
Appraisals, Coping, and Stress in Breast Cancer Screening: A Longitudinal Investigation of Causal Structure

LISA SWEET, Royal Ottawa Health Care Group
JO ANNE SAVOIE and LOUISE LEMYRE, University of Ottawa

Abstract

The cognitive-appraisal model of Lazarus and Folkman (1984) is one of the most prominent theories of stress. As integral elements in this model, Appraisal and Coping have both been proposed as mediators of the stress response. The purpose of this study was to test the predictive power of the theoretical model based on two competing formulations using structural equation modeling techniques. One conceptual model proposed that coping influences stress through appraisal; the other proposed that appraisals impact on stress via coping. Women ($n = 506$) undergoing breast cancer screening completed measures of appraisal, coping, and stress. Support was found for both hypothesized causal structures. The implications of these findings are discussed in terms of Lazarus' theoretical perspective.

Résumé

Le modèle d'évaluation cognitive de Lazarus et Folkman (1984) est une des principales théories sur le stress. Deux de ses éléments propres, l'évaluation et l'adaptation, ont été proposés comme médiateurs de la réaction au stress. La présente étude visait à tester l'efficacité prédictive du modèle théorique d'après deux formulations différentes, au moyen de techniques de modélisation par équation structurelle. Un modèle conceptuel proposait que l'adaptation influe sur le stress au moyen de l'évaluation; l'autre proposait que les évaluations influent sur le stress par l'entremise de l'adaptation. Les femmes ($n = 506$) subissant un test de dépistage du cancer du sein ont répondu à des questions visant à mesurer l'évaluation, l'adaptation et le stress. Les résultats corroborent les deux structures causales hypothétiques. Les conséquences de ces conclusions sont exposées dans le cadre de la perspective théorique de Lazarus.

As a core element in many theoretical models, the topic of stress remains the target of much academic debate. One area of particular interest involves the relationship

between stress and health. Despite evidence to support the relationship, many questions remain unanswered as to the correlates and predictors of stress (Aldwin, 1994; Folkman, Lazarus, Gruen, & DeLongis, 1986), and among them, the sequential pattern of influences.

One of the most popular theories in the area of stress research, certainly in terms of citation, is the Cognitive Theory of Stress and Coping developed by Lazarus and Folkman (1984). For Lazarus and Folkman (1984), the interaction between the environment and the individual defines stress. Stress is experienced when demands from the environment exceed available resources, and the mediating processes of appraisal and coping therefore become crucial. Appraisal is also presented as a perpetual process, evolving in time as the individual re-appraises the stressor. Following a brief overview of the studies investigating the principle components of the cognitive-appraisal framework, two competing models are presented and tested.

The cognitive-appraisal model

Lazarus and Folkman (1984) argue that cognitive appraisals and coping are pivotal in our understanding of stress. More specifically, they present both these processes as mediators of the stress response (Folkman, 1984; Lazarus, 1993). Within this framework, cognitive appraisal is the "process of categorizing an encounter, and its various facets, with respect to its significance for well-being" (Lazarus & Folkman, 1984, p.31). According to Lazarus and Folkman (1984), appraisals are either primary, when the person evaluates the implications of the stressor, or secondary, when the evaluation entails what can be done to deal with the situation. Coping as a process involves some form of thought, action or feeling that is used, modified or eliminated to deal with an event that elicits some form of psychological stress (Lazarus & Folkman, 1984).

The relationship between coping and adaptation

Attempts to develop a parsimonious taxonomy of coping

strategies have led to several classifications of these behaviours, thoughts and feelings. The most common taxonomies include dichotomous classifications such as emotion-focused and problem-focused (Folkman & Lazarus, 1980), engagement or disengagement (Tobin, Holroyd, Reynolds, & Wigal, 1989), and avoidance and approach coping (Suls & Fletcher, 1985). Similarly, Endler and Parker (1990, 1994) have identified three styles of coping: task oriented, emotion oriented, and avoidance-oriented.

Authors have used different labels to describe what are conceptually analogous types of coping behaviour. For instance, problem-focused, task-oriented, engagement and approach coping categories represent strategies such as problem solving and seeking social support, which are characterized as active and usually inferred as adaptive ways of dealing with a stressor. On the other hand, emotion-focused, emotion-oriented, disengagement and avoidance coping strategies (e.g., denial or distancing) draw attention away from the stressor. It seems as though coping efforts that draw attention away from the stressor can be considered avoidant-type efforts whereas those that channel efforts toward the stressor can be regarded as approach-type strategies (Suls & Fletcher, 1985).

Many investigators have studied the efficacy of coping in enhancing or preserving well-being. Despite agreement that specific coping can influence one's level of well-being, the strategies responsible for these fluctuations have varied from study to study. Findings suggest that avoidant-type coping strategies (e.g., denial and wishful thinking) are positively correlated with levels of psychological and physical symptoms (Commerford, Gular, Orr, Reznikof, & O'Dowd, 1994; Dunkel-Schetter, Feinstein, Taylor, & Falke, 1992; Gass & Chang, 1989; Kenlder, Kessler, Heath, Neale, & Eaves, 1991). On the other hand, approach-type coping strategies have often been associated with decreased levels of symptoms (Dunkel-Schetter et al., 1992; Folkman & Lazarus, 1985). As such, keeping avoidance and approach strategies as distinct forms of coping may help to examine the role of different strategies in psychological stress.

The relationship between appraisals and adaptation

There also exists considerable empirical evidence supporting the relationship between appraisals and adaptation. Researchers have studied the relationship between a vast array of appraisals (e.g., including impact, importance, negativity, threat, control or mastery or competence, un/desirability, un/predictability, ambiguity, and uncertainty), and the person's physical or mental well-being (Folkman, Lazarus, Gruen, & DeLongis, 1986; Gall & Evans, 1987). On conceptual and empirical grounds, the apparently heterogeneous appraisals seem to reflect

three main cognitive dimensions: perceived impact, perceived mastery, and perceived uncertainty (Biron, Truchon, & Lemyre, 1992; Fillion, 1993; Karasawa, 1995; Lemyre, 1986; Lemyre & Tessier, 1988). Perceived impact relates to the individual's evaluation that a stressor affects his/her current life or future aspirations. It includes appraisals related to perceived threat, importance, desirability, and negativity of the stressor. Perceived mastery, the notion that one can influence the course of the stressor, reflects the cognitive dimensions of personal competence and control. Finally, perceived uncertainty is defined as the person's perception of a situation as being ambiguous, unfamiliar or lacking in information. It includes cognitive appraisals such as predictability, certainty, and familiarity (Lemyre, 1986).

Findings show that events perceived as stressful typically comprise elements of impact and undesirability (Vinokur & Selzer, 1975). In contrast, thinking of an event as an opportunity, instead of perceiving undesirable impact, is associated with reduced emotional distress (Mishel & Sorenson, 1991). Overall, an enhanced sense of personal control (mastery) is related to decreased stress (Felsten, 1991; Prince-Embury, 1992), as well as better somatic health (Folkman et al., 1986). In addition, events that are perceived as uncertain are generally regarded as being quite stressful (Davis, 1990; Ham & Larson, 1990; Tomaka, Blascovich, Kelsey, & Leiten, 1993). This sense of uncertainty can lead to problems in adjustment (Christman, 1990). On a more global level, a situation that is appraised negatively will be viewed as holding more impact and uncertainty with less opportunity for mastery.

