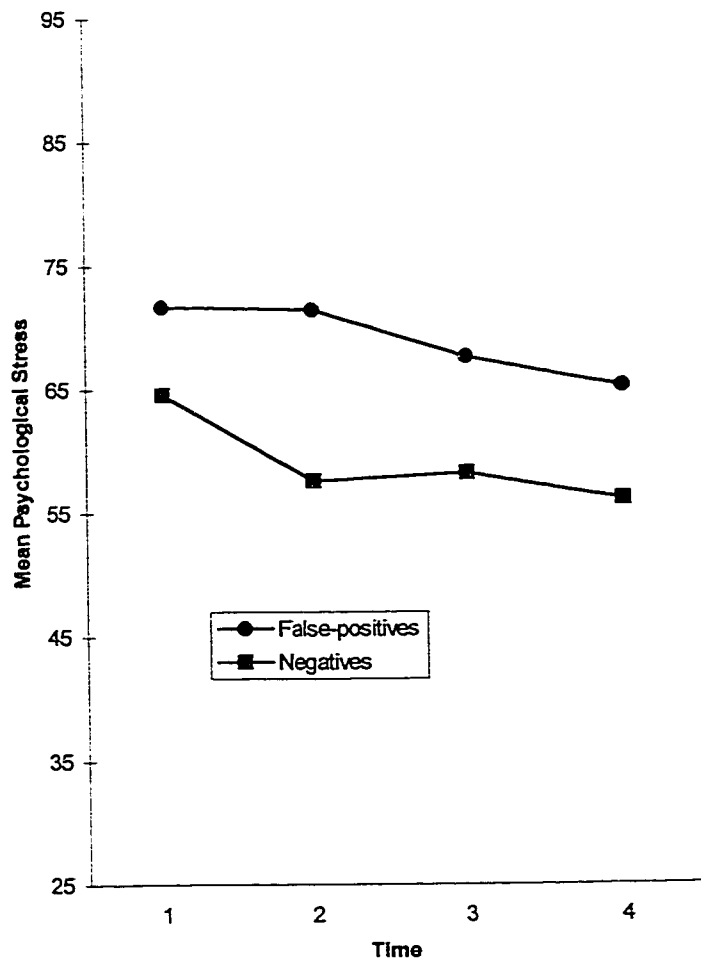


Figure 4. Psychological stress over time for equated dyads (negative and false-positive)

Table 16

Means and Standard Deviations on Psychological Stress for
the Comparison Sample* at Times 1 and 2

	Time 1	Time 2
	Test	Retest
Means	64.27	65.13
(Standard Deviations)	(27.02)	(24.48)

Note. *n=59; The effect of time was not significant
($F_{(1,58)} = .12, p < .74$).

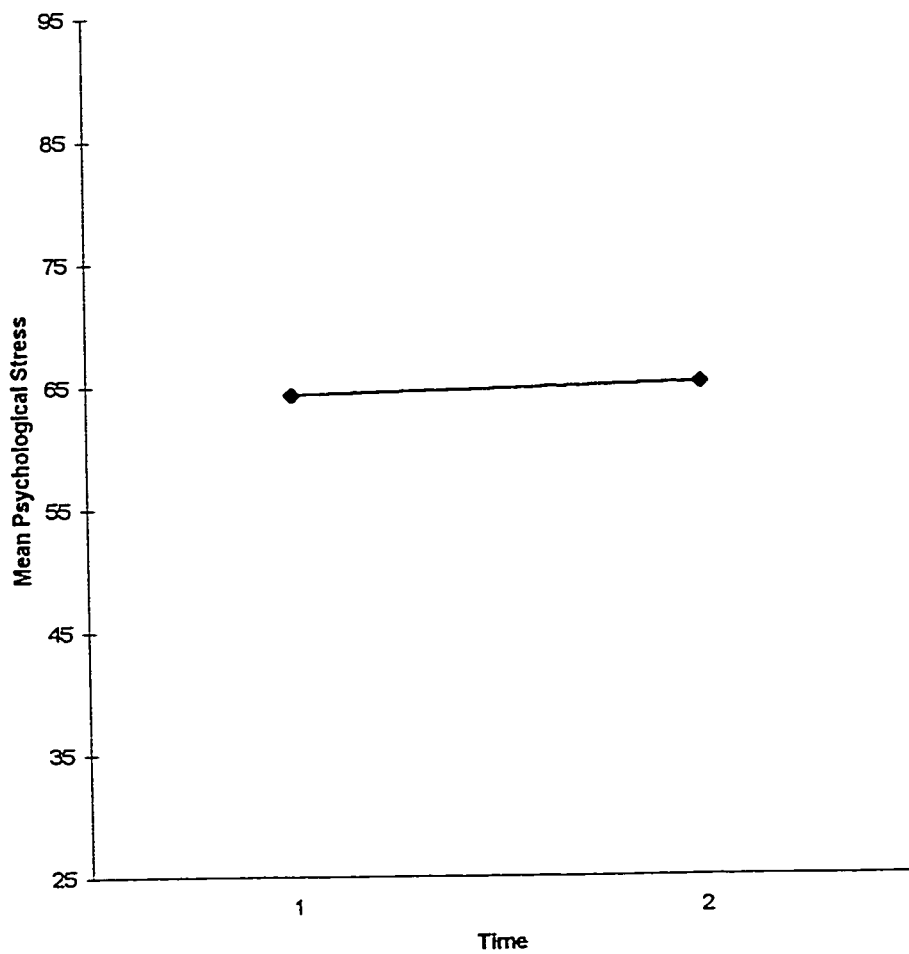


Figure 5. Psychological stress over time for the comparison group (n=59)

3.2.1.2 Between-Group Differences on Psychological Stress

Analyses were done to test differences between negatives and false-positives at Time 2 and Time 3, as well as the equivalency between all three groups at Time 1 and Time 4, respectively.

3.2.1.2.1 Group differences at time 2 and time 3. As previously mentioned, variations in stress were expected to differ based on the results from the screening. More specifically, Hypothesis 1 predicted that psychological stress would fluctuate in a different way for false-positives and negatives especially from Time 2 to Time 3. Table 15 contains the means and standard deviations of psychological stress for both groups at all times. These results are illustrated in Figure 4. As mentioned, power for the full 2x4 analysis of variance was limited, therefore more powerful planned contrasts between groups within Time 2 and Time 3 were carried out. There was a significant difference between the groups at Time 2 ($F_{(1,87)} = 4.77$, $p < .03$). Thus, false-positives report a higher level of stress as they await the official results of the screen than negatives. The difference between groups was not significant at Time 3 ($F_{(1,87)} = 2.89$, $p < .09$). So once results are known, both groups report comparable stress. The power of these analyses was estimated to be about .30 ($\alpha = .05$, $\eta^2 = .03$).

3.2.1.2.2 Group equivalence at outset and follow-up. To test the prediction that groups would report comparable levels of stress at the initial assessment an independent between-group multivariate analysis of variance tested group differences on psychological stress at the outset of the screening process (Time 1). To verify that all groups reported similar levels of stress three months later, another ANOVA tested group differences on stress at follow-up (Time 4). The individually equated triads of false-positive, negative and comparison cases were used, as

described earlier. The means and standard deviations of the three groups on psychological stress at both time points are presented in Table 17.

Analyses from Time 1 data revealed a non-significant group effect ($F_{(2,153)} = .61, p < .55$). From Figure 6, it appears as though women undergoing screening are not more stressed at the outset than women who are not presently undergoing this medical procedure. Reports at the conclusion of the study period (90 days- Time 4) revealed a group effect that did not reach significance ($F_{(2,153)} = 2.59, p < .08$). However, trends suggest that after three month women who have undergone the screening process, especially those informed of a false-positive result, may experience levels of psychological stress higher than those reported by the comparison group (Tukeys' HSD $p < .06$).

3.2.2 Objective 2: Appraisals in Time

The second objective of this project was to describe the cognitive appraisals as a stressor unfolds. It was predicted that changes in appraisals would be significant as the encounter progressed, with the most prominent changes for screened women occurring between the time before results of screening were known (Time 2) and the time after the transmittal of results (Time 3). Changes in appraisals were also expected to differ for positives, negatives and comparisons.

3.2.2.1 Within-group differences on appraisals

Once again, only the most interesting comparisons were tested using a series of planned contrasts (Time 1 vs. Time 2, Time 2 vs. Time 3, and Time 3 vs. Time 4) and alpha levels were controlled on an analysis-wise basis. Since data were grouped, the assumptions inherent to Manovas were tested for each cell separately. For each cell, results of evaluation of assumptions

Table 17
Means and Standard Deviations on Psychological Stress for Equated Triads (False-positive (FP), Negative (Neg) and Comparison (Comp)) at Time 1 and Time 4

Group	Time 1			Time 4		
	Pre-screen/Test			Follow-up/Retest		
	FP (n=53)	Neg (n=52)	Comp (n=51)	FP (n=53)	Neg (n=52)	Comp (n=51)
Means	71.71	67.78	65.82	65.65 ^a	61.42	51.64 ^b
(Standard deviations)	(29.24)	(26.44)	(27.74)	(30.84)	(31.37)	(34.24)

Note. FP=false-positive; Neg=negative; Comp=comparison; groups were not different on psychological stress at Time 1. Letters in small caps denote trend for differences found at Time 4 using Tukey's HSD ($p < .06$)

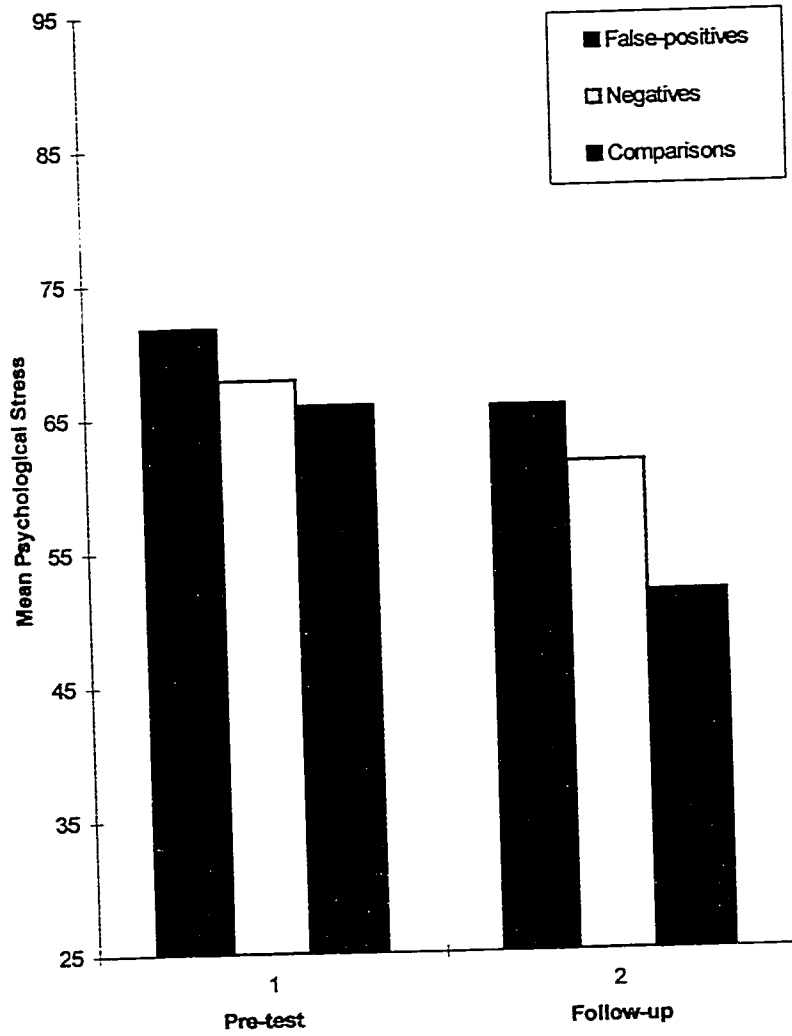


Figure 6. Psychological stress for equated triads (false-positive, $n=53$; negative, 52; and comparison, $n=51$) at Time 1 and Time 4

of normality, homogeneity of variance/covariance, linearity and multicollinearity were satisfactory. A more detailed description of these tests is provided in Appendix F.

3.2.2.1.1 Time changes on appraisals for negatives. With respect to the negative group, it was predicted that perceived impact would increase as women waited for results of the screening and then decrease once results were known. Perceived mastery would increase throughout the process, whereas perceived uncertainty would decrease from outset to follow-up. The means and standard deviations for the negatives at all time points are provided in Table 18. Results of planned comparisons which are illustrated in Figure 7, indicated that there were no significant changes in appraisals from Time 1 to Time 2 (Wilks'=.93, $p<.34$), from Time 2 to Time 3 (Wilks'=.94, $p<.36$), nor from Time 3 to Time 4 (Wilks'=.97, $p<.76$). The power of these analyses is estimated at about .50 ($\alpha=.05$, $\eta^2=.10$).

The analysis of power indicated that this was an inadequate test of the hypothesis. To truly test the hypothesis, the analysis was repeated on the larger original sample of women in the negative screen group who completed all three initial questionnaires (see flowchart in Appendix C). Table 19 contains the means and standard deviations on all appraisals for this sample ($n=480$). A within-group Manova tested differences in appraisals across the three initial time points (Time 1 to Time 3). Findings revealed a highly significant time effect (Wilks'=.89, $p<.0001$). All univariate tests were also significant. As seen in Figure 8, there were significant differences on perceived impact ($F_{(2,958)}=8.79$, $p<.0001$), on perceived mastery ($F_{(2,958)}=10.51$, $p<.0001$) and on perceived uncertainty ($F_{(2,958)}=25.40$, $p<.0001$).

As predicted, Tukey's HSD test revealed that perceived uncertainty decreased significantly from Time 1 to Time 2 ($p<.001$) and then again from Time 2 to Time 3 ($p<.0006$) (see Figure 8). Perceived mastery rose significantly from Time 1 to Time 2 ($p<.01$) and remained stable at Time 3.

Table 18

Means (Standard Deviations) on Appraisals for Equated Dyads (Negatives and False-positives) at Times 1, 2, 3 and 4

Group	Time			
	Time 1	Time 2	Time 3	Time 4
	Pre-screen	Pre-results	Post-results	Follow-up
Negatives (n=36)				
Percvd Impact	2.86 (1.35)	2.91 (1.57)	2.58 (1.51)	2.72 (1.50)
Percvd Mastery	4.63 (1.67)	4.78 (1.80)	4.72 (1.88)	4.33 (1.91)
Percvd Uncertainty	3.61 (1.42)	3.25 (1.48)	3.11 (1.62)	3.30 (1.67)
False-positives (n=47)				
Percvd Impact	3.08 (1.75)	4.00 (2.12)	3.97 (1.96)	3.27 (1.51)
Percvd Mastery	4.44 (2.13)	4.57 (1.89)	4.74 (1.67)	4.98 (1.71)
Percvd Uncertainty	3.85 (1.63)	4.19 (1.98)	4.06 (1.96)	3.72 (1.70)

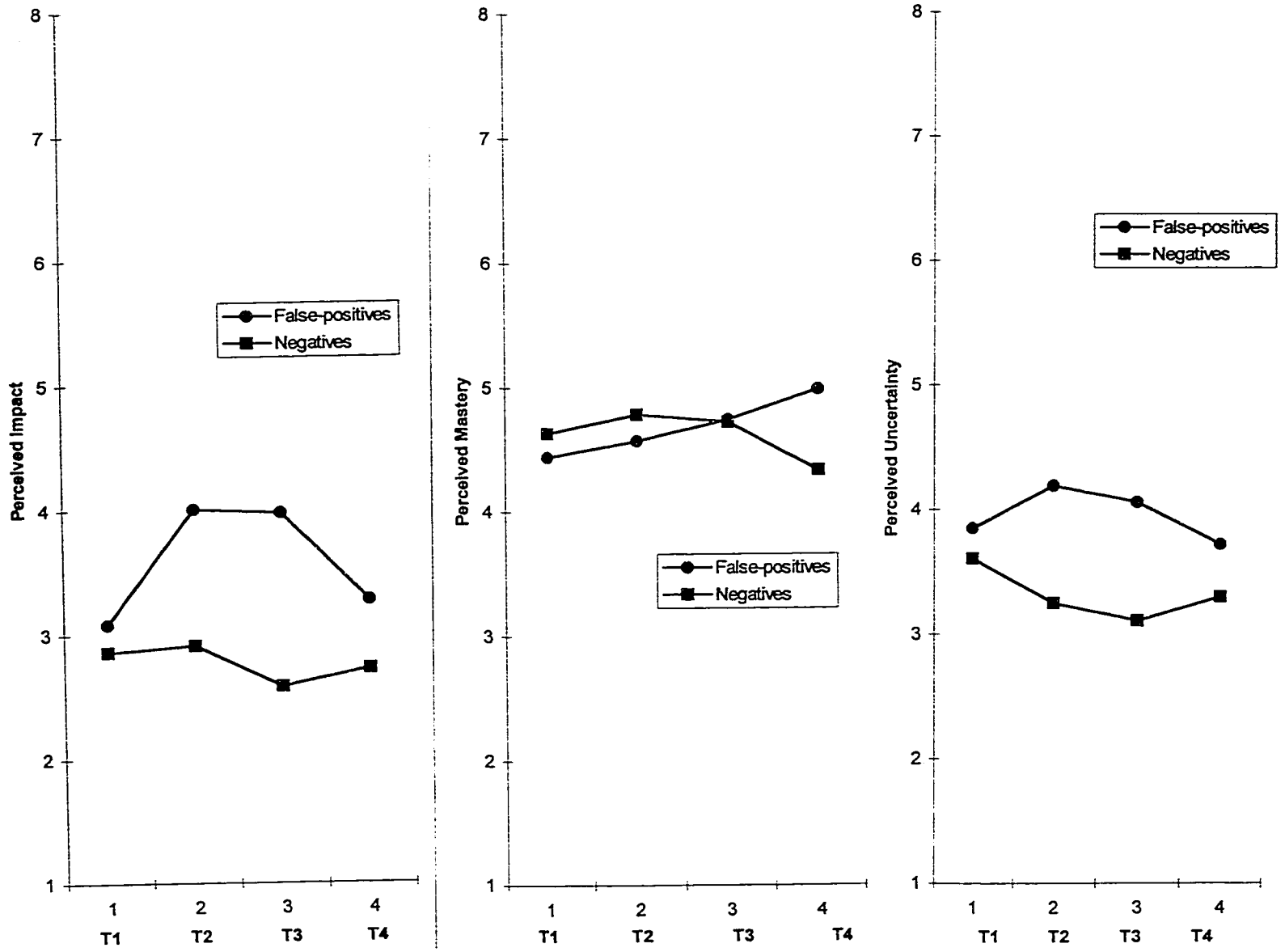


Figure 7. Appraisals for equated dyads (false-positives, $n=48$; negatives, $n=42$) across the four times