The relationship between coping and appraisals

The relationship between coping and appraisals has also been empirically investigated. Because traditional accounts of the cognitive-appraisal model suggest that appraisal of a situation precedes coping efforts, most investigations have focused on the extent to which cognitive appraisals are useful in the prediction of coping strategies (e.g., Bjorck & Cohen, 1993; Davey, 1993; Valentiner, Holohan, & Moos, 1994). Studies have consistently shown that appraisals play an important role in the moderation of various coping strategies (Carver & Scheier, 1994; Folkman & Lazarus, 1985; Stanton & Snider, 1993). For instance, coping strategies that involve approaching the stressor (i.e., more active, problem-focused efforts) are often associated with appraisals of perceived impact. When less mastery is perceived (i.e., the situation is deemed less controllable), symptomatology may be increased if the person uses an approach-type strategy (e.g., try to change the situation) (Forsyth & Compas, 1987). It has also been proposed that high degrees of uncertainty decrease the likelihood that

individuals will engage in direct action (i.e., they will rely less on approach-type strategies) (Mishel, 1981).

In Lazarus' more contemporary work on stress, however, coping is considered to be an antecedent to appraisal. That is, "...coping shapes emotion, as it does psychological stress, by influencing the person-environment relationship and how it is appraised" (Lazarus, 1993, p.16). Even though debate remains about the details of the appraisal patterns and their link to emotions or other outcomes (Smith & Lazarus, 1993), the findings reviewed above clearly indicate that coping and appraisal are somehow interrelated and that both are associated with psychological stress. For the most part, studies that examine the relationship between appraisal and coping have tended to be correlational, making it difficult to disentangle the reciprocal effects of appraisal and coping. The direction of these relationships, therefore, remains unclear.

There seem to be two distinct conceptual descriptions of the relationships among coping, appraisal, and stress. The more traditional accounts suggest that coping mediates the effects of appraisals on stress. In contrast, more contemporary descriptions claim that appraisals are the most proximate "cause" of emotions and that appraisals mediate the effects of coping on stress. Most of the research done to date has been based on the traditional description of the cognitive-appraisal model. That is, investigators have sought to understand how cognitive appraisals can predict the choice of coping strategies, often neglecting the alternate formulation. As such, an important initial step in disentangling these relationships is to contrast empirically both of these distinct formulations. Only then will it become possible to expand the conceptual model to include elements such as re-appraisal and the reciprocal relationship that this entails. Although a fully randomized experimental design is not readily possible in a real-life setting, the use of a more powerful statistical approach, such as Structural Equation Modeling (SEM), could offer a solid empirical foundation on which to rest these theoretical models, especially if based on longitudinal data.

Accordingly, the objective of this study is to test the relations among the three principal variables of the cognitive-appraisal model, coping, appraisal, and stress, using SEM techniques. Although SEM cannot test formally causal relationships, it can indicate support for causal models. The study was conducted in the context of women undergoing breast cancer screening. Research has shown a relationship between undergoing screening and increased emotional distress (Wardle & Pope, 1992). However, there is minimal understanding of the mechanisms by which some individuals participating in breast screening are distressed by the process while others are not (Marteau, 1994). Therefore, it constitutes an ideal

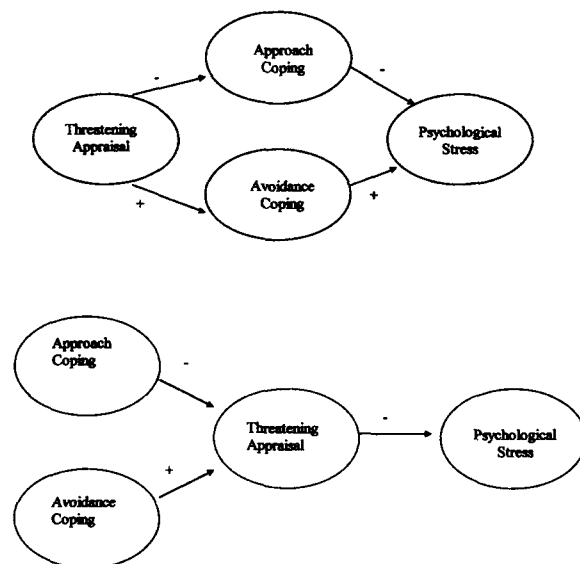


Figure 1. Conceptual models of appraisal, coping, and stress: (A) Traditional model (upper diagram) and (B) Revised Stress model (lower diagram).

setting for the study of appraisals, coping, and stress as one deals with a potentially severe health threat, an ongoing process and a non-clinical sample.

Based on Lazarus and Folkman's (1984) theoretical framework, two alternative conceptual models were tested. Our test of these models went beyond most work done by others because our test used a longitudinal design. We examined appraisals, coping, and stress throughout the screening (Time 1) and 20 days later (Time 2) once results were known. Thus, it is believed that the results of this study can significantly enhance our understanding of the relationships among appraisals, coping, and stress.

The first model (Model A), based on the more traditional account of the cognitive-appraisal model, is presented in Figure 1. As indicated by the paths in the model, it is hypothesized that appraisals, measured in terms of perceived impact, perceived mastery, and perceived uncertainty, will relate negatively on approach-type coping, but positively on avoidance-type coping. In other words, when the individual perceives little mastery and evaluates the stressor as being uncertain and as having impact (a high level of threatening appraisal), she is more likely to engage in avoidant-type coping and less likely to adopt approach-type coping strategies. In turn, high use of approach-type coping is hypothesized to lead to low levels of psychological stress, whereas high levels of avoidance-type coping are expected to result in elevated levels of psychological stress.

An alternative model (Model B), based on the more contemporary revised formulation of Lazarus' theory, allows us to hypothesize that coping strategies

(approach-type and avoidance-type) will be directly related to the appraisal of the stressor. Appraisals, in turn, will have an impact on the degree of stress reported by the individual. Thus, as argued by Lazarus (1993), the effect of coping on stress will be mediated by the person's appraisal of the stressor, and no direct relation between coping efforts and stress is postulated. A diagram of Model B is presented in Figure 1. It is hypothesized that approach-type coping is negatively associated with appraisal, whereas avoidance-type coping should have a positive association with appraisal. In other words, individuals who approach a stressor will subsequently report more perceived mastery and less perceived uncertainty and perceived impact (low levels of threatening appraisal) than those who engage in more avoidant coping efforts. In turn, high levels of perceived uncertainty and perceived impact, coupled with low perceived mastery (high levels of threatening appraisal), are expected to be associated with higher levels of psychological stress.

METHOD

Participants

Participants ($n = 826$) were women aged 50 years and over who were recruited as they attended the Ontario Breast Screening Program (OBSP). To be eligible for the OBSP, women needed to be residents of the province of Ontario, have no history of breast malignancy, have no history of breast augmentation, and have no acute breast symptoms. Women who had a breast lump or a benign breast biopsy in the past were included in the sample. Women also had to be proficient in either official language (English or French). The majority of women expressed a preference for English (91%). Relying on statistics provided by the OBSP, it was shown that the language distribution of our sample was comparable to that of the clientele seen at the OBSP ($\chi^2 = .53, p < .46$). Anglophones and Francophones were not different on demographic variables such as age and education (Wilks' = .99, $p > .24$), nor on income level ($\chi^2_{(1,47)} = 1.62, p > .20$). Multivariate analyses confirmed that Anglophone and Francophone women were not different on appraisals and stress at Time 1 (Wilks' = .99, $p > .90$) or at Time 2 (Wilks'.99, $p > .70$) (Sweet, 1998), nor were they different in the use of stress and coping strategies at Time 1 (Wilks' = .86, $p > .05$) or Time 2 (Wilks' = .84, $p < .06$) (Savoie, 1999). Therefore, data from Anglophones and Francophones were pooled.

Information pertaining to screen status could have a major effect on stress levels. Therefore, to ensure that models were tested on homogeneous samples of normal results and to avoid the potentially confounding effect of an abnormal screen result, those women informed of an abnormal screen result ($n = 70$) were removed from the

data set, as were 36 cases for whom results were not known at Time 2. An additional 158 cases could not be included in the analyses as they had not completed measures at both times. Such attrition is not uncommon in longitudinal investigations, especially since women were required to wait 20 days before completing the second evaluation. Consequently, the analyses were done on a sample of 562 cases, which represented a high percentage (68%) of the original sample. There were no significant differences between cases removed and those retained on age ($t = .98, p > .33$), education ($t = .42, p > .15$), marital status ($\chi^2_{(10,788)} = 5.21, p < .80$), or income ($\chi^2_{(14,695)} = 14.47, p < .40$).

So that the two competing models could be tested on independent samples, the remaining 562 women were randomly divided into two subsamples using a table of random numbers. Participants were aged between 50 and 83 years ($M = 60, SD = 7.0$). Of these, 73% were married or co-habiting with a partner, 11% were divorced, 6% were single, and 10% were widowed. Participants reported an average of 14 years of education ($SD = 3.20$) with a range of 7 years to 29 years.

Measures

The questionnaire used in the study incorporated versions of three pre-validated psychological scales: the Psychological Stress Measure (PSM; Lemyre, Tessier, & Fillion, 1991), the Subjective Appraisal Rating Scale (SARS; Lemyre, 1986), as well as the COPE (Carver, Scheier, & Weintraub, 1989).

Psychological stress. Most researchers agree that stress is multifaceted and is often manifest at three levels: physical, behavioural, and cognitive (Lazarus & Folkman, 1984; Lemyre, 1986; Lemyre et al., 1991; Selye, 1956). Psychological stress was assessed with the Psychological Stress Measure, a self-report instrument which evaluates the subjective experience of feeling stressed over the last four or five days (Lemyre, 1986; Lemyre & Tessier, 1988; Lemyre et al., 1991). The instrument was originally developed in French and has since been translated and validated in English. Both English and French versions have been found to have similar psychometric profiles (Lemyre, Tessier, & Fillion, 1991). The PSM is designed for use with a normal population and provides information on the somatic, cognitive-affective, and behavioural aspects of the subjects' perceptions of their stress state. Studies have shown the psychometric soundness of this instrument. Construct validity for the PSM was verified by demonstrating its capacity to distinguish between differential stress levels (Fillion, 1993; Lemyre, 1986). Concurrent validity between the PSM and salivary/serum immunoglobulin has also been demonstrated (Fillion, Tessier, Tawadros, & Mouton, 1989). Findings show that the PSM has good convergent validity with the Brief

Symptom Inventory ($r = .76$), the Beck Depression Inventory ($r = .75$), and with Spielberger's anxiety scale (State subscale $r = .73$) (Dion, 1988; Lemyre et al., 1991). The developers also provide two short versions of the PSM. These short versions are highly correlated with the original PSM (.98) (Lemyre et al., 1991). Both short versions were found that have the same psychometric qualities as the original version (Lemyre, 1986). For these shorter versions, test-retest reliability is moderately satisfactory at .56 and .65 over a six-month period for versions A and B, respectively (Lemyre, 1986; Lemyre et al., 1991).

Since the PSM provides information on the somatic, cognitive-affective, and behavioural aspects of the stress state, three indicators of stress were created by combining the appropriate items. Using one of the validated abbreviated versions of the PSM (Lemyre et al., 1991) a total of eight items comprised the somatic indicator, nine items comprised the cognitive-affective indicator, and eight items comprised the behavioural indicator of stress. All scales were found to have high internal consistencies: .80 for the somatic indicator, .78 for the behavioural indicator, and .90 for the cognitive indicator. Subscale means were used as indicators in the current model.¹

Subjective appraisal of stressors. Subjective appraisal of the stressors are measured using an abridged version of the Subjective Appraisal Rating Scale (SARS) (Lemyre, 1986). This measure was originally developed in French and was subsequently translated in English using the reverse-translation method. Both versions have been found to have similar psychometric qualities (Biron, 1992; Fillion, 1993). The original SARS consists of 10 items rated from 1 to 8 (Likert scale) designed to assess subjects' appraisals of a specific stressful event in terms of negative consequences, positive consequences, loss, danger, failure, challenge, control, coping capability, 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 of unknown and unpredictability; and c) perceived mastery, representing the dimensions of personal competence and control (Biron et al., 1992; Fillion et al., 1989; Lemyre, 1986). Together, these factors explain approximately 60% of the variance in appraisals (Fillion, 1993; Lemyre, 1986). The abridged version of the SARS used in this study consisted of three items pertaining to the perceived impact, perceived mastery and perceived uncertainty of the stressor.

For the present study, the situation chosen as the target stressor to be appraised was the "risk of breast

cancer." The items, formulated on conceptual grounds, were based on the broad cognitive dimensions discussed above. The items were presented in the following manner: "To which degree do you perceive this situation as having an impact on your life currently," "To which degree do you perceive you feel mastery over this situation currently," and "To which degree do you perceive uncertainty about this situation currently?" Items were rated on an 8-point Likert scale, ranging from "Not at all" (1) to "Extremely" (8). A high score on appraisals is indicative of more threatening appraisal (high impact and uncertainty, with low mastery). Past studies have shown test-retest reliability values of .83, .79, and .78 over a two-week delay for dimensions of perceived impact, mastery, and uncertainty (Fillion, 1993). For individual items of perceived impact, mastery, and uncertainty, 20-day test-retest values were .68, .59, and .41, respectively (Sweet, 1998). While it is recognized that some of these values are low, this is not unexpected when using single-item indices.

Coping. The COPE scale, developed by Carver and colleagues (1989), was used to measure coping strategies. This instrument comprises 54 items rated on a 4-point Likert scale ranging from "I do not do this at all" (1) to "I do this a lot" (4). A total of 13 strategies are said to be represented: active coping, planning, suppression of competing activities, restraint coping, seeking social support for instrumental reasons, seeking social support for emotional reasons, focusing on and venting emotions, behavioural disengagement, mental disengagement, positive reinterpretation and growth, denial, acceptance, and turning to religion. First-order factor analyses revealed 11 distinct factors (active coping/planning, suppression of competing activities, restraint coping, seeking social support, positive reinterpretation, acceptance, turning to religion, focus on emotions, denial, behavioural disengagement, mental disengagement). Second order factor analysis identified four higher-order factors (active coping/planning with suppression of competing activities, seeking social support/focus on emotion, denial/disengagement, positive reinterpretation/acceptance, and restraint) (Carver et al., 1989). According to Herman-Stahl and collaborators (1995), these coping indices can be conceptualized as approach and avoidance types of strategies.

Due to logistic constraints of the study, the questionnaire had to be abridged. Consequently six scales which represent commonly found strategies were chosen for the study (Carver et al., 1989; Folkman, 1984). A confirmatory factor analysis (Fournier, 1996) of the six scales represented good fit to the data (CFI = .96). However, high correlations among the factors suggested that the data may be best represented by two factors. The clusters of correlations suggested that instrumental social support

¹ Items of the Psychological Stress Measure are available from the authors.