Table 19

Means (Standard Deviations) on Appraisals for the Original Sample of Negatives* at Times 1, 2 and 3

Appraisals	Time			
	Time 1	Time 2	Time 3	p value
	Pre-screen	Pre-results	Post-results	
Perceived impact	2.99 (1.68) ^a	2.80 (1.61) ^b	2.71 (1.56) ^b	.0001
Perceived mastery	4.44 (1.97) ^a	4.69 (1.91) ^b	4.83 (1.92) ^b	.0001
Perceived uncertainty	3.44 (1.63) ^a	3.19 (1.65) ^b	2.92 (1.59) ^c	.0001

Note. * n=480; There were significant differences on all appraisals. Letters in small caps denote differences between times using Tukey's HSD. Data for Time 4 is not available for this original sample.

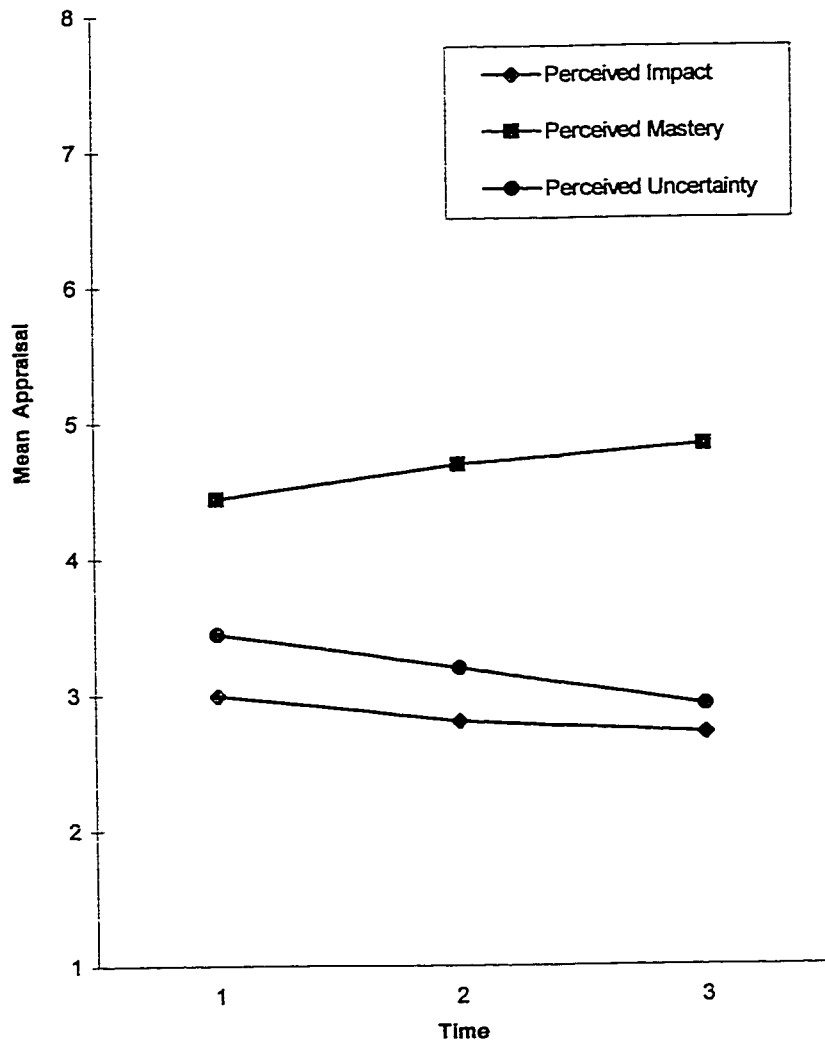


Figure 8. Appraisal over time for original sample of negatives (n=480)

Contrary to predictions, perceived impact was significantly more elevated at Time 1 than at Times 2 ($p < .01$) and 3 ($p < .0001$). Thus, there appeared to be changes in appraisal for women who were informed of a healthy screen result. Their appraisals appeared to be more favorable after results are known (i.e., less perceived impact and perceived uncertainty and an increase in perceived mastery).

3.2.2.1.2 Time changes on appraisals for false-positives. The means and standard deviations of false-positives on perceived impact, perceived mastery and perceived uncertainty from Time 1 through to Time 4 are also presented in Table 18.

For this group it was predicted that perceived impact would increase from Time 1 to Time 3, but then decrease at Time 4 as testing disconfirms the presence of true cancer, perceived mastery would rise throughout the process and perceived uncertainty would increase as they are informed of an abnormal result and then decrease again at follow-up. Using planned comparisons it was found that appraisals at Time 1 were significantly different from appraisals at Time 2 (Wilks'=.79, $p < .007$). Univariate tests reveal that differences were found on perceived impact ($F_{(1,52)} = 13.12$, $p < .0006$). Appraisals at Time 2 were not significantly different from those at Time 3 (Wilks'=.98, $p < .89$). However, appraisals from Time 3 were significantly different from those at Time 4 (Wilks'=.86, $p < .05$). Univariate tests revealed differences on perceived impact ($F_{(1,52)} = 7.42$, $p < .008$).

Thus, as seen in Figure 7, even though these women have not yet been informed of the results, they reported more impact from the risk of breast cancer while they are waiting to hear about the results of the screening and shortly after results were known when compared to the Pre-screen and Follow-up periods. Although univariate effects on perceived mastery and perceived

uncertainty were not statistically significant, trends were in line with predictions of higher perceived mastery over time and lower Uncertainty after a peak at Time 2.

3.2.2.1.3 Time changes on appraisals for comparison group. For the comparison group, that is women not currently undergoing screening, variations in appraisals were examined across time (test-retest) using the same statistical approach. The initial convenience comparison sample was reduced to 52 cases following the elimination of three multivariate outliers and other cases with missing data. Means and standard deviations on the appraisals at both test and retest are presented in Table 20.

Results indicate that the effect of time on the combined appraisals did not reach significance (Wilks'=.87, $p<.08$). However, the power for this analysis was estimated at around .45 ($\alpha=.05$, $\eta^2=.10$). Tabachnick and Fidell (1996) argue that univariate findings can be used as a guide to future research. Here, trends are suggestive of a significant univariate effect for perceived impact ($F_{(1,51)}=6.35$, $p<.01$). As shown in Figure 9, women not undergoing screening seem to have perceived more impact from their risk of breast cancer at the second evaluation when compared to their reports at the initial evaluation. Significant effects on perceived mastery and perceived uncertainty were not detected (both $p<.60$).

3.2.2.2 Between-Group Differences in Appraisals

3.2.2.2.1 Group differences at Time 2 and Time 3. As stated earlier, changes in appraisals were expected to differ for the various groups depending on time points. To test this, comparisons were planned between negatives and false-positives within Time 2 and Time 3. Means and standard deviations for both these groups at all four time points are provided in Table 18 and illustrated in Figure 7. Results from planned comparisons revealed that groups were significantly different from one another at Time 2 (Wilks'=.90, $p<.05$). Univariate tests indicated

Table 20

Means (Standard Deviations) on Appraisals for the Sample of Comparisons* at Times 1 and 2

Appraisals	Time	
	Time 1	Time 2
	Test	Retest
Perceived impact	2.33 (1.25)	2.78 (1.55)
Perceived mastery	4.00 (2.27)	3.98 (2.12)
Perceived uncertainty	2.90 (1.75)	3.02 (1.61)

Note. * n=52

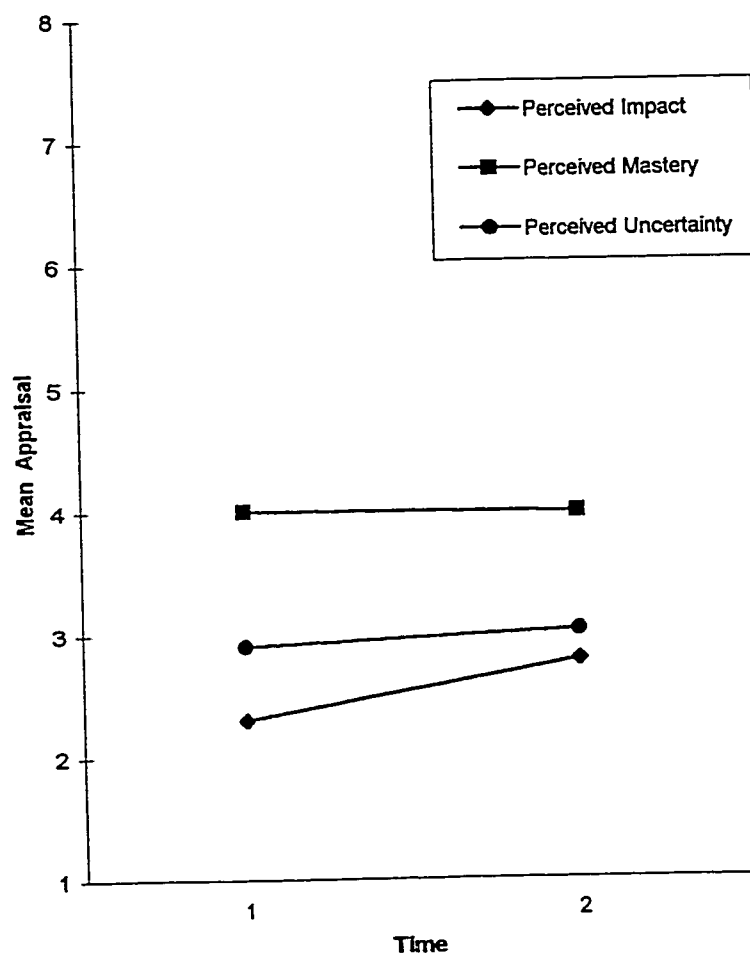


Figure 9. Appraisals over time for the comparison group (n=52)

that differences were found on perceived impact ($F_{(1,81)} = 6.61, p < .01$) and on perceived uncertainty ($F_{(1,81)} = 5.67, p < .02$). Groups were also significantly different from one another at Time 3 (Wilks' $\lambda = .86, p < .008$), with differences found on perceived impact ($F_{(1,81)} = 12.47, p < .0006$) and perceived uncertainty ($F_{(1,81)} = 5.58, p < .02$).

3.2.2.2.2 Group equivalency at time 1 and time 4. Since power was limited but the issue was of much interest, the appraisals of false-positives, negatives and comparisons reported at the outset (Time 1) as well as those reported at the end of the study period (90 days) were compared separately using the triads described earlier in the sample balancing procedure.

A between-group MANOVA tested the assumption that both the false-positive and negative groups differed from women not currently undergoing screening with respect to appraisals at the first evaluation (Time 1). The sample sizes of the equated triads were reduced through case-wise deletion of cases with missing data; there remained 52 cases in the false-positive group, 52 cases in the negative group and 50 cases in the comparison group. Tests of homogeneity of variance did not detect any violations (Box $M = 20.34, p < .07$).

The means and standard deviations of the groups on appraisals for both times are provided in Table 21 and illustrated in Figure 10. Results revealed a significant multivariate group effect (Wilks' $\lambda = .88, p < .007$), which remained significant even when alpha was corrected (experiment-wise; $p < .04$). Univariate tests indicate a group effect on perceived impact ($F_{(2,149)} = 3.47, p < .03$) and on perceived uncertainty ($F_{(2,149)} = 6.84, p < .001$). As was expected, post-hoc analyses based on Tukey's HSD test indicated that the false-positive and negative groups reported significantly more perceived impact and more perceived uncertainty while awaiting to undergo screening than their comparison counterparts who were not currently involved in the screening process.

Table 21

Means (Standard Deviations) on Appraisals for Equated Triads (False-positive, Negative and Comparison) at Initial Assessment (Time 1) and 90-Days Later (Time 4).

Appraisals	Time 1				Time 4			
	Pre-test				Follow-up (90 days)			
	FP (n=52)	Neg (n=52)	Comp (n=50)	p value	FP (n=53)	Neg (n=48)	Comp (n=38)	p value
Perceived impact	3.15 (1.72)	3.09 (1.45)	2.44 (1.28)	.03	3.21 (1.57)	2.88 (1.49)	2.63 (1.44)	NS
Perceived mastery	4.46 (2.05)	4.63 (1.70)	3.98 (2.21)	NS	4.96 (1.75)	4.54 (1.80)	4.26 (2.00)	NS
Perceived uncert.	3.87 (1.56)	3.69 (1.48)	2.78 (1.61)	.001	3.64 (1.71)	3.41 (1.57)	3.13 (1.60)	NS

Note. FP=false-positive; Neg=negative; Comp=comparison. Multivariate group effect was significant at Time 1 ($p<.007$) but not at Time 4.

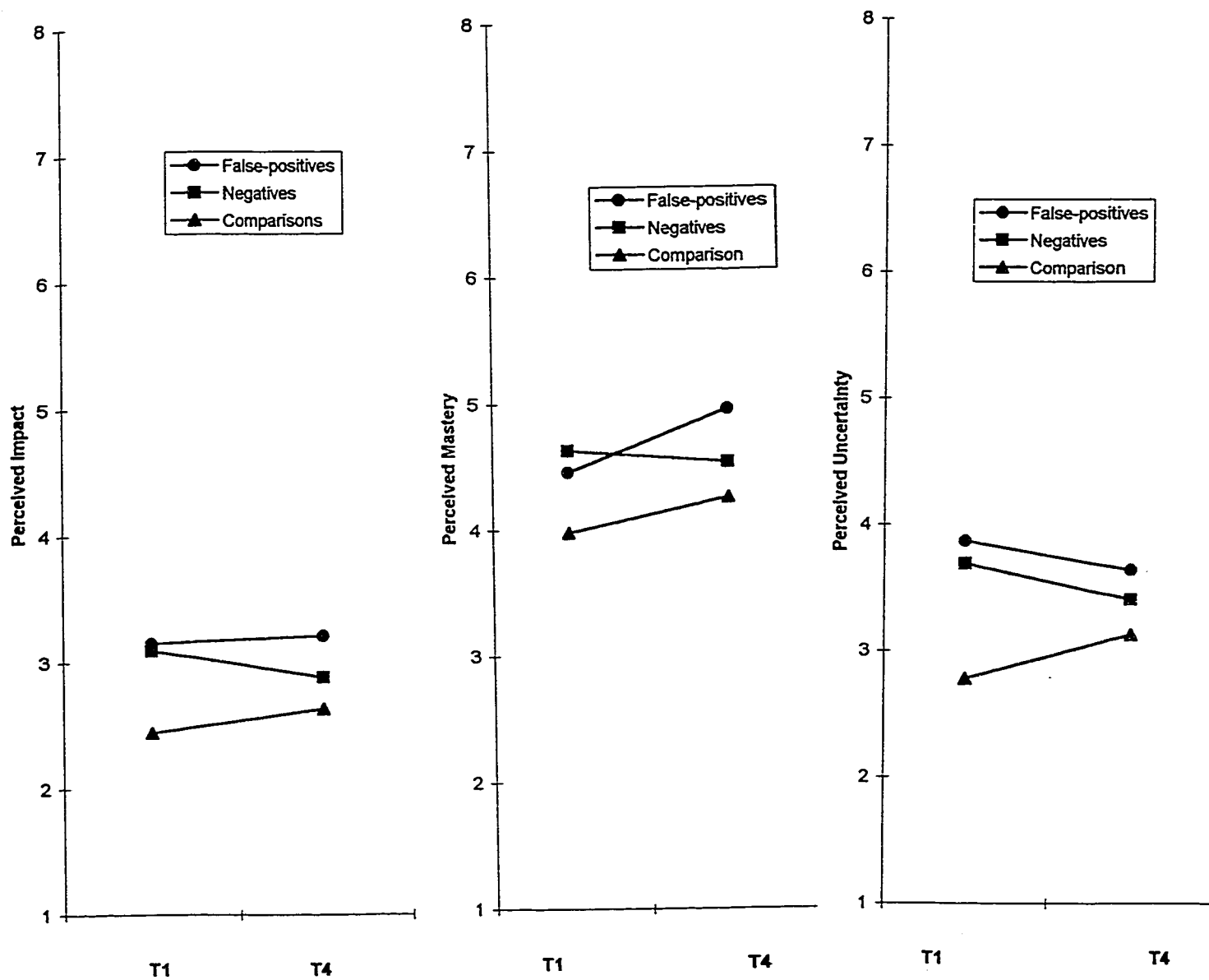


Figure 10. Appraisals for equated triads (false-positive, n=52; negatives, n=52, and comparisons, n=50) at Time 1 and Time 4

Another between-group Manova using the same equated samples tested group differences at Time 4. Test did not detect any violations of homogeneity of variance (Box $M=17.84$, $p<.14$). Results showed that at Time 4 all groups reported comparable cognitive appraisals related to the risk of breast cancer. False-positives and negatives reported appraisals that could not be distinguished from one another or from those reported by women who have not recently undergone screening, though trends indicate that perceived impact, mastery and uncertainty are slightly more elevated in the false-positive group, suggesting a slight residual effect from the screening (see Figure 10).

3.2.3 Objective 3: Anticipation

The third objective of this study was to determine the relationship between changes in cognitive appraisals over time (delta appraisals) and psychological stress reported at the peak anticipatory period. Investigating the relationship between changes in cognitive appraisals (Delta appraisals) and changes in stress (Delta stress) was also deemed important. As discussed, anticipation in this context was conceptualized as the fluctuation in the subjective evaluation of a stressor while the objective nature of this situation remained unchanged, because of a projection in time. Consequently, only data from women for whom there were no changes in contextual circumstances related to the risk of breast cancer (i.e., the negative group; normal clinical breast exam and normal mammogram) were used in all subsequent analyses. As stated in Hypothesis 3, it was predicted that the changes in appraisals would be related to peak anticipatory stress, and that pronounced changes in appraisals would be associated with prominent changes in stress.

3.2.3.1 Relationship Between Stress and Appraisal

To first explore the relationship between stress and appraisals and to ensure that findings were in line with those of previous investigations, correlations between stress and appraisals at Times 1, 2, and 3 were examined. In addition, standard multiple regression analyses were used to go

beyond bivariate correlational results by assessing their multivariate correlations. The full correlation matrix is given in Table 22. Results revealed a large number of significant correlations. As has been reported by others, appraisals were significantly associated with concurrent stress. In addition, appraisals were related to subsequent levels of stress. Specifically, perceived impact, perceived mastery and perceived uncertainty from Time 1 were related to stress at Times 2 and 3, perceived impact and perceived uncertainty from Time 2 were related to stress at Time 3. Finding that appraisals from one time point are related to stress at another point provides the preliminary support for the concept of anticipation allowing us to explore this issue by testing the hypotheses presented in Objective 3.

3.2.3.1.1 Concurrent regression analyses. To begin, a series of standard multiple regression analyses tested the assumption that appraisals were predictors of concurrent stress within each time point. The details of these regressions are provided in Appendix G. Briefly, it was found that appraisals at Time 1 predict about 7% of the variance in stress at Time 1, with perceived uncertainty being the only variable entered into the equation ($p < .001$; $n = 523$). Appraisals at Time 2 predict 11% of the variance in stress at Time 2, with perceived impact ($p < .001$) and Perceived Uncertainty ($p < .001$) entering into the equation ($n = 513$). Appraisals at Time 3 predict 7% of the variance in stress at Time 3, with perceived impact ($p < .001$) and perceived mastery ($p < .05$) contributing to the equation ($n = 539$). An overview of these findings is given in Table 23. The original sample of negative screen cases used in these analyses did not participate in the fourth assessment, therefore data from follow-up is unavailable. So, appraisals are significant predictors of the concurrent stress response with a certain portion of stress remaining unexplained.

3.2.3.1.2 Anticipation: changes from time 2 to time 3. As explained earlier, peak anticipation was expected to occur as women were awaiting results of the screening (Time 2). Thus, the most

Table 22

Correlation Matrix for Stress and Appraisals at Times 1, 2, and 3 for the Original Sample of Negatives

Variables												
	PSM1	IMP1	MAS1	UNC1	PSM2	IMP2	MAS2	UNC2	PSM3	IMP3	MAS3	UNC3
PSM1	1.00											
IMP1	.20***	1.00										
MAS1	-.13**	-.13**	1.00									
UNC1	.25***	.58***	-.19	1.00								
PSM2	.87***	.20***	-.20**	.24***	1.00							
IMP2	.22***	.60***	-.08	.46***	.27***	1.00						
MAS2	-.06	-.13**	.54***	-.15**	-.11*	-.12**	1.00					
UNC2	.28***	.40***	-.14**	.48***	.29***	.57***	-.22***	1.00				
PSM3	.76***	.14***	-.13**	.21***	.82***	.21***	-.08	.22***	1.00			
IMP3	.22***	.53***	-.09*	.43***	.22***	.64***	-.07	.44***	.22***	1.00		
MAS3	-.08	-.08	.52***	-.13**	-.10*	-.09*	.51***	-.21***	-.13**	-.17***	1.00	
UNC3	.20***	.33***	-.16***	.46***	.20***	.41***	-.18***	.52***	.20***	.55***	-.27***	1.00

Note. Original sample size n=541; pairwise deletion of data resulted in a minor reduction in sample sizes, but n>450 in all cases.

Table 23

Summary of concurrent regression findings

Stress	Appraisals	β	t	R^2
Time 1	perceived impact	.08	1.58	.07
	perceived mastery	-.08	-1.83	
	perceived uncertainty	.19**	3.61	
Time 2	perceived impact	.17**	3.29	.11
	perceived mastery	-.04	-1.14	
	perceived uncertainty	.19**	3.71	
Time 3	perceived impact	.17**	3.46	.07
	perceived mastery	-.09*	-2.07	
	perceived uncertainty	.08	1.60	

Note. *= $p < .05$; **= $p < .001$.

prominent changes were expected to occur as they were informed that results were normal (Time 3). With this in mind, change scores were derived for each subject by calculating the differences in perceived impact, perceived mastery and perceived uncertainty between Time 2 and Time 3 and were labeled as $\Delta_{(2-3)} \text{ Impact}$, $\Delta_{(2-3)} \text{ Mastery}$ and $\Delta_{(2-3)} \text{ Uncertainty}$. Although it has been argued in the literature that the measurement error associated with change scores can result in unreliable findings and reduced statistical power, it is argued here that change scores provide a conceptually valid estimation of anticipation and a conservative exploration of the hypotheses. Changes in appraisals from Time 2 to Time 3 were an indicator of how much appraisals were “restored” to low threatening levels from what was presumed to be the anticipated appraisal of higher threat. Thus, future appraisals can be used as an indicator of current anticipation. These changes were then related to peak stress. Since the peak anticipation period was thought to be at Time 2, stress reported at Time 2 served as the measure of Peak psychological stress (Peak-T2 stress). The change score for psychological stress was derived by calculating the differences in stress from Time 2 to Time 3 and was labeled $\Delta_{(2-3)} \text{ stress}$.

A first step in documenting the proposed conceptualization of anticipation is to evaluate the strength of associations among $\Delta_{(2-3)} \text{ Impact}$, $\Delta_{(2-3)} \text{ Mastery}$, $\Delta_{(2-3)} \text{ Uncertainty}$, $\Delta_{(2-3)} \text{ stress}$ and Peak-T2 stress. Although it was expected all delta appraisal variables to be related to Peak stress, results of correlational analyses provided in Table 24, revealed that only $\Delta_{(2-3)} \text{ Uncertainty}$ was significantly associated with Peak-T2 stress ($r=.09$, $p<.03$). Standard multiple regression results showed that change in perceived uncertainty was the only variable to be significantly related to stress at Time 2, though the relationship was relatively weak ($R^2=.02$, $p<.03$; $n=490$). A summary of the results of this multivariate correlation is given in Table 25. So in terms of appraisals, only changes in perceived uncertainty were of value in understanding peak stress.

Table 24

Correlation Matrix for Peak Stress (PSM2), Δ Stress ($D_{(2-3)}$ PSM) and Change Scores on Perceived Impact ($D_{(2-3)}$ IMP), Perceived Mastery ($D_{(2-3)}$ MAS) and Perceived Uncertainty ($D_{(2-3)}$ UNC) from Time 2 to Time 3

Variables					
	PSM2	$D_{(2-3)}$ PSM	$D_{(2-3)}$ IMP	$D_{(2-3)}$ MAS	$D_{(2-3)}$ UNC
PSM2	1.00				
$D_{(2-3)}$ PSM	.34 ***	1.00			
$D_{(2-3)}$ IMP	.08	.11 **	1.00		
$D_{(2-3)}$ MAS	.008	-.14 ***	-.16 ***	1.00	
$D_{(2-3)}$ UNC	.09 *	.12 **	.31 ***	-.11 **	1.00

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 25

Standard Multiple Regression of Delta₍₂₋₃₎ Appraisal Variables Related to Peak Stress at Time 2

Variables	<u>B</u>	<u>SE B</u>	β	<u>t</u>	<u>p</u>
D ₍₂₋₃₎ IMP	1.09	.94	.06	1.16	.24
D ₍₂₋₃₎ MAS	.54	.69	.04	.78	.44
D ₍₂₋₃₎ UNC	1.94	.84	.11	2.29	.02

Note. $R^2 = .02$, $p < .03$; $n = 490$.

Looking towards change in psychological stress ($D_{(2-3)}$ PSM) (see correlations in Table 24), it was found that, as expected, changes in appraisals ($D_{(2-3)}$ IMP, $D_{(2-3)}$ MAS, and $D_{(2-3)}$ UNC) from Time 2 to Time 3 were significantly associated with change in stress ($D_{(2-3)}$ PSM) from Time 2 to Time 3. Standard multiple regression tested the multivariate correlation between these variables. Results, presented in Table 26, showed that changes in perceived mastery were significantly associated with Delta stress ($R^2 = .04$, $p < .001$; $n = 503$). Changes in perceived impact and perceived uncertainty were no longer related.

3.2.3.1.3 Anticipation: changes from time 1 to time 2. In view of the findings reported in Objectives 1 and 2, it was deemed important to further examine the notion of anticipation at an earlier time point since it appeared possible that the anticipation phenomenon was in fact occurring sooner, from Time 1 to Time 2. Analyses had shown that, for women in the negative group, perceived impact and perceived uncertainty decreased significantly from the time they arrived at the clinic (Time 1) to the day after the screen (Time 2), as is the case for psychological stress. This being the case, it seemed appropriate to derive change scores by calculating the differences in appraisals ($D_{(1-2)}$ IMP, $D_{(1-2)}$ MAS, $D_{(1-2)}$ UNC) and stress ($D_{(1-2)}$ PSM) between Times 1 and 2. This also meant that stress at Time 1 should serve as the new measure of Peak stress1 (PSM1).

It was hypothesized that changes in appraisal would be significantly related to stress at Time 1 and change in stress from Time 1 to Time 2. Correlations shown in Table 27, reveal that stress at Time 1 was unrelated to any of the Delta $_{(1-2)}$ appraisal variables. However, change in stress from Time 1 to Time 2 stress was significantly associated with changes in perceived impact and perceived mastery over that same time frame. A standard multiple regression revealed a

Table 26

Standard Multiple Regression Analysis of Delta ₍₂₋₃₎ Appraisal Variables Related to
Delta ₍₂₋₃₎ Stress

Variables	<u>B</u>	<u>SE B</u>	β	<u>t</u>	<u>p</u>
D ₍₂₋₃₎ IMP	.82	.05	.07	1.43	.15
D ₍₂₋₃₎ MAS	-1.15	.05	-.12	-2.75	.006
D ₍₂₋₃₎ UNC	.92	.08	.08	1.82	.06

Note. $R^2 = .04$, $p < .001$; $n = 503$.

Table 27
Correlation Matrix for Peak Stress Time 1 (PSM1), Delta₍₁₋₂₎ Stress (D₍₁₋₂₎ PSM) and Change Scores on Perceived Impact (D₍₁₋₂₎ IMP),
Perceived Mastery (D₍₁₋₂₎ MAS) and Perceived Uncertainty (D₍₁₋₂₎ UNC) from Time 1 to Time 2

Variables					
	PSM1	D ₍₁₋₂₎ PSM	D ₍₁₋₂₎ IMP	D ₍₁₋₂₎ MAS	D ₍₁₋₂₎ UNC
PSM1	1.00				
D ₍₁₋₂₎ PSM	.13**	1.00			
D ₍₁₋₂₎ IMP	-.03	.11 **	1.00		
D ₍₁₋₂₎ MAS	-.08	-.13 **	-.05	1.00	
D ₍₁₋₂₎ UNC	-.04	.06	.36 ***	-.12 **	1.00

Note. ** p<.01; *** p<.001.

Table 28

Standard Multiple Regression Analysis of Delta₍₁₋₂₎ Appraisal Variables Related to
Delta₍₁₋₂₎ Stress

Variables	<u>B</u>	<u>SE B</u>	β	<u>t</u>	<u>p</u>
D ₍₁₋₂₎ IMP	.83	.42	.09	1.97	.05
D ₍₁₋₂₎ MAS	-.86	.33	-.12	-2.61	.009
D ₍₁₋₂₎ UNC	.15	.39	.02	.34	.70

Note. $R^2 = .03$, $p < .01$; $n = 493$.

significant multivariate relationship. Results, summarized in Table 28, show that $\Delta_{(1-2)}$ Impact and $\Delta_{(1-2)}$ Mastery were significantly correlated with Δ stress ($n=493$). Changes in perceived impact and perceived mastery helped to understand some of the change in stress from Time 1 to Time 2, while perceived uncertainty did not enhance the relationship beyond that which is based on perceived impact and perceived mastery.

3.2.3.2 Prospective Regression Analyses

Although not a central focus of the study, the issue of anticipation was further explored by examining the extent to which anticipatory appraisals (Time 1) were predictive of stress at Time 2 to see if the appraisals were as predictive of stress prospectively as they were concurrently. Using standard multiple regressions, it was revealed that appraisals from Time 1 predicted about 6% ($R^2=.06$, $p<.001$; $n=523$) of the variance in the stress reported at Time 2, compared to 7% of stress at Time 1. As summarized in Table 29, perceived mastery ($p<.05$) and perceived uncertainty ($p<.001$) each contributed to the prediction.

The results described above support the claim that there can be significant changes in appraisals over time, even when on an objective level the situation had not changed. Looking first at the original hypothesis which stated that changes in appraisals from Time 2 to Time 3 would be related to stress at Time 2 as well as to changes in stress over time, it was shown that changes in perceived uncertainty, as indicators of anticipation, were associated with earlier stress and that changes in perceived mastery were significantly associated with changes in stress. When looking at anticipation from Time 1 to Time 2 it was found that changes in appraisals over this time period were not related to stress at the outset of the process. However, changes in perceived impact and perceived mastery were predictive of change in stress from Time 1 to Time 2.

Table 29

Standard Multiple Regression Analysis of Appraisal variables at Time 1 Predicting Psychological Stress at Time 2

Variables	<u>B</u>	<u>SE B</u>	β	<u>t</u>	<u>p</u>
IMP-T1	1.61	.89	.09	1.79	.07
MAS-T1	-1.27	.64	-.09	-2.00	.05
UNC-T1	2.79	.94	.16	2.98	.003

Note. $R^2 = .07$, $p < .01$; $n = 523$.

3.3 Supplementary Analyses

Overall results suggested that changes in appraisals and psychological stress occurred sooner than expected. That is, something was happening for women, even before official screening results were known. In an attempt to better understand the screening experience, supplementary analyses examining the effects of other potentially important variables are described in the paragraphs that follow.

A part of the screening process is the clinical breast exam. As the woman leaves the clinic, she is already aware of the nurse examiner's findings. Anecdotally it appeared that it may influence the way women appraise the risk of breast cancer and, consequently, the psychological stress they experience. It seemed appropriate therefore, to explore whether the Clinical Breast Exam had an effect on appraisal and stress.

3.3.1 The Clinical Breast Exam and Stress

The sample was re-divided into two new groups: abnormal versus normal clinical breast exam (CBE+ and CBE-). This division was based solely on the results of the CBE and thus results from the mammogram were not considered. Looking back at Table 8, it is seen that of the 606 women screened, 553 were advised of a normal clinical breast exam (CBE-) whereas 53 were informed of an abnormality (CBE+).