TABLE 1
Means and Standard Deviations for Appraisal, Coping, and Stress

Subscale	Model A (<i>n</i> = 248)		Model B (<i>n</i> = 258)		
	Mean (<i>SD</i>)		Mean (<i>SD</i>)		
	Time 1	Time 2	Time 1	Time 2	
Appraisals					
IMP	3.08 (1.69)	2.91 (1.56)	3.00 (1.77)	2.78 (1.78)	
MAS	4.17 (1.96)	4.64 (1.83)	4.63 (1.95)	4.90 (1.99)	
UNC	3.53 (1.68)	2.94 (1.54)	3.46 (1.66)	3.08 (1.73)	
Coping Strategies					
Approach	ISS	2.20 (0.92)	2.43 (0.95)	2.09 (0.93)	2.20 (1.00)
	ESS	2.09 (0.99)	2.22 (0.94)	2.01 (0.94)	2.03 (0.93)
	AC	2.52 (0.95)	2.75 (0.94)	2.40 (0.99)	2.47 (0.98)
	PL	2.77 (2.14)	2.81 (1.00)	2.57 (1.09)	2.53 (1.07)
Avoidance	DI	1.54 (0.66)	1.35 (0.53)	1.46 (0.59)	1.40 (0.60)
	BD	1.36 (0.51)	1.27 (0.44)	1.35 (0.50)	1.32 (0.45)
Psychological Stress					
Total score	n/a	63.24 (26.37)	n/a	64.02 (29.18)	

Note. IMP = impact, MAS = mastery, UNC = uncertainty, ISS = instrumental social support, ESS = emotional social support, AC = active coping, PL = planning, DI = denial, BD = behavioural disengagement; perceived mastery scores are interpreted in direction opposite to that of perceived impact and perceived uncertainty.

(2 items), emotional social support (3 items), planning (2 items), and active coping (4 items) represented approach-type coping strategies, whereas denial (4 items) and behavioural disengagement (3 items) reflect avoidant-type coping strategies. Mean inter-item correlations ranged from 0.29 (behavioural disengagement) to 0.79 (planning and emotional social support), supporting the internal consistency of the coping scales. According to Carver, et al. (1989), test-retest reliabilities over an eight-week period were also reported to be satisfactory, ranging from .54 (denial) to .77 (emotional social support).² The items from the COPE were translated for this study using the reverse-translation method.

Procedure

As the study should not interfere or reduce compliance with the efficiency of the screening program, women who had made an appointment at the screening clinic were invited by the OBSP to present themselves about 30 minutes earlier than their scheduled appointment. Upon arrival at the clinic, women read and signed the appropriate consent forms, then completed the questionnaires immediately prior to their screening. The screening consisted of a clinical examination by a specially trained nurse, followed by a mammogram. While waiting to be seen by the nurse examiner, women completed the initial

questionnaire and were provided with the second questionnaire that was to be completed at home 20 days later after the screening, once their screen results were known. The official protocol of the clinic is to notify women of results from both the clinical breast exam and the mammogram simultaneously in writing. Letters can take anywhere from 3 to 14 days and sometimes longer to be delivered. The 20-day waiting period was chosen to ensure that all women had indeed received their letter. As a reminder, women were called on the day they were to complete and mail the second questionnaire. In all, 618 (75%) women returned the second questionnaire.

Statistical analyses

Each conceptual model was tested in a three-step process. Firstly, preliminary analyses were conducted to screen the data for violation of basic assumptions inherent to multivariate analyses (Tabachnick & Fidell, 1996). Secondly, separate confirmatory factor analyses using Lisrel 8.12 (Joreskog & Sorbom, 1993) were conducted to test the adequacy of the measurement models. For each of the two structural models, a CFA estimated the fit for a two-factor solution using the six indicators of coping. Another CFA tested a one-factor solution for appraisal using the three indicators of appraisal, and a third CFA tested a one-factor solution for stress using the three indicators of stress. Finally, confirmatory factor analytic procedures within the framework of covariance structure analysis were used to test the hypothesized relationships between latent constructs. All analyses were based on the covariance matrices and used the Maximum Likelihood

² Analyses and selected items from the COPE are available from the authors. The test-retest interval for the Carver et al. (1989) was eight weeks, which may explain the relatively low test-retest correlation for denial as a coping process.

TABLE 2
Lisrel Estimates for the Appraisal Measurement Models^a

Indicators	Model A Traditional	Model B Revised
IMP	.44 $t = 8.27^*$.53 $t = 8.09^*$
MAS	-.11 $t = -2.69^*$	-.31 $t = -5.07^*$
UNC ^b	1.42	1.08

Note. IMP = perceived impact; MAS = perceived mastery; UNC = perceived uncertainty. Perceived mastery scores are interpreted in direction opposite to that of perceived impact and perceived uncertainty.

^a Results represent completely standardized solution.

^b This parameter was fixed to 1.00, therefore no t value is available.

* $p < .05$.

estimation method.³

As recommended by researchers in this area (e.g., Marsh & Hocevar, 1985), the evaluation of fit of the model was based on many criteria, which consider statistical, theoretical, and practical issues. Global assessments of fit are based on a) the chi-square likelihood ratio, b) the revised normal comparative fit index (CFI; Bentler, 1990), c) expected cross-validation index (ECVI; Cudeck & Brown, 1983) and d) the root mean square error of approximation (RMSEA).

As proposed by Byrne (1991), a number of criteria were also taken into account in judging the worth of individual parameters; these include statistical significance as indicated by the LISREL t -values, goodness-of-fit based on the normalized residual values and modification indices.

For Model A, appraisals from the initial assessment (i.e., Time 1, prior to screen) were used to predict the coping efforts reported at the second assessment (i.e., Time 2, post screen), which were related to stress at Time 2. For Model B, coping at Time 1 was related to appraisals at Time 2, which were related to stress at Time 2. Stress as the outcome was measured at the same time for both models so that the potential impact of the timing of the screen result was uniform across both models.

RESULTS

Data screening

Data from each subsample were screened independently. Cases with more than 10% missing data were excluded, while mean substitution was the strategy used in cases with less than 10% missing data. Looking first at subsample A ($n = 279$), a preliminary screen of the data revealed that all values were reasonable and within expected limits. No univariate outliers were identified. Using Mahalanobis distances, 12 multivariate cases were

identified as outliers and were thus deleted from the dataset. This resulted in a final sample size of 248 participants for subsample A. As for subsample B, 20 cases with more than 10% missing data were deleted. Once again, no univariate outliers were identified and only one multivariate outlier was identified which resulted in a sample of 258 cases. When compared, the two resulting subsamples were not different from one another on age ($F_{(1,528)} = .001, p > .95$), education ($F_{(1,514)} = .68, p > .40$), marital status ($\chi^2_{(5,532)} = 7.18, p > .20$), or income ($\chi^2_{(5,473)} = 5.86, p > .55$). As recommended by Muth en and Kaplan (1985), the mean skewness and kurtosis of the measured variables were within limits for both subsamples. Thus, the data were considered as normally distributed. For both subsamples, a visual inspection on the plotted raw predicted values versus the raw residuals suggested that the relationship between the independent and dependent variables was linear, and supported the assumption of multivariate normality. The means and standard deviations on coping, appraisal, and stress are presented for both subsamples in Table 1.

Structural equation modeling

An important preliminary step in the analysis of full latent variable models is to test the validity of the measurement model before making any attempt to evaluate the structural portion of the model. Accordingly, CFA procedures are used in testing the validity of indicator variables.

Traditional Model:

Appraisal influences stress through coping

Establishing the measurement model. In the present case, CFAs were conducted for indicator variables derived from the three measures used in the study. The first CFA model hypothesized a priori that responses to the abridged SARS could be explained by one factor named "threatening appraisals." The initial one-factor model of appraisal represented a high degree of fit to the data with $\chi^2_{(1)} = 0.0$ ($p > .05$). As shown in Table 2, the estimated parameters were all statistically significant. Perceived impact and perceived uncertainty were both positively associated with appraisal, whereas perceived mastery was negatively associated with this factor.

The second CFA model hypothesized a priori that responses to the abridged COPE could be explained by two factors named "approach-type coping" and "avoidant-type" coping (i.e., instrumental social support, emotional social support, active coping, and planning would load together on one factor representing approach-type coping, whereas denial and behavioural disengagement would load together on a second factor representing avoidant-type coping). The initial two-factor model represented satisfactory fit to the data on the basis

³ All covariance matrices are available from the authors.