A 2x2 (group x time) anova was run to assess the effect of clinical breast exam result on stress from Time 1 to Time 2. Due to missing data, sample sizes were reduced to $n=514$ and $n=51$ for CBE- and CBE+ groups respectively. The means and standard deviations for both groups at Times 1 and 2 are provided in Table 30. Results, illustrated in Figure 11, indicate that the effects of group ($F_{(1,563)} = 1.09, p < .30$) and time ($F_{(1,563)} = 1.95, p < .16$), as well as their interaction were not statistically significant. The power for this analysis was estimated at .60 ($\alpha = .05, \eta^2 = .03$). It is

interesting to note, however, that stress seemed to decrease for the CBE- group at Time 2, but that this does not seem to be the case for the CBE+ group.

3.3.2 The Clinical Breast Exam and Appraisals

The same strategy was used to examine the effects of the clinical breast exam on appraisals. Sample sizes were reduced to $n=478$ and $n=48$ for CBE- and CBE+ groups respectively due to missing data. Means and standard deviations for both groups are also provided in Table 30. Results of the Manova showed a significant interaction effect ($Wilks=.93$, $p<.001$) and univariate findings revealed that perceived impact ($F_{(1,524)} = 38.11$, $p<.001$) and perceived uncertainty ($F_{(1,524)} = 11.53$, $p<.001$) were the two variables affected. More specifically, as shown in Figure 12, the CBE- group reported decreases on both these variables, while increases were reported by the CBE+ group.

Women who were aware of an abnormal finding from the nurse examiner perceived significantly more Impact and Uncertainty than those who were told that the clinical breast exam had not detected any abnormality. At the same time, women did not report more psychological stress than the women who left the clinic with a normal clinical breast exam result. Thus, the clinical breast exam may play a crucial, yet subtle, role in defining appraisals throughout the screening process. Because these clinical breast exam results were immediate and delivered in person, they might have helped to alleviate fears for women who were told that all seemed normal, or for those informed of an abnormal result, lead to a more negative perception of the risk of breast cancer.

In light of these findings, group (false-positive vs negative) by time (Time 1 vs Time 2) analyses were re-run a first time by only excluding from the false-positive group those women who had been informed of an abnormal clinical breast exam. Analyses were then repeated by only excluding from the false-positive group those women informed of a normal clinical breast exam.

Table 30

Means and Standard Deviations on Psychological Stress, Perceived Impact, Perceived Mastery and Perceived Uncertainty for Normal(-) and Abnormal (+) Clinical Breast Exam (CBE) at Times 1 and 2

Group	CBE- n=514		CBE+ n=51	
	Time 1	Time 2	Time 1	Time 2
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Psychological stress	66.98(26.77)	63.16(27.91)	68.92(29.08)	69.35(34.27)
Appraisals				
Perceived Impact	3.02(1.68)	2.82(1.61)	2.71(1.77)	3.93(2.11)*
Perceived Mastery	4.45(1.94)	4.68(1.92)	4.72(2.11)	4.47(1.94)
Perceived Uncertainty	3.46(1.64)	3.21(1.67)	3.62(1.76)	4.22(2.14)*

Note. * Interaction effect was significant (Wilks'=.93, $p<.001$) for Perceived Impact ($p<.001$) and Perceived Uncertainty ($p<.01$); group, time and interaction effects were non-significant for psychological stress.

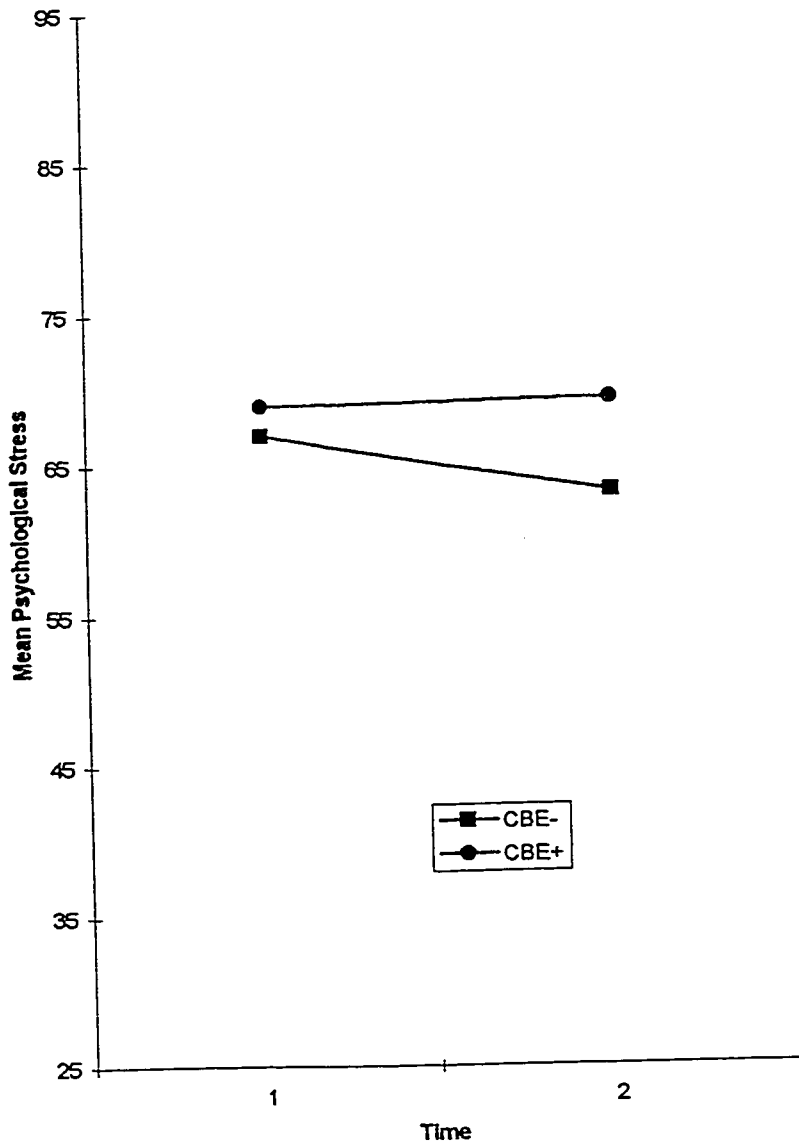


Figure 11. Psychological stress for CBE- and CBE+ at times 1 and 2

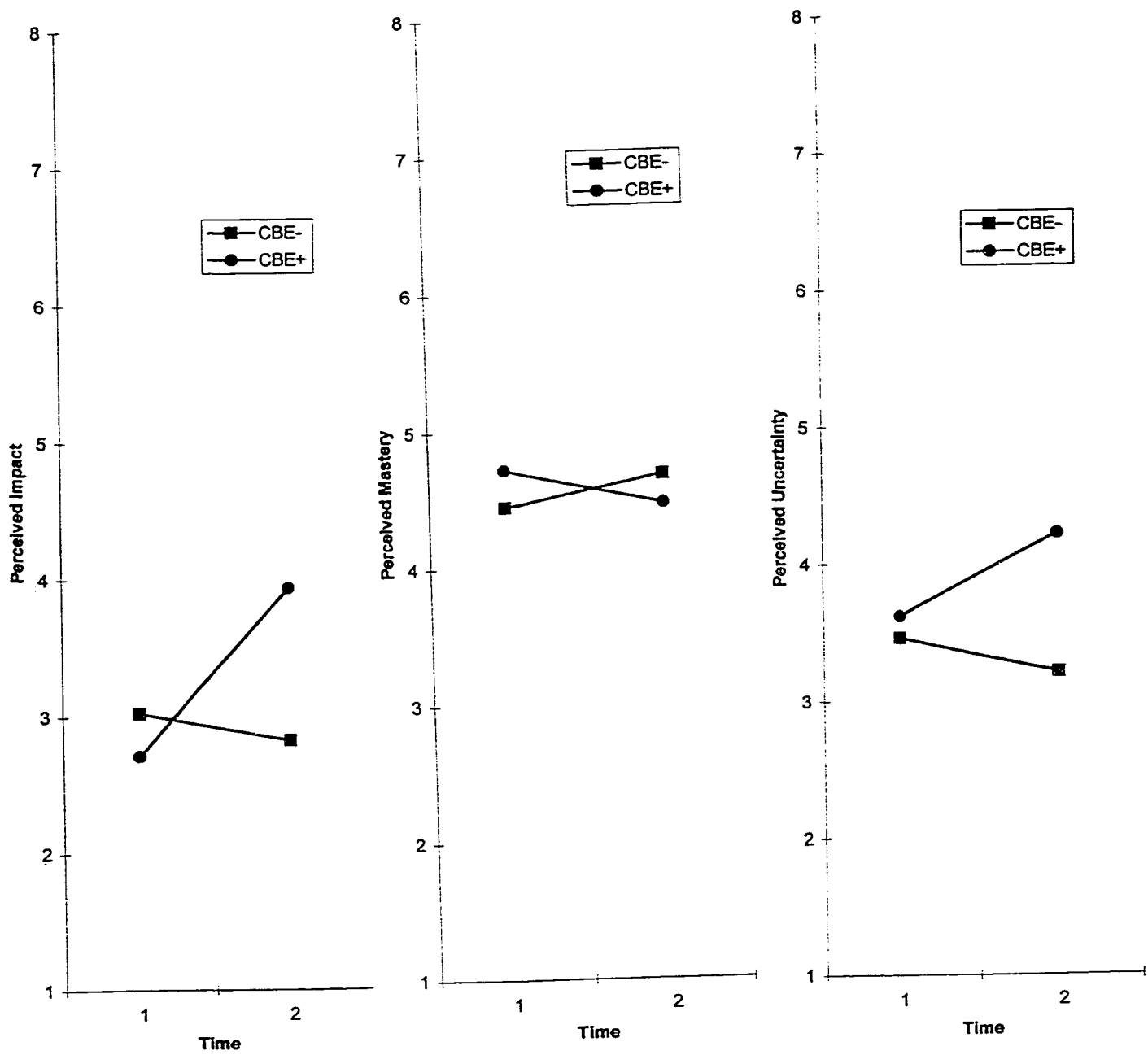


Figure 12. Appraisals for CBE- and CBE+ at times 1 and 2

This would allow us to check if the pattern of findings would differ when only results from the mammogram were considered.

3.3.3 The role of Clinical Breast Exam results for False-positives

Within the entire false-positive group, only 12 women had been informed of a normal clinical breast exam. When their appraisals were compared to those of negatives ($n=487$), all effects were non-significant. The means and standard deviations given in Table 31 indicate that there was no difference between the negatives and the false-positives (+mammogram only) on stress ($F_{(1,497)} = 1.90, p < .17$) or on appraisals (Wilks' $= .98, p < .08$). Also, there were no significant changes in stress ($F_{(1,497)} = .12, p < .73$) or appraisals (Wilks' $= .99, p < .40$) across time for either group. However, the reliability of these specific results is questionable given the small sample size.

When women told of a normal clinical breast exam were excluded from the false-positive, sample means provided in Table 32 revealed that groups were not different on stress ($F_{(1,536)} = 1.07, p < .30$); nor were there any significant changes in stress from Time 1 to Time 2 ($F_{(1,536)} = 2.02, p < .16$). However, when looking at appraisals, a significant interaction effect was found (Wilks' $= .92, p < .0001$) with perceived impact ($p < .001$) and perceived uncertainty ($p < .001$) being significantly affected. More specifically, perceived impact and perceived uncertainty increased at Time 2 for women informed of an abnormal clinical breast exam but decreased for those told of a healthy screen. When only the mammogram results are considered, there does not appear to be significant differences between negatives and false-positives, whereas the difference between these groups is very clear when women with an abnormal clinical breast exam are included in the sample.

Table 31

Means and Standard Deviations on Psychological Stress, Perceived Impact, Perceived Mastery and Perceived Uncertainty for False-Negatives With a Normal CBE and Negatives

Group	false-positives		negatives	
	n=12		n=487	
	Time 1	Time 2	Time 1	Time 2
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Psychological stress	74.50(21.63)	76.75(27.69)	67.03(26.95)	63.11(28.04)
Appraisals				
Perceived Impact	3.66(1.66)	3.50(2.23)	3.01(1.68)	2.79(1.58)
Perceived Mastery	4.00(2.08)	4.33(2.46)	4.50(1.93)	4.73(1.89)
Perceived Uncertainty	4.17(1.94)	4.67(1.87)	3.45(1.63)	3.18(1.65)

Note. All effects were non-significant.

Table 32

Means and Standard Deviations on Psychological Stress, Perceived Impact, Perceived Mastery and Perceived Uncertainty for False-Positives With an Abnormal CBE and Negatives

Group	False-Positives n=48		Negatives n=453	
	Time 1	Time 2	Time 1	Time 2
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Psychological stress	68.92(29.08)	69.36(34.27)	67.03(26.95)	63.11(28.04)
Appraisals				
Perceived Impact	2.71(1.77)	3.94(2.11)	3.02(1.68)	2.79(1.58)
Perceived Mastery	4.73(2.11)	4.48(1.95)	4.50(1.93)	4.73(1.89)
Perceived Uncertainty	3.63(1.76)	4.23(2.14)	3.45(1.63)	3.18(1.65)

Note. The interaction effect was significant (Wilks'=.92, $p<.0001$) on perceived impact ($p<.001$) and Perceived Uncertainty ($p<.001$).

CHAPTER 4

DISCUSSION

The purpose of this study was to enhance the existing cognitive-appraisal model developed by Lazarus and Folkman (1984) by more explicitly considering the cognitive appraisals of anticipated events and the psychological stress related to these evaluations in a real-life setting. In addition, we attempted to empirically test a conceptualization of anticipation that blended both subjective and objective facets of a stressful transaction.

Three main objectives guided our endeavors. First, it was necessary to document the psychological stress experienced by an individual from the anticipation to the resolution of this stressor was investigated using a longitudinal and prospective design. Next, we were interested in documenting the cognitive appraisals generated by individuals as a stressor unfolded. Finally, the changes in cognitive appraisals over time were related to the psychological stress reported while anticipating the outcome, as well as, changes in stress over time.

4.1 The Course of Psychological Stress Over Time

Using a longitudinal design, the course of psychological stress throughout this encounter was investigated. To supplement the current state of knowledge on the relationship between life events and stress, stress was measured throughout a stressful encounter and thus considered the stress provoked by an anticipated event. Significant changes in stress were expected over time. More specifically, it had been predicted that psychological stress would be heightened at the peak anticipation time and subsequently decrease as time went on.

The results lent convergent support to these predictions. As predicted, Figure 4 shows that was a trend for women informed of a normal result (i.e., negatives) to show a steady decline in

psychological stress, with the most prominent changes occurring from Time 1 to Time 2. Contrary to expectations, however, they did not show the initial increase during the wait for results. Women from the false-positive group also demonstrated a trend for a decline in stress throughout the process, but this finding did not reach statistical significance. Contrary to predictions, women who were told of an abnormality (false-positives) did not, at any time, report a rise in psychological stress. Actually, they seemed to start off at a slightly, yet non-significantly, higher level of psychological stress at Time 1. Results for the comparison group were as expected without any significant changes in psychological stress detected over time.

When looking at group differences, it was found that false-positives appeared to consistently reported a higher level of psychological stress. Significant statistical differences were found between negatives and false-positives at Time 2, so immediately after the screening. All groups were found to be statistically equivalent on stress at Time 1, although a slightly higher degree was observed for the screened group, especially for those who would eventually be told of an abnormal result. At follow-up, all groups were again found to be equivalent statistically, with a trend suggesting higher levels of stress for false-positives.

Findings also tentatively uphold one of the fundamental aspects of the stress process: There is some variation in the stress response throughout a transaction. Even though the statistical significance of these changes was not always significant, the qualitative importance of these findings is deserving of some attention. Therefore, as argued by McGrath and Beehr (1990) stress can seemingly be considered a cycle comprised of several stages. When researchers examine but one stage of an encounter they may be neglecting crucial information. Cohen, et al. (1995) have argued that charting the temporal course of stress is an important challenge facing stress researchers. The results offer insight into these changes by showing that there seems to be a significant decrease in

stress throughout the encounter, and that this decrease seems to be initiated from the outset of the encounter. Psychological stress does not seem to increase significantly throughout an encounter. Moreover, the results help to bolster the findings of various studies suggesting that potential events can bring about psychological stress in much the same way as past or present events (Lemyre, 1986; Spacapan & Cohen, 1983) and that negative psychological reactions, such as increased stress, seem most pronounced while anticipating a stressor (Dunn, 1981; Hobfoll & Walfisch, 1986; Scherer, et al., 1993). Lazarus and Folkman (1984) argue that it is during the anticipation phase that individuals must consider whether or not an event will occur and what it will imply. Using a prospective design, it has been shown that this period is characterized by a higher degree of stress which seems to slowly abate as the situation unfolds. Further research is needed to understand the factors associated with decreased stress throughout an encounter. The findings reported to date suggest that the person's outlook (Alloy & Clements, 1992; Shower, 1992) and coping efforts (Buntrock & Reddy, 1992) may be involved.