TABLE 3
Lisrel Estimates for the Coping Measurement Models^a

Indicators	Model A Traditional		Model B Revised	
	Approach-type	Avoidant-type	Approach-type	Avoidant-type
ISS	.80 <i>t</i> = 17.64*		.81 <i>t</i> = 15.46*	
ESS	.72 <i>t</i> = 14.34*		.87 <i>t</i> = 17.07*	
AC	.94 <i>t</i> = 25.01*		.86 <i>t</i> = 16.76*	
PL ^b	.93		.84	
DI		.97 <i>t</i> = 2.12*		.61 <i>t</i> = 2.82*
BD ^b		.48		.64

Note. ISS = instrumental social support; ESS = emotional social support; AC = active coping; PL = planning; DI = denial; BD = behavioural disengagement.

^a Results represent completely standardized solution.

^b These parameters were fixed to 1.00, thus no *t* values are available.

**p* < .05.

of statistical criteria ($\chi^2_{(8)} = 46.42, p < .05$). Examination of the CFI (.95) is indicative of an adequate fit to the data at a practical level. As seen in Table 3, all paths leading from indicators to the latent constructs are statistically significant.

The third CFA model hypothesized a priori that responses to the Psychological Stress Measure could be explained by one factor named "psychological stress." The one-factor model of psychological stress represented a high degree of fit to the data on the basis of statistical criteria ($\chi^2_{(1)} = 0.0, p > .05$). As indicated in Table 4, all estimated parameters had statistically significant *t*-values in the initial model and were positively associated with stress.

Testing the hypothesized causal structure of Model A. The next step involved testing the structural paths between the latent constructs. Figure 1 presents the hypothesized conceptual traditional model (Model A) to be tested. As shown, it is hypothesized that appraisals are directly related to both avoidant- and approach-type coping strategies, which in turn, impact on psychological stress. Figure 2 shows that one indicator for each latent construct was fixed to 1.0 for model identification. A total of 28 parameters were to be estimated. With 78 datapoints [(12(13)/2 = 78)], the initial full structural model was conducted with 50 degrees of freedom and was over-identified.

Examination of the CFI of .95 indicated that the model represented an adequate fit to the data at a practical level. Furthermore, the RMSEA (0.08) also suggested an acceptable fit. See Table 5 for a summary of specifications and fit statistics.

Individual indicators of misfit were also examined. One parameter representing the relationship between

approach-type coping and psychological stress (Gamma_(1,1)) was not significant (*t* = -.42, *p* > .05). To establish a more parsimonious model, this structural path was deleted. The difference in χ^2 ($\Delta\chi^2_{(1)} = 0.17, p > .05$) was non-significant and therefore, removal of the parameter did not significantly change the fit of the model. In this model, the fit was satisfactory ($\chi^2_{(52)} = 130.96, p < .05$, CFI = .95, RMSEA = 0.08, ECVI = .75). All estimated parameters within the model were significant. Appraisals were positively and significantly related to approach- (*t* = 2.52, *p* < .05) and avoidant-type (*t* = 3.46, *p* < .05) coping. Avoidant coping was positively associated with stress (*t* = 3.51, *p* < .05). The reliability of the indicators ranged from $R^2 = .02$ for perceived mastery to $R^2 = .89$ for active coping. The very low reliability for perceived mastery is discussed later. Disturbance terms for approach coping, avoidance coping, and psychological stress were generally quite elevated (.96, .86, & .89, respectively) (see Figure 2).

Revised Model: Coping influences stress through appraisal
Establishing the measurement model. As for Model A, here also a CFA model hypothesized that indicators of coping could be explained by two factors and was found to have satisfactory fit ($\chi^2_{(8)} = 64.75, p < .01$). The comparison fit index (CFI = .93) was above the critical value with no sizeable standardized residuals and represented a psychometrically reasonable fit to the data. As seen in Table 3, individual parameters were significantly and positively associated with avoidant-type coping efforts or avoidant-type coping efforts in a similar fashion as for Model A.

Another CFA model applied to indicators of appraisal. The hypothesized one-factor appraisal model was found

to have good fit with $\chi^2_{(1)} = 0.00$ ($p < .05$). Individual parameters were significant and related in a similar manner to appraisal.

The last CFA model revealed a one-factor appraisal model of stress to have good fit with $\chi^2_{(1)} = 0.00$ ($p < .05$) with individual parameters all being significant. As seen in Table 4, somatic, cognitive-affective, and behavioural aspects were all positively related to stress.

Testing the hypothesized causal structure of Model B. As shown in Figure 1, the hypothesized structural model postulated a priori that approach and avoidant-type coping efforts would be directly related to appraisal and that appraisal would impact on stress. The 28 parameters were to be estimated with 12 observed variables. As there were $[12(12+1)]/2 = 78$ data points, the model was over-identified and was tested with 50 degrees of freedom.

Goodness-of-fit statistics are presented in Table 5. Turning first to the comparative fit index (CFI = .93), we found that it provided evidence of a fairly well-fitting model. Since there were no outstanding modification index values suggestive of model misfit, no further consideration was given to the inclusion of additional parameters.

In reviewing the structural parameter estimates for the full structural model, we can see that one parameter is not significant. Specifically, approach-type coping was not found to be related to appraisal (Beta_(3,1), $t = .67$, $p > .05$). In the interest of parsimony, a final model of stress was estimated with this structural path deleted from the model.

Estimation of the final model resulted in an overall χ^2 value of 159.70 ($p < .05$), with a CFI value of .94 and an RMSEA of .09. Although there is a slight increase in the χ^2 value, the important aspect of this change in model fit is that the χ^2 difference between the two models is not significant (see Table 5). Based on the ECVI (.83), it seems that the final model has a better potential for replication. All hypothesized paths were significant and thus important to the model. More specifically, avoidant coping behaviours were positively and significantly associated with appraisal ($t = 2.45$, $p < .05$), and appraisal was positively associated with stress ($t = 4.25$, $p < .05$). No additional paths were identified as essential components of the causal structure. The reliability indicators ranged from $R^2 = .13$ for perceived mastery (MAS) to $R^2 = .91$ for cognitive aspects of stress (COGN). As with Model A, the reliability for the perceived mastery item was rather low and this issue is addressed in the discussion. Disturbance terms were rather high (.95 for threatening appraisal and .89 for psychological stress) (see Figure 3).

DISCUSSION

Using data from women undergoing breast cancer screening with normal results, the objective of this study

TABLE 4
Lisrel Estimates for the Psychological Stress Measurement Models^a

Indicators	Model A Traditional	Model B Revised
COG	.90 $t = 22.43^*$.95 $t = 28.80^*$
BEH	.86 $t = 20.20^*$.86 $t = 22.37^*$
SOM ^b	.91	.92

Note. SOM = somatic indicator of stress; COG = cognitive indicator of stress; BEH = behavioural indicator of stress.

^a Results represent completely standardized solution.

^b This parameter was fixed to 1.00, thus no t value is available.

* $p < .05$.

was to test the "causal" relations among the three principle variables of the cognitive-appraisal model, coping, appraisal, and stress, using structural equation modeling techniques. Two competing structural models were presented. In the first, more traditional model, it was postulated that appraisal would influence coping efforts which, in turn, would impact on the stress response. In the second, revised model, it was hypothesized that coping efforts would be directly related to the appraisal of the stressor, which in turn, would have an impact on the degree of stress reported by individuals.

A first step entailed testing the adequacy of the measurement models. No problems with the measurement models of each of the two conceptual models were identified. Turning our attention to the structural portion of the models, we found that both models yielded a relatively high degree of fit. These findings partially supported both formulations of Lazarus' model of stress.