Other researchers (e.g. Abel & Larkin, 1990; Taylor & Scogin, 1992; Tomaka, et al., 1993) have reported increased anxiety and mood disturbances while anticipating a stressful event. Findings help to demonstrate that this pattern of anticipation can manifest itself in terms of normal psychological indicators as well as by physiological markers and morbid clinical symptomatology.

Perhaps more importantly, the findings go beyond those of other researchers by showing that, in terms of stress, this pattern holds true regardless of outcome. That is, it seems worse to be waiting to know if and when a stressor will occur than to actually know with some certainty that it will, even when the news is bad (i.e., the screening has detected an abnormality). Similar results were described by Fillion (1993) who found that women undergoing biopsy were more distressed as

they awaited the procedure and the results than after they were told of their status, even when the results suggested the presence of a cancerous tumor.

4.2 The Changes of Appraisals Over Time

To document the changes of appraisals throughout the process, three major cognitive dimensions (perceived impact, perceived mastery and perceived uncertainty) were studied. The present study was one of the few that considered major cognitive dimensions which seemed to be representative of the vast array of appraisals studied in the past.

As predicted, results show that appraisals fluctuate significantly throughout the stressful encounter and that these variations differ as a function of contextual circumstances, in this case the screening result. As shown in Figure 7, for negatives, there is evidence to suggest that perceived impact and perceived uncertainty decrease over time, whereas perceived mastery increases as the situation progresses. It should be noted that the large sample used in this particular analysis made the test quite powerful ($\text{power}=.99$). However, to ensure that the effect was not a purely statistical phenomenon we tested two random samples of 150 women ($\text{power}=.80$). Finding that results remained significant and that the effect size was within the medium range suggests that these effects are true and clinically relevant.

For the false-positives, there is a significant rise in perceived impact from Time 1 to Time 2, which only subsides at Time 4. There are no significant changes in the appraisals of the comparison group, although there is a trend suggesting increased perceived impact. Although this is a tentative finding, it can be used to orient future research (Tabachnick & Fidell, 1996). It was also found that negatives and false-positives are significantly different from one another at Time 2 and Time 3 in terms of perceived impact and perceived uncertainty. Screened samples report more perceived impact and perceived uncertainty than the comparison group. All groups report comparable

appraisals at Time 4, although the false-positives seem to still have slightly more elevated perceptions of impact and uncertainty.

As shown by other researchers (e.g., DeLongis, Folkman & Gruen, 1985; Lemyre, 1986; Taylor & Scogin, 1992), when individuals are faced with a threatening stressor (i.e., the presence of an abnormality), they seem to perceive the situation as holding more importance, and hence perceive additional impact. In other words, as a person is faced with the reality of this future stressor, its implications are more readily apparent. In contrast, the perceived impact from a stressor decreases in the absence of cues signaling its pending occurrence (i.e., no detection of an abnormality).

For the negatives, the results pertaining to perceived mastery are partly in keeping with those of other studies suggesting that an individual's sense of mastery increases as a situation becomes less ambiguous (Lazarus & Folkman, 1984; Mishel & Sorenson, 1991). According to Mishel and Sorenson (1991), if mastery is situationally based, self-control expectancies should fluctuate along with the characteristics of the situation. Theoretically, the subjective appraisals of these women should not change, reflecting the non-changing objective circumstances. However, it was shown that these women reported a significant increase in perceived mastery. It is possible that these women feel an increased sense of mastery relative to the risk of breast cancer once they have been shown that the preventive actions they had engaged in thus far had, in fact, averted the realization of the threat (i.e., a breast tumor). In other words, for them, the screening process has concluded with a clear healthy result confirming the status quo. Surprisingly, significant changes in perceived mastery are not reported for the false-positive group who experienced significant changes in objective circumstances, although there appeared to be a trend indicative of continually increasing perceived mastery. For this second group of women, it may be that the news of an abnormality

slows the development of mastery by making them feel more vulnerable to this disease and become more aware of the limited control they can in fact exert over its presence. However, the limited power of these analyses implies that more research may be necessary before the sense of mastery experience by women told of an abnormality is clearly understood.

With respect to perceived uncertainty, Mishel (1988) suggested that the individual's sense of uncertainty decreases as a situation becomes more clearly defined, whether it be on temporal or informational grounds. Once again, this seems to be the case for women in the negative group. Indeed, reports of perceived uncertainty seem to diminish from the outset of the screening to after results are known. But, it had also been expected that upon being told of an abnormality women would report increased perceived uncertainty in the face of additional diagnostic testing. This was not the case; women from the false-positive group do not report any significant variations in perceived uncertainty. There appears to be a trend suggesting that perceived uncertainty decreases but that the decline only becomes apparent once final results are known. It is possible that, although women are provided with important information enabling them to initiate any necessary measures, this information simply prolongs the process retarding the decline of perceived uncertainty until diagnostic testing has disconfirmed the realization of the anticipated threat.

Results help to support the idea of studying a variety of appraisal dimensions. As described in Lazarus and Folkman's theory, it has been shown that appraisals change over time. However, it is also demonstrated that the degree and direction of change differ according to the appraisal dimension which is being considered. While studies which limit their investigation to a single appraisal dimension are useful in understanding very specific issues, it must be realized that a more global understanding of the cognitive-appraisal process is sacrificed.

4.3 Anticipation

In addition to documenting the changes in appraisals and stress, the cognitive-appraisal model of Lazarus and Folkman (1984) was expanded in order to explicitly include the notion of anticipation. The conceptualization developed considered both the subjective and objective facets of a stressful encounter. It was proposed that the presence of substantive changes in cognitive appraisals while contextual circumstances remained unchanged would signal the presence of anticipation and that the degree of change would be proportional to peak anticipatory stress.

First, the concurrent relationship between appraisals and stress were examined. Like others (e.g., Ham & Larson, 1990; Prince-Embury, 1992; Vinokur & Selzer, 1975), it was found that appraisals are related to stress. The way people perceive a stressor seems to be related to their stress response (Lazarus & Folkman, 1984). In addition, it was demonstrated that the predictive value of the various cognitive dimensions changes over time. Moreover, it was demonstrated that appraisals reported at the outset of the process can help to predict the stress experienced while awaiting the outcome. These findings underscore the need to consider various cognitive dimensions and to examine their role over a period of time, thereby allowing the process to play itself out. These interpretations should be tempered by high test-retest correlations for appraisals which may indicate a certain underlying stability in appraisals over time. Further longitudinal investigations are warranted before the true nature and magnitude of variations in appraisals can be appreciated.

Finding that initial appraisals are valuable in understanding anticipatory stress (i.e., before results are known) suggests that anticipation is more than the reported level of stress. Thus, we went further by testing the notion of anticipation in the form of changes in cognitive appraisals without any changes in the contextual situation. To do so, the associations among change in appraisals and stress reported during the peak anticipation period were examined. Looking first at

the original hypothesis, that changes in cognitive appraisals from Time 2 to Time 3 would be related to stress at Time 2 as well as to changes in stress over the same time period, it was shown that changes in perceived uncertainty are predictive of earlier stress and that changes in perceived mastery are significantly associated with changes in stress. Thus, pronounced changes in perceived uncertainty, presumable secondary to official screening results, can help predict the level of stress women will experience prior to being informed of the results. Nonetheless, the change in stress which takes place after women are told their results is predicted by the change in their level of perceived mastery. Based on results signaling important changes earlier on in the process, changes in stress and appraisals were examined from Time 1 to Time 2. It was shown that changes in appraisals from the outset to awaiting results are not predictive of stress scores reported as the process is initiated. Changes in perceived impact and perceived mastery are however, associated with changes in stress over this time period. Therefore, women appraise the situation more negatively (higher perceived impact and lower perceived mastery) at the outset and experience significant changes in stress (from higher to lower levels) because of a projection in time of what "may" happen.

So then, changes in perceived impact seem most relevant to understanding early changes in stress. This makes sense given that stakes are thought to be determined at the outset (Folkman, 1984) and threat is considered to be most important at the beginning of the process (Lazarus & Folkman, 1984). Changes in perceived mastery or rather the expectations about the ability to control the event (Morgan, et al., 1986) seem most pronounced once official results are known. Finally, as time passes things become clearer, and changes in perceived uncertainty become important determinants of decreased stress. As suggested by Hilton (1988), a certain degree of certainty about the situation is needed for a more healthy psychological state.

The idea of anticipation received additional indirect support. First, it was shown that, for women informed of a normal screen, so for whom contextual circumstances remained unchanged throughout the encounter, appraisals changed significantly over time. It was also shown that stress decreases significantly for these women from the outset of the screening to the confirmation of results. Moreover, at the first assessment (Time 1) women being screened (negatives and false-positives) report appraisals that are significantly different from those of the comparison group suggesting that women being screened are anticipating something that others were not.

Looking back to the conceptual model presented in the introduction of this thesis, it is found that results partially supported this framework. Data show that subjective appraisals of potential stressors can change even though contextual circumstances remain unchanged, lending support to the idea of an anticipatory experience. In terms of cognitive appraisals, this period is characterized by heightened perceived impact and perceived uncertainty as well as a low sense of Mastery demonstrating that negative appraisals decreased from anticipation of a stressor to the outcome stage of the encounter as found by Scherer, Drumheller and Owen (1993). In addition, psychological stress peaks during anticipation and subsequently decreases as time goes on. Nonetheless, as illustrated in Figure 13, anticipation occurs at the outset of the situation. What is expected to happen on a contextual level is related to the appraisals and stress experienced at the outset of the transaction. Once the outcome has been ascertained, one can appraise the situation as it is or on a concurrent basis.

In our opinion anticipation is a normal phenomenon experienced by all individuals going through a stressful encounter and should be distinguished from certain forms of over-evaluation and worry that have been discussed in the literature. Monitoring, for example, is one form of over-evaluation described by Miller (1987) as a coping style used by individuals who have a tendency to

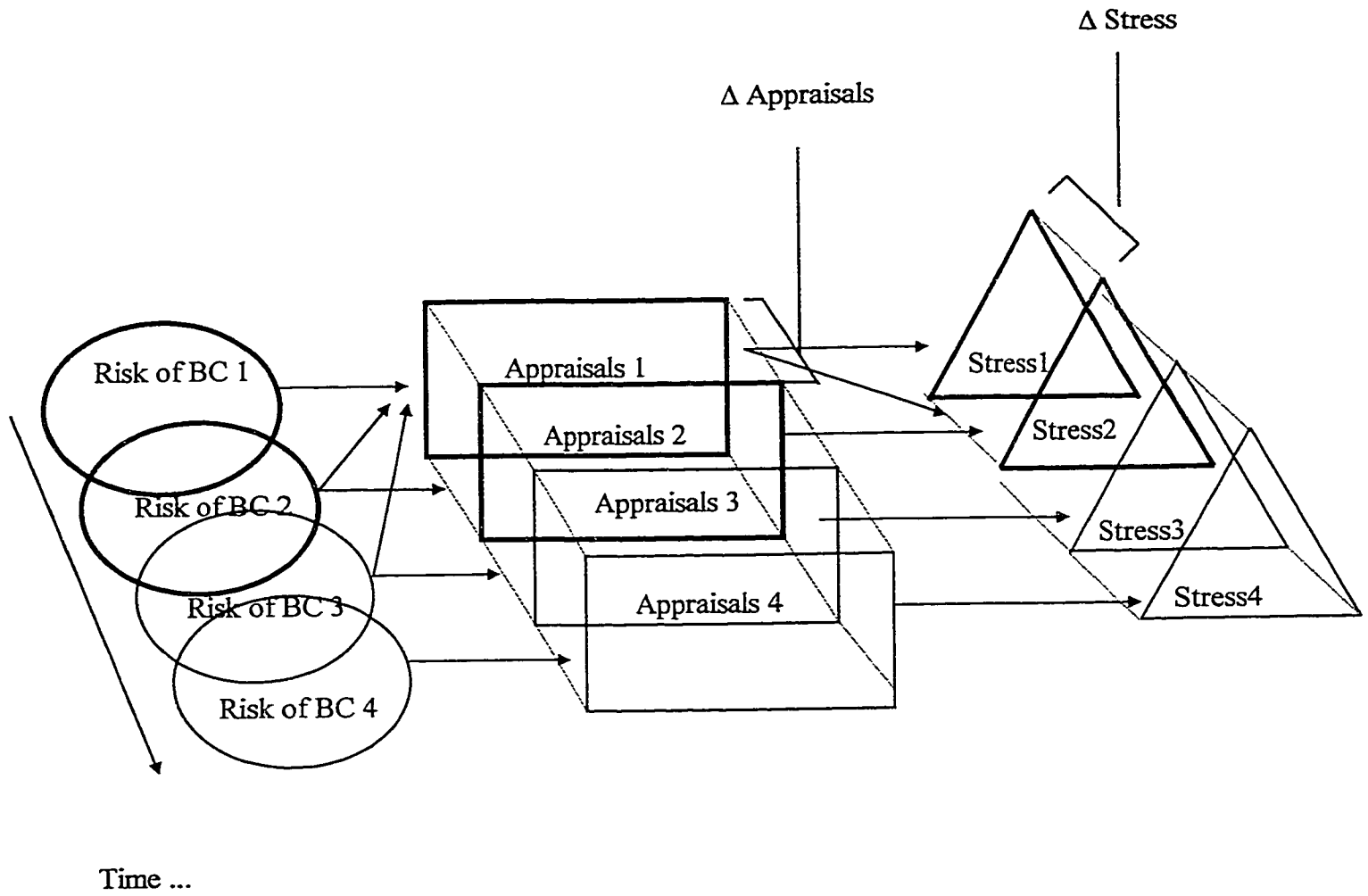


Figure 13. Empirical model of stress, appraisal and anticipation

scan for and focus on threats. Studies have shown that monitors worry excessively about risks and exhibit heightened psychological and physiological vulnerability. Anticipation can be distinguished from monitoring in that monitoring can be seen as a trait or style, whereas anticipation would be more situationally specific and more likely to be experienced by all who enter into a stressful transaction. Worry can be seen as an adaptive function serving to alarm, prompt and prepare the individual in the face of a threat (Tallis & Eysenk, 1994). This is to be distinguished from anticipation in that there need not be any cues signaling the presence of the threat for the person to engage in anticipation.

Studies have also shown that less adaptation is required to face anticipated events (Fontana, et al., 1979; Ham & Larson, 1990; Vinokur & Caplan, 1986) and that unanticipated events are often associated with more health problems (Gardner, et al., 1992; Matheny & Cupp, 1983). It may be hypothesized then that anticipation serves an adaptive function by helping individuals to prepare for potential eventualities. As suggested by previous studies, individuals may be able to call upon more adaptive coping strategies (Buntrok & Reddy, 1992; Taylor, 1991). However, more research is needed before the effects of anticipation are clearly understood.

Lazarus and his colleagues have promoted the use of the term *transaction*, implying that the person-environment relation is constantly changing as a function of personal characteristics and situational demands. Overall, the findings provide support for the conceptualization of appraisal as a process (Folkman, 1984; Lazarus & Folkman, 1984) and they underscore the importance of studying all stages of a stressful encounter. Researchers that rely on a single assessment of appraisals may be overlooking important information.

The study also demonstrates the relevance of using a specific context. Already a homogeneous stressor has its complexities, as most researchers have collected appraisal across a

variety of heterogeneous stressors they may have missed crucial information needed to better understand the process of stress.

Whereas Lazarus and Folkman (1984) propose that the occurrence of negative events can signal impending threats which are anticipated by the individual, it has been shown that appraisals can fluctuate while situational factors remain unaltered (i.e., the negative event has not actually taken place). In line with their theoretical propositions, it would seem as though it is not the objective nature of the stressor which is the crucial determinant of the stress response, but rather the individual's perception of this situation. The person's perception is not limited to the current context, but rather encompasses the individual's expectations for the future. Notwithstanding that any and all conclusions are only tentative, it seems that the occurrence of anticipation would be apparent particularly when a transaction has been initiated. So when environmental cues sensitize the individual to the impending threat, the potential stressor becomes more imminent, and thus leads to anticipation and arousal (Lazarus & Folkman, 1984). In contrast, anticipation would not be as prominent for those not entering into an encounter. There is a need to further expand this theoretical model so that the phenomenon of anticipation can receive the empirical attention it deserves.

4.4 Clinical and Research Implications of Findings

Finding that for women informed of a normal result stress decreased from the outset of the screening process throughout the three month process is clinically relevant. Results are in line with those of other studies that have examined the effects of a negative screen result (e.g., Bartolucci, et al., 1989; Lightfoot, et al., 1994; Sutton, et al., 1995), and suggest that, despite not often being considered, the beneficial effects of negative or normal results on psychological well-being are worthy of consideration.

Gram and Slenker (1992) suggest that a healthy screen result may lower the prevalence of anxiety as compared to the general population. Although this issue was not examined specifically, this study showed that the negative group reports a decrease in perceived impact over time, whereas the comparison group reports an increase in perceived impact after being sensitized to the issue of breast cancer. Thus, undergoing screening may make women more aware of their risk of breast cancer (Dean, et al., 1989), but completing the process may also help to put their concerns to rest.

Particularly noteworthy is the finding that psychological stress did not increase for women informed of a potential abnormality. Contrary to reports by Lerman, et al. (1991), it was not found that women informed of an abnormality report more psychological stress than those informed of a normal result at any time. In fact, there is a trend suggestive of mildly reduced psychological stress in the false-positive group at the conclusion of the three month period. As such, for this sample, the psychological implications of an abnormal screen result may have been less detrimental than would have been expected based on accounts by Wardle and Pope (1992) and Roberts (1989). However, more research is needed to clarify this issue.

Despite being similar in terms of stress, groups are different on certain appraisal measures. It was found that the false-positive group reports significantly more perceived impact and perceived uncertainty than the negative group while waiting for results and shortly thereafter (Time 2 and Time 3). These findings are in line with those described by Gram & Slenker (1990; 1992) who found that for women informed of a positive screen the risk of breast cancer can become more salient and lead to an increased sense of impact. Nonetheless, these differences are no longer apparent at the conclusion of the screening process; screened women reported appraisals relative to the risk of breast cancer indistinguishable from those of women who had not recently undergone

screening. Furthermore, as suggested by Hilton (1988), perceived uncertainty may be related to the fact that they must undergo additional testing before the occurrence of the stressor can be ruled out. This suggests that any detrimental effects of the screening process on subjective evaluations likely dissipated within a three-month period.

In addition, there is a trend suggesting an increase in perceived mastery over time that cannot be underestimated. As mentioned, it is generally believed that perceived mastery over a situation is stress reducing (Friedland, et al., 1992) and enhance the person's ability to adapt (Vinokur & Caplan, 1986). Knowing that undergoing screening may help women to feel more in control of breast health is clinically relevant. First, their sense of mastery may serve to moderate this stressful experience (Mishel & Sorenson, 1991) and thereby lead to a better somatic health status (Folkman, et al., 1986). Secondly, research has shown that an individual's sense of self-efficacy is an important determinant of healthy behaviors (Holden, 1991). Thus, as women feel more masterful with regards to their risk of breast cancer, they may become more vigilant by adhering more closely to recommended screening guidelines and adopting a more healthy lifestyle. Future research will be helpful in understanding the predictors of increased mastery so that interventions can be designed to promote this process.

In terms of process, this study has shown that for the majority of women who are informed of a normal screen result the most stressful period is immediately prior to undergoing screening. For them, this period is also typified by a more negative appraisal profile. Overall, as the process unfolds, their psychological makeup improves. For women eventually informed of an abnormal screen, the process is slightly altered. For them the period preceding the screening is also the most stressful, but negative appraisals increase as they await official screen results. These negative cognitive evaluations do not subside until diagnostic testing has ended the encounter. It is

important for health practitioners to be aware of this process so that care can be taken to provide adequate support to women as they are screened, especially when they appear most vulnerable.

In an effort to elucidate the distinct appraisal processes of negatives and false-positives, we considered the role of the clinical breast exam in the screening group as a whole, regardless of mammogram results. Looking at the entire OBSP sample, it was found that stress seemed to decrease slightly for women informed of a normal clinical breast exam, although this effect did not reach statistical significance. As for appraisals, women warned of a potential abnormality by the nurse examiner perceive more impact and more uncertainty the day after the screening, whereas those women who are told that all seemed normal report perceiving less impact and uncertainty. Moreover, once women with an abnormal clinical breast exam are excluded from the analyses, then there are no significant differences between false-positives and negatives. This could account for the decrease in perceived impact and perceived uncertainty reported by women in the negative group who were all told by the nurse that nothing had been detected through the clinical breast exam. It may also explain the increased perceived impact reported by the false-positive group whom, for the most part, had been told of an abnormal clinical breast exam cueing the presence of an abnormal mammogram result and possible cancer. The clinical breast exam result becomes the contextual cue that signals the imminence of the anticipated stressor and thus leads the woman to perceive this situation as having more impact on her life

In a similar vein, the important role played by the nurse examiner is underscored by findings showing that results of the clinical breast exam have a significant effect on certain appraisals. This finding has clinical implications for gynecologists or family physicians who often conduct clinical breast exams on a routine basis. Their role in encouraging women to be screened has already been documented (O'Connor & Perrault, 1995); however, the way in which they relay results of their

own clinical breast exam may also have important consequences. It would seem that the human contact and the immediate feedback as to breast health status afforded by this simple procedure has a profound impact on psychological sequela of screening, maybe even more so than the results of the mammogram itself. If the results of the clinical breast exam are congruent with those of the mammogram, then the earlier results can provide an appropriate relief for women. This relief may, however, be premature and faulty given the fact that women are yet unaware of the mammogram results. In contrast, if the results of the clinical breast exam are misleading, they may provide a false sense of security, making the results of the mammogram all the more anxiety provoking.

For researchers studying the implications of breast cancer screening, it becomes important to clearly identify the screening procedure that was carried out (e.g., whether or not it involved a clinical breast exam) and to disentangle the effects of the clinical breast exam results from those of the mammogram result. To date, researchers have essentially focused on the impact of mammography results and categorized women according to these results. Although additional research is needed to refine the understanding of the effects of the clinical breast exam, it may eventually become necessary for us to reconsider our definition of a false-positive result. False-negative results are also to be considered, given the seeming importance given to verbal reassurance from the nurse and its implications for further health behaviors. Certainly, an understanding of the psychological implications of breast cancer screening cannot be complete until the role of the clinical breast exam has been more extensively investigated.

A comparison group was included in the study design so that stress and appraisals relative to the risk of breast cancer could be longitudinally investigated in a sample of women who were not presently undergoing screening. The inclusion of this group helped to evaluate the effect of repeated measurement. As predicted, psychological stress, perceived mastery and perceived

uncertainty remain unchanged over the three month period. To our surprise, a rise in perceived impact from test to retest was reported by the comparison group. Theoretically, the appraisals of this group of women relative to their risk of breast cancer, should have remained unchanged. However, this increase in perceived impact may be the result of a sensibility effect (Robert, 1989). Once having completed the questionnaire related to the risk of breast cancer women from the community may have a heightened awareness of the potentiality of this disease; yet, they are unlikely to report increased perceived mastery and decreased perceived uncertainty without undergoing screening, and thus resolving the situation.

Perceived impact, perceived mastery and perceived uncertainty varied as the screening process unfolded and as a function of the screen results. These findings underscore the role of the cognitive appraisal process in determining the psychological implications of breast cancer screening. Knowing a woman's appraisals of the circumstances can help us to understand her emotional state (Smith, Haynes, Lazarus & Pope, 1993). Research with cancer patients has shown that perceived threat is related to behavioral upset whereas perceived control over this threatening situation is related to more favorable adjustment (Jenkins & Pargament, 1988). Presumably, the same processes may be involved in women's adjustment to screening. In view of this increasing awareness of the role of cognitive appraisal processes, it may be important to investigate predictors of these processes. Such studies may assist clinicians in identifying more precisely the pathways through which screening procedures have their effects and subsequently to develop more focused prevention and intervention strategies (Ireys, et al., 1994).

4.5 Strengths and Limitations of the Study

Several strengths of this study are worth mentioning. First, this study was a field study and was thus carried out in the participants' natural environment as they faced a true consequential

stressor. Such an approach certainly enhances the ecological validity of the protocol. Secondly, our concern for ecological validity was accompanied by with an equal preoccupation with internal validity. Care was taken to control experimenter and participant expectations by using standard administration instructions that underscored the importance of accurate personal responses while never revealing research hypotheses or hoped for results.

Next, considerable effort was invested in assuring that the research protocol was respected by participants. Researchers were on site at all times to present the research project to interested OBSP clients. Women were also called on an individual basis on the days they were to complete the questionnaires to help ensure that all was completed and mailed as requested. We individually interviewed women from both groups. These interviews allowed us to gather important socio-medical information, to clarify any confusion surrounding responses, and to gather a clear picture of the factual elements of the screening process. Moreover, this more personal approach seemed to help participants remain engaged and most certainly contributed to the low rate of attrition.

Thirdly, great care was taken to ensure that groups were equivalent. Research has shown that socio-demographic factors are related to breast screening practices and attitudes towards screening (Rimer, 1994). This being the case, these factors must be taken into account. For this study, participants were individually balanced on four socio-demographic factors (age, marital status, income and education). A high rate of success was achieved with the individual equating procedure and were ensured that overall groups were not different from one another. Such painstaking measures helped to eliminate the potential confounds of these factors.

Cohen et al. (1995) have discussed the importance of mapping the course of stress and appraisals in time, and others (e.g. Scherer, et al. 1993) have clearly stated that more longitudinal investigations are needed. This study made use of a longitudinal design; appraisals and stress were

assessed at four different times over a three-month period. This design allowed us to gather a comprehensive account of the stressful encounter. As mentioned, most studies on appraisals and stress measure cognitions at only one point in time. The results, which have shown changes in stress over time, certainly argue against such practices. The results reported by researchers who choose to limit their design to a single assessment will vary according to the time-frame in question. These results can become misleading and lead to false conclusions. Similarly, appraisals were found to vary as the situation progressed and changes sometimes occurred over a very short period of time. If based on a single evaluation, these changes in appraisals would be overlooked leading to erroneous conclusions and faulty theoretical developments.

Finally, this study provided a comparison between women undergoing screening and women not presently undergoing this process. Without the use of a community comparison group, it is difficult to truly appreciate the implications of screening and certain findings may be overlooked.

Results must, however, be interpreted in light of certain limitations. First, as is the case for most studies, the generalizability of the findings to the general population of women over the age of 50 is limited by potential biases in the sample resulting from the self-selection of participants. Participants were by and large from middle class to upper middle class socio-economic backgrounds and most were Caucasian. Further investigation is needed before conclusions drawn from the results can be generalized beyond the immediate sample.

Moreover, the situational focus of this project may have overshadowed the importance of individual differences. On this point, we argue that Lazarus and Folkman's model is based on the premise that appraisals are specific to each individual and thus does acknowledge the significance of individual differences in the stress process. However, other variables such as personality, have

also been shown to be related to appraisals, and the study of their moderating effects may further enrich our understanding of anticipation.

It is also crucial to note that levels of stress reported by the participants were generally mild. So then, as we speak of “peak stress”, the reader must always keep in mind that this comparison standard is individual rather than normative. Nonetheless, as argued by Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen (1986), it is sometimes more important to consider whether an individual has more or less stress from one time to the next than to compare his/her overall level of stress with that of other individuals. This attenuated stress experience may be a function of the clinic atmosphere. Contrary to the reports of women who undergo mammograms in a hospital setting where the atmosphere is more medical and sterile, women in this program reported a warm and sympathetic milieu. Many women commented on the kindness of the staff, the serenity of the décor and the overall care received via the screening program. These positive characteristics may have helped alleviate some of the stress typically experienced while undergoing screening. Alternatively, it may also be that most of the women who participated in the study had already undergone screening in the past, in fact, only three women had never had a mammogram in the past. This previous exposure may have also contributed to lower levels of stress during the screening process. This mild level of psychological stress being the “peak stress” level may be the reason why the tests of anticipation were non-significant. Additional research using a situation that would generate more substantial degrees of stress would be necessary before rejecting this conceptualization of anticipation.

A third and related issue is the fact that effects, although significant at times, were generally small. This fact, coupled with the limited sample sizes available compromised the statistical power of certain analyses. Although every effort was made to maximize the statistical power of analyses,

we found results were unchanged even when using the entire sample of interviewed women. Thus, care must be taken to not over-interpret the absence of significant changes or significant group differences. Additional investigations are needed to clarify this issue.

Next, it is important to note that due to logistical constraints, appraisal dimensions were each represented by a single item. Most researchers would agree that it would be preferable to have at least 2 to 3 items per dimensions so as to enhance the reliability of individual scores. Furthermore, the test-retest reliability of these items was not always at an optimal level. This is especially true for the item relating to perceived mastery. This may, in part, help to explain why perceived mastery remained relatively unaffected throughout the study. However, as mentioned in the method section, such an approach has been frequently used by other researchers in the area and the items were judiciously chosen to reflect the three scales of the Subjective Appraisal Rating Scale (Lemyre, 1986) as well as the major cognitive dimensions identified in the literature.

An ideal study would make use of a truly experimental design. Thus, participants would be randomly selected and assigned to experimental groups. Of course, within the context of breast cancer screening, this would be impossible, not to mention ethically unthinkable. Nonetheless, some perhaps more realistic measures could be taken to improve upon the design. First, it would be interesting to have a baseline measure of stress and appraisals so as to evaluate pre-encounter functioning. To do so, it would be necessary to have women complete a questionnaire prior to being eligible for screening in the OBSP. Family physicians and gynecologist could be asked to invite their younger patients to complete an initial questionnaire so that interested women can be re-assessed as they become eligible for screening, initiate the process and undergo the procedure. This study focused on short-term effects, though extending the follow-up period may prove quite valuable.

Eventually, as a finer understanding of the effects of screening is developed, it may become necessary to exercise systematic control over all other factors of the situation. For instance, the scheduling of appointments, the mail-out of invitations, and the transmission of screening and diagnostic results should be carried out in a uniform manner (e.g. delay and manner of presentation) by nurses and physicians. Awarding researchers control over such details would ensure a rigorous research protocol and eliminate all other potential sources of confound.

Finally, it would be ideal to compare the screened group to a group of similar women who have never undergone screening. This is a very difficult feat. We have invested a considerable amount of money on promoting screening for Canadian women and many women have heeded the call. This is not to say that our work is done in the areas of attitudes towards screening and the practice of health behaviors, but rather that it has become increasingly difficult to reach and engage women who do not attend to health matters like breast cancer.

4.6 Summary and Conclusions

This study examined the cognitive appraisals of anticipated events and their relationship to psychological stress with the hope of learning more about anticipation. By sampling women going through breast cancer screening, we found significant variations in appraisals and stress as this stressful encounter progressed. Perceived impact decreased for women informed of a healthy screen, but increased for those women for whom an abnormality had been detected. Increases in perceived mastery and decreases in perceived uncertainty were only found for the negative group. As such, findings provide support for the idea that appraisal is a multi-dimensional and perpetual process.

Results also support the presence of anticipation. That is, appraisals were shown to fluctuate, even when there were no changes in the contextual situation. The anticipatory period

appears to feature heightened perceived impact and perceived uncertainty with low perceived mastery. There is also heightened psychological stress. These findings are preliminary and only sustained research on anticipation will yield solid theoretical formulations.

On a clinical level, we have shown that the healthy results obtained by most women undergoing screening can have meaningful beneficial effects on their appraisal of the risk of breast cancer. We also found that, when informed of an abnormality, women report high levels of perceived impact and perceived uncertainty. However, these more negative effects were found to have dissipated at the follow-up assessment. Moreover, psychological stress seems to abate as the process unfolds, regardless of the screening results. Findings suggest that, for most women, undergoing screening may not be as psychologically detrimental as once believed. This study has also emphasized the importance of the clinical breast exam. The outcome of this simple procedure can significantly impact on cognitive appraisals related to the risk of breast cancer. Such reports suggest that clinicians and researchers may both need to rethink the merit of the clinical breast exam and its consequential results.

In summary, the objectives of this study were to prospectively investigate psychological stress from anticipation to resolution, to describe the appraisals generated by an individual as a stressor unfolds and to relate the changes in appraisals to stress. First, we found that stress seems to decline with time and that the most prominent changes occur early in the process. Secondly, we found that appraisals too fluctuate over time. Specifically, when the situation remains contextually unchanged, there is a significant drop in perceived impact during the early stages of the encounter. Perceived mastery seems to increase and perceived uncertainty seems to decrease but these results are tentative and require additional study. Finally, we found that changes in appraisals are associated with changes in stress, but that the importance of these changes are different according

to the stage of the transaction: Changes in perceived impact are most important at the outset, changes in perceived mastery are related to stress once results are known, and changes in perceived uncertainty become involved once the situation has become clearer. Furthermore, it was found that appraisals fluctuate even when contextually the situation remains unchanged, supporting the occurrence of an anticipatory experience.

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Appendix A Questionnaires

Q1. The Psychological Stress Measure (PSM; Lemyre, et al., 1990)

After EACH sentence, CIRCLE the number from 1 to 8 which best indicates the degree to which it applies to you recently, that is in the last 4 or 5 days.
There are no right or wrong answers. Give your global immediate impression.