Nonetheless, the traditional model of stress seemed to yield a marginally better fit as demonstrated by a stronger CFI index. The RMSEA value was also lower, suggesting that this model more closely approximated the population correlation matrix. In addition, the ECVI suggested that this model was more likely than the revised model to be cross-validated in another sample. As such, it would seem that appraisals influence coping strategies which then determine the degree of stress experienced. These findings must, however, be cross-validated before any firm conclusions can be drawn. Furthermore, both models yielded a high level of fit and, therefore, both formulations merit some discussion.

Regarding the first model, the predicted paths from appraisal to both types of coping were significant. When women perceived the stressor more negatively, they made more of an effort to cope with the situation, whether it be by approaching it or avoiding it. The path from avoidant-type coping to stress was also significant.

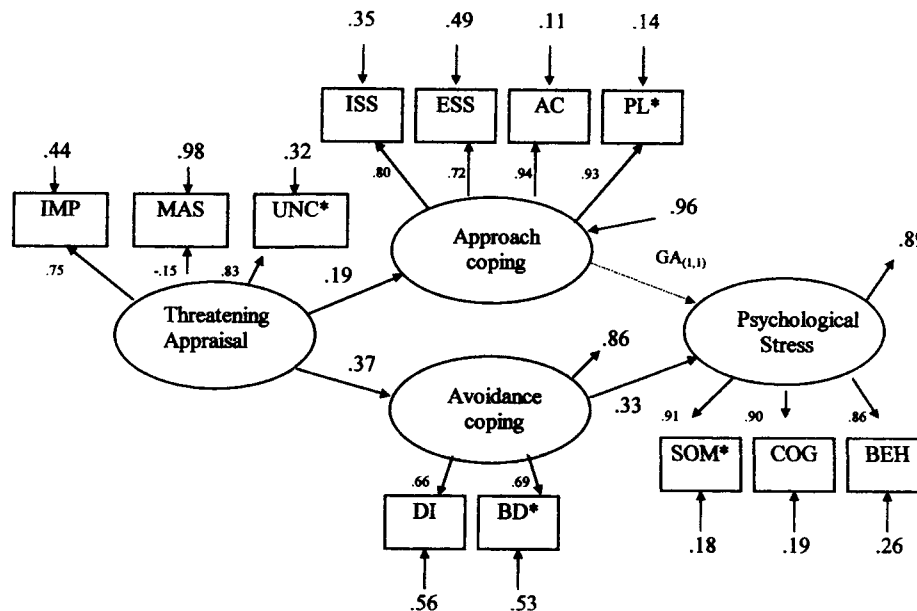


Figure 2. Full structural model (Traditional) with completely standardized estimates. IMP = perceived impact, MAS = perceived mastery, UNC = perceived uncertainty, ISS = instrumental social support, ESS = emotional social support, AC = active coping, PL = planning, DI = denial, BD = behavioural disengagement, SOM = somatic, COG = cognitive, BEH = behavioural, * = parameter fixed to 1.0.

Thus, yielding to more avoidance led to an increase in stress.

As predicted in the second model, avoidant-type strategies were positively associated with threatening appraisal. Thus, as individuals focused attention away from the source of stress or their reactions to it (Suls & Fletcher, 1985), they appraised the situation more negatively (i.e., high perceived impact, high perceived uncertainty, and low perceived mastery). The relationship between appraisal and stress was also significant. Therefore, a negative perception of the event led to increased psychological stress.

Certain paths in the models were not significant. Based on the traditional conceptualization, it had been hypothesized that approach-type coping would be associated with reduced stress. This relationship was not significant. Inconsistencies in the direction of the relations of approach-type coping to stress have been noted in previous studies. It has also been suggested that the use of approach-type strategies in the context of an uncontrollable stressor are less likely to be adaptive (Coyne & Downey, 1991; Lazarus & Folkman, 1984). The high prevalence of breast cancer, coupled with no possibility of action until full diagnosis, may leave women feeling helpless in the face of potentially receiving an abnormal screen, resulting in the nonsignificant path between approach-type coping and stress.

The lack of association between approach strategies and stress may also be explained by the natural context

in which the study was conducted. Some women indicated that they tried to regard screening as a routine procedure and they expressed some difficulty in understanding how a person could actively cope with something as abstract as the risk of breast cancer.

In the revised model, the effect of approach-type coping on appraisal was not significant. One possible explanation for this lack of association stems from findings suggesting a strong relationship between active coping behaviours and event controllability. Researchers have found that individuals are more active in situations that are appraised as controllable (Terry, 1994; Vitaliano, DeWolf, Maiuro, Russo, & Katon, 1990). In fact, denial is a common strategy used when a situation is perceived as having a high degree of threat and uncontrollability (Buntrock & Reddy, 1992); when there is nothing constructive left to be done, avoidant-type strategies may take precedence (Lazarus & Folkman, 1984). Perhaps once women arrived at the clinic, they perceived the risk of breast cancer as being out of their control. Consequently, they may have preferred to focus attention away from the stressor at hand.

Before concluding, various strengths and limitations of this study merit consideration. This study was based on a relatively large sample size and was conducted in the context of a naturalistic setting. Moreover, the use of a longitudinal design allowed us to examine more clearly the sequence of events outlined in the cognitive-appraisal framework. In terms of limitations, it must first be

TABLE 5
Summary of Specifications and Fit Statistics for Tested Models of Stress

Model	Parameter Deleted	χ^2	df	CFI	ECVI	RMSEA	$\Delta\chi^2$	Δdf	<i>p</i>
Model A - Traditional									
1 Initial	—	130.79	50	.95	.76	.08	—	—	
2 Final	Gamma _(1,1)	130.96	51	.95	.75	.08	0.17	1	ns
Model B - Revised									
1 Initial	—	159.27	50	.93	.84	.09	—	—	
2 Final	Beta _(3,1)	159.70	51	.94	.83	.09	0.43	1	ns

Note. ns = non-significant.

recognized that structural equation modeling techniques cannot establish causal relationships between variables. Instead, they are used to evaluate the relative fit of various hypothesized causal models to existing data. In addition, even though considerable structural equation modeling research is done using such a limited amount of indicators, generally, the use of at least three indicators per construct is recommended (Hayduk, 1987). Future studies should include a third indicator of avoidance-coping.

Second, appraisal indicators (i.e., perceived impact, mastery, and uncertainty) were each assessed using a single item. Even though multiple items would be preferable, the squared multiple correlations for perceived impact and perceived uncertainty indicated that these items were in fact, reliable. The low squared multiple correlation for perceived mastery suggests, however, that this particular item may not reliably represent the underlying construct of appraisal. This may, at least in part, be explained by the overlap between appraisals of mastery or control and coping efforts noted by various researchers (e.g., Dewe, 1991; Folkman & Lazarus, 1985). However, a more likely explanation is the fact that single items were used to assess each appraisal dimension.

Third, although the structural models were characterized by a high degree of fit, the disturbance terms for the dependent variables suggest that a significant amount of variance in both appraisal and stress was left unexplained. There are therefore other elements, not considered in these models, that may help to explain variations in appraisal and stress.

Next, our findings were based on data from self-reports. It is appropriate to recognize the various limitations associated with the use of such measures. The use of objective measures (i.e., investigator-based interview protocols and ratings) such as those of Brown and Harris (1978) in tandem with subjective reports would enhance the validity of the findings.