The numbers from 1 to 8 signify:

1	2	3	4	5	6	7	8
not at all	not really	very little	a bit	some	much	very much	extremely

1. I am tensed and nervous (wrought)	1 2 3 4 5 6 7 8
2. I feel that my throat is tight or that my mouth is dry	1 2 3 4 5 6 7 8
3. I feel rushed, I do not seem to have enough time.	1 2 3 4 5 6 7 8
4. I have a tendency to skip meals or to forget to eat.	1 2 3 4 5 6 7 8
5. I go over ideas in my mind over and over again; I juggle ideas; I have repetitive thoughts; my head is full of thoughts.	1 2 3 4 5 6 7 8
6. I feel lonely, isolated, misunderstood.	1 2 3 4 5 6 7 8
7. I suffer from physical aches and pains: sore back, headaches, tensed neck, stomach aches.	1 2 3 4 5 6 7 8
8. I feel preoccupied, tormented or worried.	1 2 3 4 5 6 7 8
9. I have sudden changes in bodily temperature (very warm or very cold).	1 2 3 4 5 6 7 8
10. I forget about meetings or things I have to do or to get.	1 2 3 4 5 6 7 8
11. I cry (easily).	1 2 3 4 5 6 7 8
12. I feel tired.	1 2 3 4 5 6 7 8
13. My jaws are tight.	1 2 3 4 5 6 7 8
14. I feel calm.	1 2 3 4 5 6 7 8
15. I sigh heavily or I have to catch my breath suddenly.	1 2 3 4 5 6 7 8
16. I have diarrhoea, intestinal cramps, or constipation.	1 2 3 4 5 6 7 8
17. I feel anxious, worried or distraught.	1 2 3 4 5 6 7 8
18. I startle easily; things or noises make me jump.	1 2 3 4 5 6 7 8
19. I take more than half an hour to fall asleep.	1 2 3 4 5 6 7 8
20. I feel confused; my thoughts are muddled; I lack concentration and I cannot focus my attention.	1 2 3 4 5 6 7 8
21. My facial features are drawn; I have bags or rings under my eyes.	1 2 3 4 5 6 7 8
22. I feel a great weight on my shoulders.	1 2 3 4 5 6 7 8
23. I feel restless; I need to move constantly; I cannot stay still.	1 2 3 4 5 6 7 8
24. I have difficulty controlling my reactions, emotions, moods or gestures.	1 2 3 4 5 6 7 8
25. I feel stressed.	1 2 3 4 5 6 7 8

Q2. Subjective appraisal of stressors (adapted from the Subjective Appraisal Rating Scale;
(Lemyre 1986)

SITUATION: RISK OF HAVING BREAST CANCER

Some women worry about the risk of having breast cancer. We would like to know how you perceive the RISK OF HAVING BREAST CANCER CURRENTLY. After each question, please circle the number which best describes your perception CURRENTLY.

On a scale of 1 to 8, where:

1	2	3	4	5	6	7	8
Not at all	Not really	Very little	A bit	Some- what	Quite a bit	Very much	Extremely

IN REGARDS TO THE RISK OF HAVING BREAST CANCER:

1. To which degree do you perceive this situation as having *impact* on your life currently? 1 2 3 4 5 6 7 8
2. To which degree do you perceive you *feel mastery* over this situation currently? 1 2 3 4 5 6 7 8
3. To which degree do you perceive *uncertainty* about this situation currently? 1 2 3 4 5 6 7 8

SITUATION: PERSONAL FINANCIAL STATUS

Concerning your PERSONAL FINANCIAL STATUS situation, we would like to know how you PERCEIVE your PERSONAL FINANCIAL STATUS situation CURRENTLY . After each question, please circle the number which best describes your perception CURRENTLY.

On a scale of 1 to 8, where:

1	2	3	4	5	6	7	8
Not at all	Not really	Very little	A bit	Some- what	Quite a bit	Very much	Extremely

IN REGARDS TO THE FINANCIAL STATUS:

1. To which degree do you perceive this situation as having *impact* on your life currently? 1 2 3 4 5 6 7 8
2. To which degree do you perceive you *feel mastery* over this situation currently? 1 2 3 4 5 6 7 8
3. To which degree do you perceive *uncertainty* about this situation currently? 1 2 3 4 5 6 7 8

Q2. Subjective appraisal of stressors (continued)

SITUATION: YOUR WORST CURRENT STRESSOR

Most people have a situation in their life which is a source of stress for them.

WHAT IS YOUR WORST CURRENT STRESSOR?: _____ ()

We would like to know how you PERCEIVE this YOUR WORST CURRENT STRESSOR situation CURRENTLY. After each question, please circle the number which best describes your perception CURRENTLY

On a scale of 1 to 8, where:

1	2	3	4	5	6	7	8
Not at all	Not really	Very little	A bit	Some- what	Quite a bit	Very much	Extremely

IN REGARDS TO YOUR WORST CURRENT STRESSOR (specify) _____ ():

1. To which degree do you perceive this situation as having *impact* on your life currently? 1 2 3 4 5 6 7 8
2. To which degree do you perceive you *feel mastery* over this situation currently? 1 2 3 4 5 6 7 8
3. To which degree do you perceive *uncertainty* about this situation currently? 1 2 3 4 5 6 7 8

Q3. Breast Screening Survey

Breast Screening Survey

Part 1. Breast Cancer Information

1. Which factors of the following list do you think may increase a woman's chance of getting breast cancer. Please circle the number 1 or 0 for each of the following items.

	uncertain	yes	no
a) family history of breast cancer	2	1	0
b) injury to the breast	2	1	0
c) age (women over 50)	2	1	0
d) birth control pills	2	1	0
e) hormone therapy for menopause (change of life)	2	1	0
f) obesity (being overweight).....	2	1	0
g) high alcohol consumption	2	1	0
h) high fat diet	2	1	0
i) having no children	2	1	0
j) having children after 30	2	1	0
k) late menopause (after 55)	2	1	0
l) other factors you are aware of:			

2. Which of the following symptoms do you believe may be associated with breast cancer? Please circle the number 1 or 0 for each of the following items.

	uncertain	yes	no
a) a lump in the breast	2	1	0
b) a change in the shape of the breast	2	1	0
c) a discharge or leakage from the nipple	2	1	0
d) an inverted nipple	2	1	0
e) a change in the appearance of the breast skin.	2	1	0

3. Which of the following events do you believe may cause changes in the breasts?

	uncertain	yes	no
a) menstrual cycle	2	1	0
b) menopause	2	1	0
c) pregnancy	2	1	0
d) diet and nutrition	2	1	0

4. There are many ways to detect breast cancer. Which of the following ways do you believe allow(s) for the early detection of breast cancer?

	uncertain	yes	no
a) breast self-examination	2	1	0
b) clinical breast exam (by health care professionals)	2	1	0
c) mammography (x-ray of the breast)	2	1	0
d) biopsy (to take a tissue sample)	2	1	0
e) surgery (lumpectomy or mastectomy)	2	1	0

5. Do you believe that maintaining good health habits (e.g. exercise, good nutrition, not smoking, etc.) is sufficient to protect you against breast cancer?

yes	no
1	0

6. According to you, at which time during the menstrual cycle do you believe a woman should perform breast self-examination?

	uncertain	yes	no
a) immediately before menstruation.....	2	1	0
b) immediately after menstruation	2	1	0
c) during menstruation	2	1	0
d) anytime during the cycle	2	1	0

7. According to statistics, what is the average number of years that a woman may survive after being diagnosed with breast cancer?

_____ year(s)

- 8a. What do you think are the chances that a woman will have breast cancer someday?

Using the scale below from 1 to 4, please circle the number which best represents your answer.

<u>Not at all</u> <u>likely</u> 1	<u>Not very</u> <u>likely</u> 2	<u>Somewhat</u> <u>likely</u> 3	<u>Very</u> <u>likely</u> 4
---	---------------------------------------	---------------------------------------	-----------------------------------

- 8b. More specifically, on a scale of 0 to 100%, what is the probability (risk) that a woman will someday have breast cancer?

_____%

Please also circle your response on the scale below.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

Part II. Personal Information

9. Have any of the people identified below that you know ever been diagnosed with breast cancer? Circle the number 1 or 0 for each individual. For those who have been diagnosed with breast cancer, please specify when the diagnosis was made.

	yes	no	when (month/year)
a) your biological mother	1	0	_____
b) your adoptive mother	1	0	_____
c) your sister (blood relative)	1	0	_____
d) your sister (not blood relative, e.g., adoption)	1	0	_____
e) your half sister	1	0	_____
f) your step sister	1	0	_____
g) your sister in law	1	0	_____
h) your aunt (blood relative)	1	0	_____
i) your aunt (by marriage)	1	0	_____
j) your cousin (blood relative)	1	0	_____
k) your cousin (not blood relative)	1	0	_____
l) close friend	1	0	_____
m) colleagues/acquaintance	1	0	_____
n) a neighbour	1	0	_____

10. Have you started your menopause (that is, have you stopped menstruating)?

If so, please specify at what age.

uncertain	yes	no	age
2	1	0	_____ years

11. Have you yourself ever found a lump in your breast? *If so, please indicate how many months ago.*

yes	no	number of months
1	0	_____

12. Has anyone else found a lump in your breast (doctor, partner, etc.)? *Please circle the number 1 or 0 for each individual. If a lump was found by an individual mentioned below, please specify how many months ago.*

	yes	no	number of months
a) general practitioner/ family doctor	1	0	_____
b) specialist (e.g. gynecologist, obstetrician, etc.)	1	0	_____
c) nurse	1	0	_____
d) partner/spouse	1	0	_____
e) friend or sister	1	0	_____
f) other, specify: _____			

13. How often do you examine your own breasts for lumps or irregularities? *Please circle the letter corresponding best to your behavior.*

- a) once a month
- b) every 2-6 months
- c) every 7-11 months
- d) once a year or less often
- e) never

14. Have you ever had any medical problems with your breasts?

yes	no
1	0

If so, please specify among the following items, what kind of problem(s) you had by circling the letter(s) corresponding best to your medical problem(s)

- a) cyst or lump
- b) tumour (not cancerous)
- c) malignant tumour/cancer
- d) pain/swelling
- e) breast feeding problems
- f) other (specify) _____

15. How tall are you?

_____ foot _____ inches or _____ cm

16. How much do you weigh?

_____ pounds or _____ kg

17. At approximately what age did you begin your menstruation? _____ years

18. How confident do you feel performing breast self-examination? Using the scale below from 1 to 4, please circle the number which best represents your answer.

Not at all
confident
1

Not very
confident
2

Somewhat
confident
3

Very
confident
4

19. How comfortable do you feel discussing breast screening, which refers to having a clinical examination of your breast and a mammogram with your doctor? Please circle the number which best represents your answer.

Not very
comfortable at all
1

Not very
comfortable
2

Comfortable
3

Very
comfortable
4

20. Have you ever smoked (cigarettes, cigars or pipe)?
Please, circle number 1 or 0.

yes no
1 0

a) If so, please indicate for how many years?

_____ number of years

b) On average, how many cigarettes per day?

_____ number of cigarettes/day

c) Are you still smoking?

yes no
1 0

21. On average, how many alcoholic beverages do you drink per week?

_____ number of
glasses/week

22. Do you exercise regularly (e.g., swimming, jogging, aerobic classes, walking, etc.)?

a) If so, please specify the number of minutes per week and the type of activity?

yes no _____ minutes/
1 0 week

b) type of activity _____

23. Do you see yourself as overweight? If so, please indicate what your ideal weight would be.

yes no ideal
weight
(pounds)
1 0 _____

24. Do you see yourself as too thin? If so, please indicate what your ideal weight would be.

yes no ideal weight
(pounds)
1 0 _____

25. Have you ever been pregnant? If so, indicate the number of pregnancies.

yes	no	no. of pregnancies
1	0	_____

- a) Number of live birth(s): _____
 b) Number of children breast-fed: _____
 c) Length of breast-feeding _____ months

26. On a scale of 1 to 7, how would you describe the size of your breast in relation to the average women of your age? Please circle the number which best describes you.

<u>Very small</u>			<u>Average size</u>			<u>Very large</u>
1	2	3	4	5	6	7

27. On a scale of 1 to 7, how would you describe the firmness of your breast in relation to the average women of your age? Please circle the number which best describes you.

<u>Not Very firm</u>			<u>Average firmness</u>			<u>Very firm</u>
1	2	3	4	5	6	7

28. On a scale of 1 to 7, how often do you wear a bra?

<u>Never</u>			<u>Half of the time</u>			<u>Always</u>
1	2	3	4	5	6	7

29. What is your bra size (ex. 36 C)? _____ (number) _____ (letter)

30a. What do you think your chances are that you personally will have breast cancer someday? Please circle the number which best represents your answer.

<u>Not at all likely</u>	<u>Not very likely</u>	<u>Somewhat likely</u>	<u>Very likely</u>
1	2	3	4

30b. More specifically, on the following scale from 0 to 100%, what do you believe is the probability (risk) that you will one day have breast cancer? _____ (%)
 Please also circle your response on the scale below.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

31. In the last year, have you seen a health professional for a medical examination (check-up)?

yes	no
1	0

32. In the last year, have you had:

	yes	no
a) a clinical breast exam.....	1	0
b) a gynecological exam (pap-test and pelvic exam).....	1	0

33. Has your doctor prescribed hormones for you (e.g. oestrogens or progestine tablets) after menopause (that is, after you have stopped menstruating)?

yes	no
1	0

34. Do you believe that if you are currently in good physical and mental health, your chances of one day having breast cancer are almost nil?

yes	no
1	0

35. Do you visit your dentist annually (denturologist, hygienist, etc.) for a cleaning or a dental examination (check-up)?

yes	no
1	0

36. From which sources did you receive information about breast screening mammography)? For each of the following items, please circle 1 or 0.

	yes	no
a) obstetrician/gynecologist (medical specialist).....	1	0
b) medical students (interns, residents)	1	0
c) general practioner (family physician)	1	0
d) friends	1	0
e) parents or relatives	1	0
f) radio/television	1	0
g) magazines, newspaper, pamphlets	1	0

37. On a scale from 1 to 7, how often do you wear your seat belt when in a car? Please indicate your position on the scale below by circling the number that describes best this frequency.

<u>Never</u>			<u>Half of the time</u>			<u>Always</u>
1	2	3	4	5	6	7

The following is a list of some concerns women have reported about going for a mammogram.

On the scale of 1 to 4, please indicate the extent to which you are concerned about:

<u>Extremely Concerned</u>	<u>Quite Concerned</u>	<u>Slightly Concerned</u>	<u>Not at all Concerned</u>
1	2	3	4

38. feeling embarrassed	1	2	3	4
39. feeling pain	1	2	3	4
40. radiation from the breast x-ray	1	2	3	4
41. the time it takes to go for screening	1	2	3	4

(continued next page)

The following are some statements women have made about breast screening and treatment for breast cancer.

Please indicate the extent to which you agree with each statement by circling on the scale from 1 to 4, the number which best corresponds to your opinion.

Strongly
Agree
1

Agree
2

Disagree
3

Strongly
Disagree
4

- | | | | | |
|---|---|---|---|---|
| 42. Screening would make me worry unnecessarily about cancer. | 1 | 2 | 3 | 4 |
| 43. Screening could save my life. | 1 | 2 | 3 | 4 |
| 44. My family would approve of this. | 1 | 2 | 3 | 4 |
| 45. I'm afraid of finding something wrong. | 1 | 2 | 3 | 4 |
| 46. It's too much trouble. | 1 | 2 | 3 | 4 |
| 47. Screening would increase my chances of cure if I did have cancer. | 1 | 2 | 3 | 4 |
| 48. Screening doesn't apply to me. | 1 | 2 | 3 | 4 |
| 49. Screening would give me peace of mind. | 1 | 2 | 3 | 4 |
| 50. Mammography is useless if you perform breast self-examination. | 1 | 2 | 3 | 4 |
| 51. Mammography is useless when you visit your doctor annually for a physical breast examination. | 1 | 2 | 3 | 4 |
| 52. Mammography is useless because I am too young. | 1 | 2 | 3 | 4 |
| 53. Mammography is useless given that you can notice anything abnormal with your breast when taking a shower or a bath. | 1 | 2 | 3 | 4 |
| 54. Mammography is useless given that you or your partner can notice anything abnormal with your breast during sexual activities or while being intimate. | 1 | 2 | 3 | 4 |
| 55. I would be willing to pay for a mammography. | 1 | 2 | 3 | 4 |
| 56. I believe treatments (e.g., radiation treatment, chemotherapy) for breast cancer are <i>effective</i> . | 1 | 2 | 3 | 4 |
| 57. I believe treatments (e.g., radiation treatment, chemotherapy) for breast cancer are <i>unpleasant</i> . | 1 | 2 | 3 | 4 |
| 58. Access to a medical clinic is <i>difficult</i> for me. | 1 | 2 | 3 | 4 |
| 59. Mammography is useless because I am too old. | 1 | 2 | 3 | 4 |
| 60. Mammography is useless because I am too healthy. | 1 | 2 | 3 | 4 |

61. In the last two years, have you had a mammography (x-ray of the breast)?

yes	no	number of months
1	0	_____

62. If you answered no to question 61 what reason(s) would you give for not having had a mammography in the last two years?

63. On a scale of 1 to 4, what is your intention to arrange to have a mammogram over the next two years. Please *circle* the number that corresponds the best to the *likelihood* of that behavior.