Finally, it is important to remember that this study was conducted within a very specific context, that of breast cancer screening. We argue that appraisals, coping,

and stress should be investigated in the context of a natural stressor that is readily experienced by a large number of homogeneous individuals. However, the specific stressful situation chosen for this study may hinder the extent to which our results can be generalized. It should also be acknowledged that women were informed of their normal results between the first and second measures, which may have impacted upon stress levels. Nonetheless, the paths between appraisal, coping, and stress remain significant. Moreover, the exclusion of women with abnormal findings prevented us from investigating whether or not the process would be different for women whose screen results brought a raised and sustained level of uncertainty and threat. Further replication of these findings using different samples is clearly needed.

To conclude, the results from this study support the importance of both appraisals and coping in the experience of stress. As described in Lazarus and Folkman's (1984) theoretical model, coping behaviours and appraisal are both important to a person's adaptation. Findings suggested that appraisals could influence coping strategies which, in turn, would relate to the stress level. However, given the fact that both models of appraisal leading to coping and reversibly coping leading to appraisal, yielded a high degree of fit, more cross-validation studies are needed to better understand the complex and dynamic interrelationship between these concepts. In fact, there may be a need to develop a new alternative model that encompasses both traditional and revised views. Such a model would better reflect the evaluation process by acknowledging the possible bi-directional nature among these concepts. This model can then be tested on data from many time points, allowing the investigation of how the process unfolds and how a stressor is re-evaluated over time.

This study was carried out with the financial support of the Social Sciences and Humanities Research Council. We wish to express our gratitude to the Ontario Breast Screening Program, all staff members involved in helping us with this project, and the women who shared their experi-

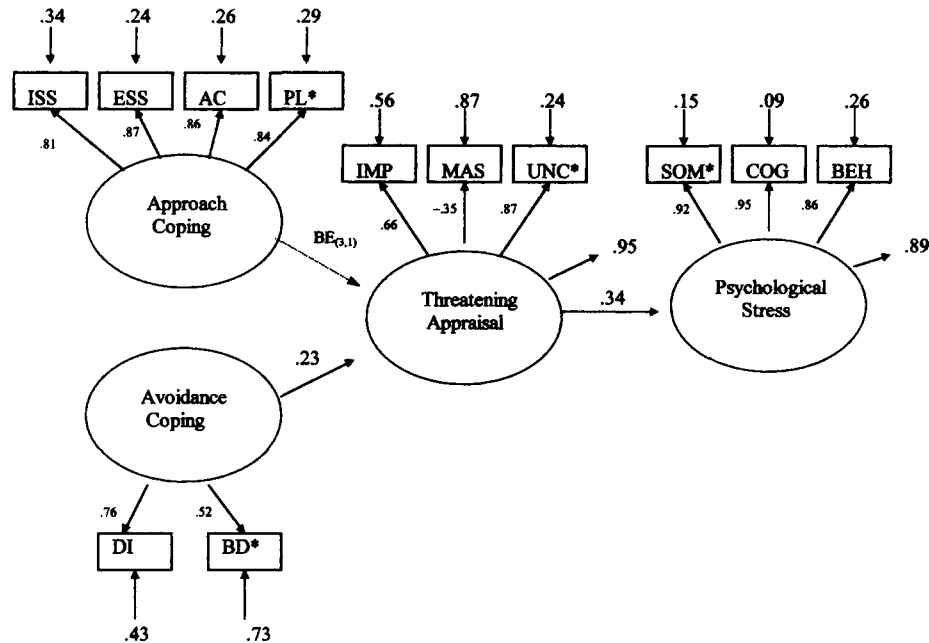


Figure 3. Full structural model (Revised) with completely standardized estimates. IMP = perceived impact, MAS = perceived mastery, UNC = perceived uncertainty, ISS = instrumental social support, ESS = emotional social support, AC = active coping, PL = planning, DI = denial, BD = behavioral disengagement, SOM = somatic, COG = cognitive, BEH = behavioral, * = parameter fixed to 1.0.

ences with us. Correspondence concerning this article should be addressed to Dr. Lisa Sweet, Royal Ottawa Health Care Group, 1145 Carling Ave., Ottawa, Ontario K1Z 7K4 Canada (E-mail: lsweet@rohcg.on.ca).

References

- Aldwin, C.M. (1994). *Stress, coping, and development: An integrative perspective*. New York: Guilford Press.
- Bentler, P. (1990). Comparative fit indices in structural models. *Psychological Bulletin*, 107, 238-246.
- Biron, C., Truchon, M., & Lemyre, L. (1992). Investigator and respondent evaluations of stressors: Psychometrical considerations. Unpublished manuscript, Université Laval, Québec.
- Bjorck, J.P., & Cohen, L. H. (1993). Coping with threat, losses, and challenges. *Journal of Social and Clinical Psychology*, 12, 56-72.
- Buntrock, C.N., & Reddy, D.M. (1992). Coping disposition and the stress appraisal process: Impact of defensiveness on emotional response to threat. *Personality and Individual Differences*, 13, 1223-1231.
- Byrne, B.M. (1991). The Maslach Burnout Inventory: validating factorial structure and invariance across intermediate, secondary, and university educators. *Multivariate Behavioral Research*, 26, 583-605.
- Carver, C.S., Pozo, C., Harris, S.D., Noriega, V., Scheier, M.F., Robinson, D.S., Ketcham, A.S., Moffat, F.L., & Clark, K.C. (1993). How coping mediates the effect of optimism on distress: a study of women with early stages of breast cancer. *Journal of Personality and Social Psychology*, 65, 375-390.
- Carver, C.S., & Scheier, M.F. (1994). Situational coping and coping dispositions in a stressful encounter. *Journal of Personality and Social Psychology*, 66, 184-195.
- Carver, C.S., Scheier, M.F., & Weintraub, J.K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56, 267-283.
- Christman, N.J. (1990). Uncertainty and adjustment during radiotherapy. *Nursing Research*, 39, 17-20.
- Commerford, M.C., Gular, E., Orr, D.A., Reznikof, M., & O'Dowd, M.A. (1994). Coping and psychological distress in women with HIV/AIDS. *Journal of Community Psychology*, 22, 224-230.
- Coyne, J.C., & Downey, G. (1991). Social factors and psychopathology: Stress, social support, and coping processes. *Annual Review of Psychology*, 42, 401-425.
- Cudeck, R., & Brown, M.W. (1983). Cross-validation of covariance structures. *Multivariate Behavioral Research*, 18, 147-167.
- Davey, G.C.L. (1993). A comparison of three cognitive appraisal strategies: the role of threat devaluation in problem-focused coping. *Personality and Individual Differences*, 14, 535-546.
- Davis, L.L. (1990). Illness uncertainty, social support, and stress in recovering individuals and family caregivers. *Applied Nursing Research*, 3, 69-71.