Not at all
likely
1

Not very
likely
2

Somewhat
likely
3

Very
likely
4

Demographic Information

Please indicate:

a) Age: _____ years

b) Current civil status: 1. married _____ 4. single _____
2. cohabiting (common law spouse) _____ 5. widow _____
3. separated or divorced _____ 6. other (specify) _____

c) Total number of completed years of education: _____ years (1st grade at elementary level)

d) Personal Annual Income: (please circle one)

1) 0 to \$9,999	5) 25 to \$29,999
2) 10 to \$14,999	6) 30 to \$39,999
3) 15 to \$19,999	7) 40 to \$49,999
4) 20 to \$24,999	8) \$50,000 and more

e) If applicable, spouse's Annual Income: (please circle one)

1) 0 to \$9,999	5) 25 to \$29,999
2) 10 to \$14,999	6) 30 to \$39,999
3) 15 to \$19,999	7) 40 to \$49,999
4) 20 to \$24,999	8) \$50,000 and more

f) Number of paid worked hours per week: _____

g) Main Occupation: _____

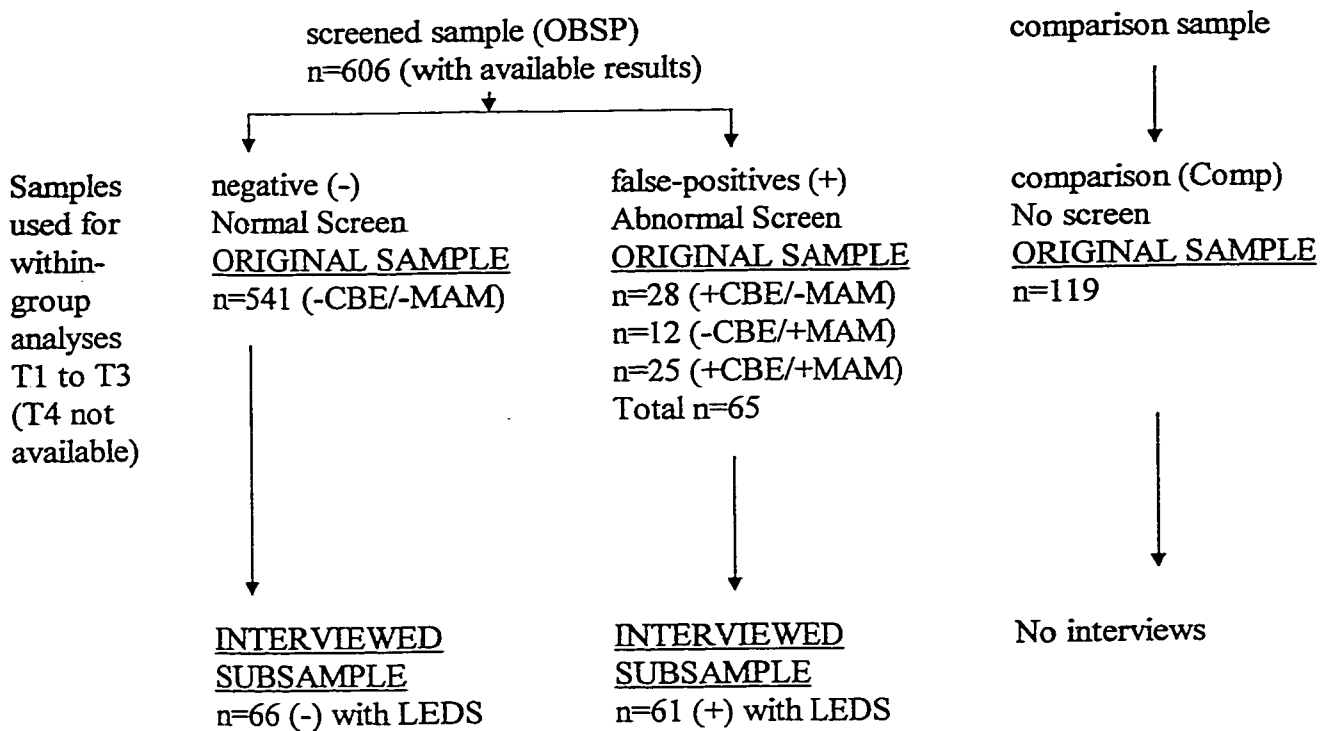
h) Number of children living at home: _____

i) Simply for the sake of pairing future questionnaires please enter your date of birth in the following sequence:

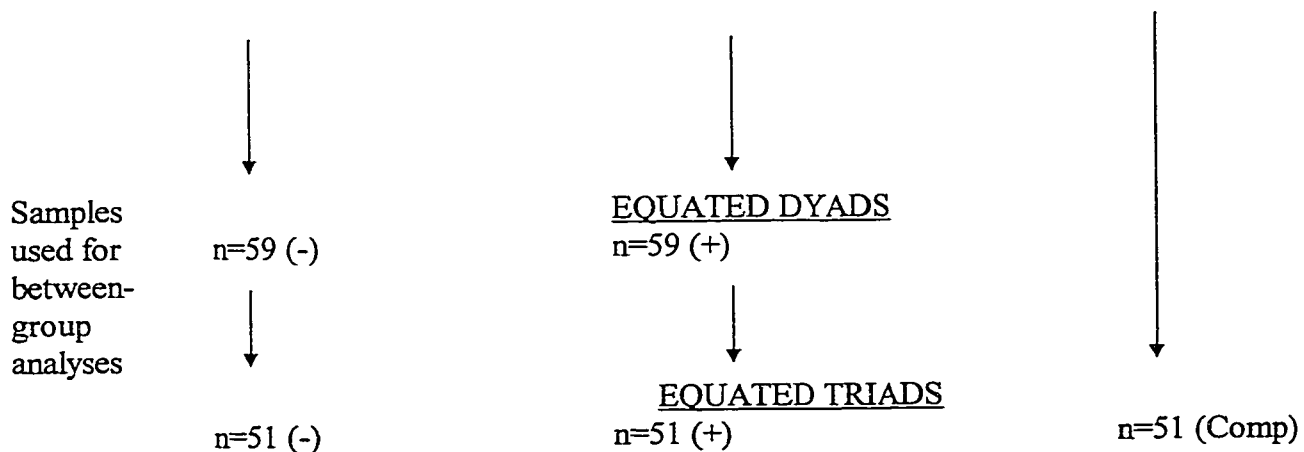
____ D ____ D ____ M ____ M ____ Y ____ Y

(day/month/year)

Appendix B
Flowchart of sample and subsample sizes



Group equivalency



Appendix C

Comparison between balanced subsamples of negatives and original samples

Table C1

Means and Standard Deviations of Subsample of Negatives Selected for Equating Triads and Those Non-selected from Original Sample on Psychological Stress and Appraisals at the Three Initial Time Points

Variable/Group	Time 1	Time 2	Time 3
<i>Stress</i>			
Non-selected	67.99 (28.26)	64.15 (29.48)	63.94 (28.85)
Selected	71.93 (32.81)	64.38 (32.36)	67.08 (29.46)
p value	.38	.96	.49
<i>Appraisals</i>			
Perceived Impact			
Non-selected	3.06 (1.76)	2.94 (1.76)	2.84 (1.69)
Selected	2.93 (1.43)	2.90 (1.59)	2.71 (1.53)
Perceived Mastery			
Non-selected	4.38 (2.01)	4.63 (1.95)	4.80 (1.94)
Selected	4.60 (1.78)	4.90 (1.72)	4.86 (1.67)
Perceived Uncertainty			
Non-selected	3.44 (1.71)	3.26 (1.73)	3.00 (1.67)
Selected	3.66 (1.37)	3.22 (1.47)	3.06 (1.57)
Wilks' p value	.41	.85	.71

Table C2

Means and Standard Deviations of subsample of Negatives Selected for Equating Dyads and Those Non-selected from Original Sample on Psychological Stress and Appraisals at the Three Initial Time Points

Variable/Group	Time 1	Time 2	Time 3
<i>Stress</i>			
Non-selected	68.22 (28.05)	64.14 (29.32)	64.23 (28.49)
Selected	70.23 (32.28)	64.35 (33.01)	64.01 (32.34)
p value	.60	.96	.95
<i>Appraisals</i>			
Perceived Impact			
Non-selected	3.07 (1.75)	2.96 (1.77)	2.84 (1.71)
Selected	2.87 (1.64)	2.86 (1.52)	2.75 (1.43)
Perceived Mastery			
Non-selected	4.39 (2.02)	4.68 (1.94)	4.81 (1.94)
Selected	4.41 (1.78)	4.33 (1.90)	4.74 (1.76)
Perceived Uncertainty			
Non-selected	3.48 (1.70)	3.28 (1.75)	3.01 (1.68)
Selected	3.36 (1.55)	3.02 (1.41)	3.09 (1.59)
Wilks' p value	.86	.30	.87

Appendix D

Test-retest reliability for the subjective appraisal items related to breast cancer screening

Table D1

Coefficients of Test-retest Reliability Over 1 Day, 20 Days and 90 Days on Appraisals of the Risk of Breast Cancer

	OBSP sample	Negatives	False-positives	Comparison sample
One day test-retest				
Percvd Impact	.54 ***	.72 ***	.47 **	n/a
Percvd Mastery	.49 ***	.49**	.48 **	n/a
Percvd Uncertainty	.38 ***	.30 *	.42 *	n/a
20-day test-retest				
Percvd Impact	.45 ***	.68 ***	.36 *	n/a
Percvd Mastery	.42 ***	.59 ***	.29 *	n/a
Percvd Uncertainty	.33 **	.41 **	.28 *	n/a
90-day test-retest				
Percvd Impact	.48 ***	.49**	.48 ***	.59 ***
Percvd Mastery	.28 **	.22	.35 **	.30 *
Percvd Uncertainty	.26 **	.28	.25	.46 ***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Appendix E

Analyses related to the verification of the reliability of our findings

Table E1.

Multivariate Analysis of Variance for Financial Situation.

Source	<u>df</u>	Wilks'*	p
Group	3, 490	.99	.68
Time	6, 487	.99	.64
Group x Time	6, 487	.99	.72

Note. * All univariate tests were also non-significant.

Appendix F

Data screening for Anova and Manova

The use of Anova and Manova requires that data be screened to ensure all assumptions inherent to analysis of variance have been respected. A check on the accuracy of data entry, missing data, skewness and kurtosis for the data set was done using STATISTICA DESCRIPTIVES. The minimum and maximum values, means and standard deviations of each of the variables was inspected for plausibility. All values were reasonable and within expected limits.

Univariate and multivariate outliers. Casewise residuals were examined to identify potential univariate outliers. Cases with standardized scores in excess of ± 3.00 are deemed potential outliers. In this data set, no univariate outliers were identified. Mahalanobis distances were examined to identify potential multivariate outliers. Mahalanobis distances are interpreted as a chi-square with degrees of freedom equal to the number of independent variables (4 in this case). Cases with Mahalanobis distances greater than $X^2_{(4)} = 13.27$ were considered to be multivariate outliers and thus eliminated from subsequent analyses.

Normality. Univariate normality was assessed by examining the skewness and kurtosis of the measured variables. Muth  n and Kaplan (1985) argue that data can be considered to be normally distributed if mean skewness and kurtosis fall between -1.0 and 1.0. As this was the case, data were considered to approximate a normal distribution.

Linearity. Linearity among pairs of variables is assessed through inspection of plots of predicted versus residual scores. A visual inspection reveals a homogeneous cloud which does not suggest any marked departure from linearity (Statistica, 1994).

Appendix G

Summary of concurrent regression analyses

Summaries of concurrent regression analyses are presented in table format. Each table represents a separate analysis.

Table G1

Standard Multiple Regression of Stress at Time 1 on Appraisals at Time 1.

Variables	<u>B</u>	<u>SE B</u>	β	<u>p</u>
IMP1	1.31	.83	.08	.11
MAS1	-1.09	.59	-.08	.07
UNC1	3.12	.86	.19	.001

Note. $R^2 = .07$, $p < .01$; $n = 523$; IMP=perceived impact, MAS=perceived mastery, UNC=perceived uncertainty.

Table G2

Standard Multiple Regression of Stress at Time 2 on Appraisals at Time 2.

Variables	<u>B</u>	<u>SE B</u>	β	<u>p</u>
IMP2	2.80	.85	.17	.001
MAS2	-.75	.66	-.04	.25
UNC2	3.29	.87	.19	.001

Note. $R^2 = .11$, $p < .01$; $n = 513$; IMP=perceived impact, MAS=perceived mastery, UNC=perceived uncertainty.

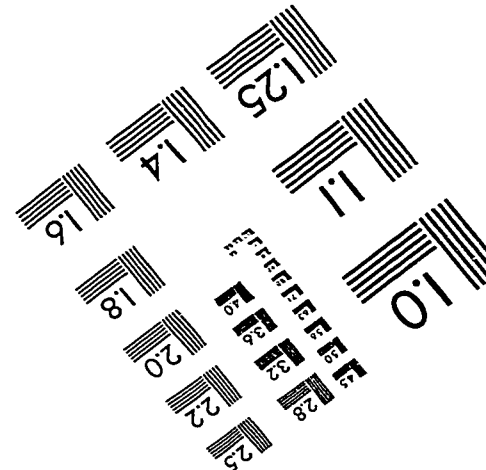
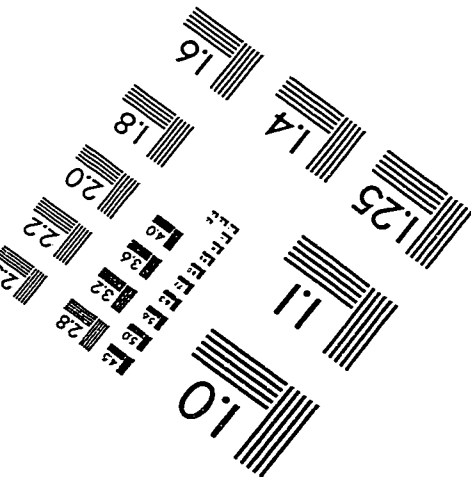
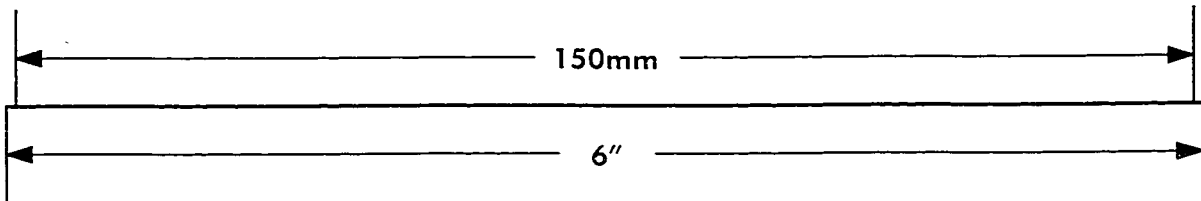
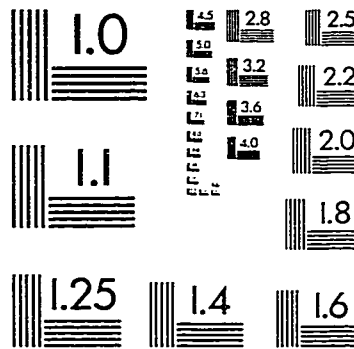
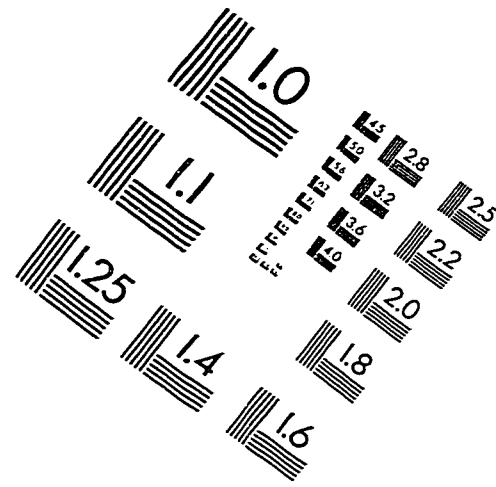
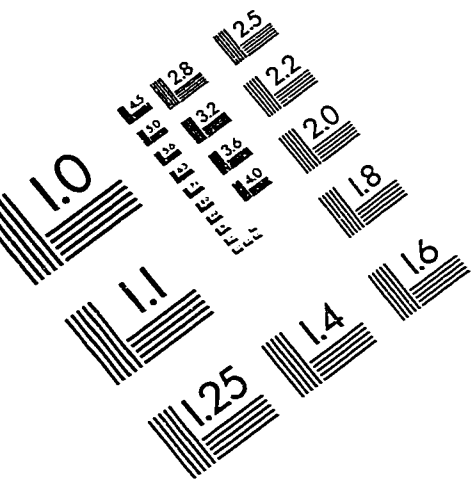
Table G3.

Standard Multiple Regression of Stress at Time 3 on Appraisals at Time 3.

Variables	<u>B</u>	<u>SE B</u>	β	<u>p</u>
IMP3	2.97	.86	.17	.001
MAS3	-1.34	.65	-.09	.03
UNC3	1.42	.88	.08	.11

Note. $R^2 = .07$, $p < .01$; $n = 539$; IMP=perceived impact, MAS=perceived mastery, UNC=perceived uncertainty.

IMAGE EVALUATION TEST TARGET (QA-3)



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