- Dewe, P. (1991). Primary appraisal, secondary appraisal and coping: Their role in stressful work encounters. *Journal of Occupational Psychology, 64*, 331-351.
- Dion, G. (1988). *Validation du concept de burnout*. Mémoire de maîtrise. Québec, Canada, École de psychologie, Université Laval.
- Dunkel-Schetter, C., Feinstein, L.G., Taylor, S.E., & Folk, R.L. (1992). Patterns of coping with cancer. *Health Psychology, 11*, 79-87.
- Endler, N.S., & Parker, J.D.A. (1990). Multidimensional assessment of coping: A critical evaluation. *Journal of Personality and Social Psychology, 58*, 844-854.
- Endler, N.S., & Parker, J.D.A. (1994). Assessment of multidimensional coping: Task, emotion and avoidance strategies. *Psychological Assessment, 6*, 50-60.
- Felsten, G. (1991). Influences of situation-specific mastery beliefs and satisfaction with social support on appraisal of stress. *Psychological Reports, 69*, 483-495.
- Fillion, L. (1993). *Évaluation cognitive, état de stress et immunité lors d'un diagnostic de tumeur au sein*. Unpublished doctoral dissertation. Université Laval, Québec.
- Fillion, L., Tessier, R., Tawardos, E., & Mouton, C. (1989). Stress et immunité: Etude de validité d'une mesure de stress psychologique. *Canadian Psychology, 30*, 30-38.
- Folkman, S. (1984). Personal control and stress and coping processes: a theoretical analysis. *Journal of Personality and Social Psychology, 46*, 839-852.
- Folkman, S., & Lazarus, R.S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior, 21*, 219-239.
- Folkman, S., & Lazarus, R.S. (1985). If it changes it must be a process: Study of emotions and coping during three stages of a college examination. *Journal of Personality and Social Psychology, 48*, 150-170.
- Folkman, S., & Lazarus, R.S. (1988). *Manual for the Ways of Coping Questionnaire: Research edition*. Palo Alto, CA: Consulting Psychologists Press.
- Folkman, S., Lazarus, R.S., Gruen, R.J., DeLongis, A. (1986). Appraisal, coping, health status, and psychological symptoms. *Journal of Personality and Social Psychology, 50*, 571-579.
- Forsythe, C.J., & Compas, B.E. (1987). Interaction of cognitive appraisals of stressful events and coping: Testing the goodness of fit hypothesis. *Cognitive Therapy and Research, 11*(4), 473-485.
- Gall, T.L., & Evans, D.R. (1987). The dimensionality of cognitive appraisal and its relationship to physical and psychological well-being. *The Journal of Psychology, 121*, 538-546.
- Gass, K.A., & Chang, A.S. (1989). Appraisals of bereavement, coping, resources, and psychosocial health dysfunction in widows and widowers. *Nursing Research, 38*, 31-36.
- Ham, M., & Larson, R. (1990). The cognitive moderation of daily stress in early adolescence. *American Journal of Community Psychology, 18*, 567-585.
- Hayduk, L.A. (1987). *Structural Equation Modeling with Lisrel: Essentials and Advances*. Baltimore, MD: John Hopkins University Press.
- Herman-Stahl, M.A., Stemmler, M., & Petersen, A.C. (1995). Approach and avoidant coping: implications for adolescent mental health. *Journal of Youth and Adolescence, 24*, 649-665.
- Hu, L.T., & Bentler, P. (1995). Evaluating model fit. In R.H. Hoyle (Ed.), *Structural Equation Modeling: Concepts, Issues, and Applications*. London: Sage.
- Irvin, M.J., & Logan, A.G. (1994). Is knowing your cholesterol number harmful? *Journal of Clinical Epidemiology, 47*, 131-145.
- Joreskog, K.G., & Sorbom, D. (1993). *Lisrel 8.12*. Chicago, IL: Scientific Software.
- Karasawa, K. (1995). Cognitive antecedents of emotions: Findings and future directions. *Japanese Psychological Research, 37*, 40-55.
- Kendler, K.S., Kessler, R.C., Heath, A.C., Neale, M.C., & Eaves, L.J. (1991). Coping: A genetic epidemiological investigation. *Psychological Medicine, 21*, 337-346.
- Lazarus, R.S. (1991). Cognition and motivation in emotion. *American Psychologist, 46*, 352-367.
- Lazarus, R.S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology, 44*, 1-21.
- Lazarus, R.S., & Folkman, S. (1984). *Stress, Appraisal and Coping*. New York: Springer Publishing Company Inc.
- Lemyre, L. (1986). *Stress psychologique et appréhension cognitive*. Unpublished doctoral dissertation, Université Laval, Québec.
- Lemyre, L., & Tessier, R. (1988). Mesure de Stress Psychologique (MSP): Se sentir stressée. *Canadian Journal of Behavioural Science, 20*, 302-321.
- Lemyre, L., Tessier, R., & Fillion, L. (1991). *Psychological Stress Measure: A translation*. Québec, PQ: Université Laval.
- Marsh, H.W., & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: first- and higher-order factor models and their invariance across groups. *Psychological Bulletin, 97*, 562-582.
- Marteau, T.M. (1994). Psychology and screening: Narrowing the gap between efficacy and effectiveness. *British Journal of Clinical Psychology, 33*, 1-10.
- Mishel, M.H. (1981). The measurement of uncertainty in illness. *Nursing Research, 30*(5), 258-263.
- Mishel, M.H., & Sorenson, D.S. (1991). Uncertainty in gynecological cancer: A test of the mediating functions of mastery and coping. *Nursing Research, 40*(3), 167-171.
- Muthén, B., & Kaplan, D. (1985). A comparison of some methodologies for the factor analysis of non-normal

- Likert variables. *British Journal of Mathematical and Statistical Psychology*, 38, 171-189.
- Prince-Embury, S. (1992). Psychological symptoms as related to cognitive appraisals and demographic differences among information seekers in the aftermath of technological disaster at Three Mile Island. *Journal of Applied Social Psychology*, 22, 38-54.
- Savoie, J. (1996). Confirmatory Factor Analysis of the Cope Scale. Unpublished manuscript, University of Ottawa, Ottawa, ON.
- Savoie, J. (1999). *Contextual and Subjective Indices of Coping Strategies in Breast Cancer Screening: A Longitudinal Investigation*. Unpublished doctoral dissertation, University of Ottawa, Ontario.
- Selye, H. (1956). *The stress of life*. New York, NY: McGraw-Hill.
- Smith, C.A., & Lazarus, R.S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition and Emotion*, 3-4, 233-269.
- Stanton, A.L., & Snider, P.R. (1993). Coping with breast cancer diagnosis. *Health Psychology*, 12, 16-23.
- Suls, J., & Fletcher, B. (1985). The relative efficacy of avoidant and non-avoidant coping strategies. A meta-analysis. *Health Psychology*, 4, 249-288.
- Sweet, L. (1998). *Stress, Subjective Appraisals, and Anticipation in the Context of Breast Cancer Screening*. Unpublished doctoral dissertation, University of Ottawa, Ottawa, ON.
- Tabachnick, B.G., & Fidell, L.S. (1996). *Using multivariate statistics (3rd ed.)*. New York: Harper Collins Publishers Inc.
- Tenner, H., & Herzverger, S. (1985). Ways of Coping Scale. In D.J. Keyser & R.C. Sweetland (Eds.), *Test Critiques* (Vol. 3, pp. 686-697). Kansas City, KA: Test Corporation of America.
- Terry, D.J. (1994). Determinants of coping: The role of stable and situational factors. *Journal of Personality and Social Psychology*, 66, 895-910.
- Tobin, D.L., Holroyd, K.A., Reynolds, R.V., & Wigal, J.K. (1989). The hierarchical factor structure of the Coping Strategies Inventory. *Cognitive Therapy and Research*, 13, 343-361.
- Tomaka, J., Blascovich, J., Kelsey, R.M., & Leiten, C.L. (1993). Subjective, physiological, and behavioral effects of threat and challenge appraisal. *Journal of Personality and Social Psychology*, 65, 248-260.
- Valentiner, D.P., Holahan, C.J., & Moos, R.H. (1994). Social support, appraisals of event controllability, and coping: An integrative model. *Journal of Personality and Social Psychology*, 66, 1094-1102.
- Vinokur, A., & Selzer, M.L. (1975). Desirable versus undesirable life events: their relationship to stress and mental distress. *Journal of Personality and Social Psychology*, 32, 329-337.
- Vitaliano, P.P., DeWolfe, D.J., Maiuro, R.D., Russo, J., & Katon, W. (1990). Appraised changeability of a stressor as a modifier of the relationship between coping and depression: A test of the hypothesis of fit. *Journal of Personality and Social Psychology*, 59, 582-592.

Received January 16, 1998

Revised March 1, 1999

Accepted April 19, 1999